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1 INTRODUCTION

Vantage Data Centers (Vantage) files this Application for a Small Power Plant Exemption (SPPE Application) pursuant to Public Resources Code Section 25541 and Section 1934 et seq. of the California Energy Commission (Commission) regulations for the 9198.7 MW[1] McLaren Backup Generating Facility (MBGF). The MBGF will consist of a total of 47 diesel fired generators that will be used exclusively to provide backup generation to support the McLaren Data Center (MDC), which is currently being constructed at 651, 725, and 825 Mathew Street in Santa Clara, California. In addition the MBGF will include three one life safety emergency generators to support a fire suppressionpump and other emergency operations. Figure 1-1 depicts the location of the MDC and the MBGF.

Unlike the typical electrical generating facility reviewed by the Commission, the MBGF is designed to operate only when electricity is unavailable to the MDC. The MBGF will not be electrically interconnected to the electrical transmission grid. Rather, it will consist of three generation yards, each separately electrically interconnected to the three server buildings that make up the MDC.

Section 2 of the SPPE Application provides a detailed description of the construction and proposed operation of the MBGF. To describe the context of the MBGF and its role in serving the MDC, Section 2 also includes a general description of the MDC.

Section 3 of the SPPE Application provides a description of power plant efficiency, reliability and potential energy resource impacts which may result from the construction and operation of the MBGF.

Section 4 of the SPPE Application includes environmental information and analyses in sufficient detail to allow the Commission to conduct an Initial Study consistent with Section 16063(d) of the California Environmental Quality Act (CEQA) Guidelines. Additionally, Section 4 contains a list of applicable agencies and contact information with laws, ordinances, regulations, and standards (LORS) that are applicable to the MBGF.

Section 5 of the SPPE Application includes a discussion of Alternative backup

[1] Continuous steady state generating capacity.

generation configurations and technology considered by Vantage including an evaluation of the No Project Alternative.

1.1 NEED FOR BACKUP GENERATION

The MDC's purpose is to provide its customers with mission critical space to support their servers, including space conditioning and a steady stream of high quality power supply. Interruptions of power could lead to server damage or corruption of the data and software stored on the servers by Vantage's clients. The MDC will be supplied electricity by Silicon Valley Power (SVP) through a new distribution substation constructed on the MDC site and owned and operated by SVP.

To ensure a reliable supply of high quality power, the MGBF was designed to provide backup electricity to the MDC in the event of electricity cannot be supplied from SVP and delivered to the MDC buildings. To ensure no interruption of electricity service to the servers housed in the MDC building, the servers will be connected to uninterruptible power supply (UPS) systems that store energy and provide near-instantaneous protection from input power interruptions. However, to provide electricity during a prolonged electricity interruption, the UPS systems will require a power generation source to continue supplying steady power to the servers and other equipment. The MBGF provides that power generation source.

1.2 COMMISSION SPPE JURISDICTION

Vantage acknowledges that the Commission's authorizing statute grants exclusive authority for the Commission to issue licenses for the construction and operation of thermal power plants with generating capacities in excess of 50 MW.[2] For thermal power plants with generating capacities greater than 50 MW but less than 100 MW, the Commission can grant an exemption from its licensing authority[3]. The MBGF is not a typical power generating facility in that it consists of generators that can operate independently. In addition, the generators are arranged in generation yards to support individual buildings within the greater data center campus. None of the generators will be interconnected to the electrical transmission system and therefore no electricity can be delivered off site.[4]

[2] Public Resources Code (PRC) Section 25500.

[3] PRC Section 25541 and Title 20 California Code of Regulations (CCR) Section 1934.

[4] The Commission Staff has determined that notwithstanding these facts, the Commission has jurisdiction over the MBGF. Vantage reserves all its rights regarding whether or not the Commission has jurisdiction over the MBGF and the filing of this SPPE Application is not an admission by Vantage that the Commission has exclusive jurisdiction over the MBGF.

1.2.1 Power Plant

The MBGF will consist of a total of 47 backup generators, each with a peak output capacity of ~~3~~2.75 MW and with a continuous steady state output capacity of 1.93~~2.1~~ MW.[5] The backup generators will be arranged in three location or generation yards. Sixteen (16) of the backup generators will be arranged in a generation yard located adjacent to support MDC Building A. Sixteen (16) will be arranged in a generation yard adjacent to support MDC Building B. The remaining fifteen (15) of the backup generators will be arranged in a generation yard adjacent to support MDC Building C. Additionally, the MGBF will have three~~a~~ 6~~5~~00 kW life safety backup generators to provide continuous power to the pumps associated with the fire sprinkler system and other emergency operations for each building.

The Commission Staff and Vantage exchanged information concerning another one of Vantage's Data Centers relating to how to calculate the generating capacity of backup generator banks for Commission jurisdictional calculations. In a response to Vantage, Staff opined that to determine the generating capacity of a collection of backup generators, the maximum of capacity of the load being served was determinative.[6] In other words the maximum generating capacity of the MBGF is limited by the combined load of the 3 MDC buildings since the MBGF is exclusively interconnected to the MDC and is not capable of delivering electricity to any other user or to the electrical transmission system. In the case of the MBGF, the maximum load for the 3 MDC buildings combined at total buildout and 100 percent tenant occupancy will not exceed 100 MW and the continuous steady state generating capacity of all the generators would not exceed ~~-~~91~~98~~.7 MW for a prolonged electricity outage.

Therefore, the MBGF's generating capacity is below the 100 MW threshold and would qualify for consideration under the Commission's SPPE authority.

1.2.2 Data Center Facilities Not Within Scope of SPPE

The MDC is not within the scope of the Commission's jurisdiction because it is not a thermal power plant. The MDC is the sole consumer of the electricity produced by the MGBF. The MDC was approved by the City of Santa Clara (City) as discussed in Section 1.3 and is currently under construction. Vantage provides a brief description of the MDC and current modifications being considered by the City in Section 2. Where appropriate, the changes are considered in environmental analyses of Section 4 to assist the Commission in evaluating cumulative impacts from the co-location of the MBGF and the MDC.

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[5] Steady state continuous generating capacity is 70 percent of the peak generating capacity. See Appendix A.

[6] Letter dated August 25, 2017 from Robert Ogelsby, CEC Executive Director to Mr. Matt Silvers, Vantage Director of Operations.

1.3 PRIOR ENVIRONMENTAL REVIEW

The City prepared an Initial Study (IS) and adopted a Mitigated Negative Declaration (MND) and a Mitigation Monitoring and Reporting Plan (MMRP) for the MDC on February 10, 2017. The IS, MND and MMP included backup generation facilities. A copy of the MND which includes the IS and MMP and supporting technical studies is include in Appendix B.

The original configuration of the MDC was smaller and consisted of two four-story buildings to be constructed in four phases. The original design of the MDC encompassed a total building square footage of 413,000 gross square feet (gsf) and a total electrical load at full buildout of 76 MW. To serve this 76 MW electrical load of the original MDC, Vantage proposed a total of 32 backup generators.

Since approval by the City, Vantage has reconfigured the MDC and now proposes that the MDC consist of three four-story buildings encompassing a total building square footage of 541,000 gsf and total electrical load at full buildout not to exceed 100 MW. The reconfigured MDC will be constructed in three phases. Backup generation has been increased to serve the additional electrical load and will be served by the MBGF.

The City is allowing construction of the MDC to continue for Phase I and is currently processing the modifications to allow full buildout of the reconfigured MDC as proposed by Vantage. Our understanding is that the City intends to rely on the environmental analysis of the MBGF performed by the Commission to supplement its environmental review of the modified MDC by way of an Addendum to the MND.

To enable the City to timely conduct its review of the modified MDC, Vantage requests the Commission complete its review of the MBGF by March 2018.

2 PROJECT DESCRIPTION

2.1 OVERVIEW OF PROPOSED GENERATING FACILITIES

MBGF will be a backup generating facility with a generation capacity of up to 91.798.7 MW to support the need for the MDC to provide uninterruptible power supply for its tenant's servers. The MBGF will consist of 47 diesel-fired back up generators, arranged in three generation yards each designed to serve one of the three server buildings that make up the MDC. Project elements will also include switchgear and distribution cabling to interconnect the three generation yards to their respective buildings. In addition, the MBGF will include onethree life safety diesel fired generators, each capable of generating 6500 kW.

2.2 GENERATING FACILITY DESCRIPTION, CONSTRUCTION AND OPERATION

2.2.1 Site Description

The MBGF will be constructed within the boundaries of the MDC site. The MDC site is 8.97 acres (390,900 square feet) and located at 651, 725, and 825 Mathew Street in Santa Clara, California. The project site is primarily surrounded by industrial and commercial land uses. The site is bounded by existing occupied buildings to the West, rail tracks to the East, a Home Depot location to the North and Mathew Street to the South. The project site is located approximately 0.3 mile west of the Norman Y. Mineta San Jose International Airport. See Figure 1-1, Site Location Map.

The MDC site is comprised of three parcels that were previously used for industrial warehouse, manufacturing, and office purposes as well as associated surface parking. These buildings are currently being demolished as part of the MDC. The westernmost portion of the project site is the 0.26-acre APN 224-40-011 (located at 825 Mathew Street). Vehicle ingress and egress for this parcel is provided by one gated driveway along Mathew Street. The central portion of the project site is the 4.36-acre APN 224-40-002 (located at 725 Mathew Street). Vehicle ingress and egress to this parcel is provided by one gated driveway along Mathew Street. The easternmost portion of the project site is the 4.35-acre APN 224-40-001 (located at 651 Mathew Street). Vehicle ingress and egress to this parcel is provided by one gated driveway along Mathew Street. APNs 224-40-001 and 224-40-002 were developed as canneries in the late 1940s.

There are no native trees and limited landscaping present on the project site. The limited landscaping includes several non-native volunteer shrubs, including Canary Island date palm, Mexican avocado, tree of heaven, and silk tree.

2.2.2 General Site Arrangement and Layout

The 47 backup generators will be located at the site in generation yards at three separate locations within the MDC. Each generation yard will be adjacent to the building it serves. Figure 2-1 shows the general arrangement and site layout of the MBGF within the MDC site. Sixteen (16) of the backup generators will be dedicated to support MDC Building A; Sixteen (16) will be dedicated to support MDC Building B; and Fifteen (15) will be dedicated to support MDC Building C. Each of t~~T~~he three life safety generators will be located ~~in the~~ within the generation yard supporting each respective builindg~~Building A~~.

Each backup generator is a fully independent package system with dedicated fuel tanks located on a skid below the generator. As shown in Figure 2-2, the generators will be supported in a stacked configuration. Each generation yard will be electrically interconnected to the building it serves through combination of underground and above ground conduit/cabling to a location within the building that houses electrical distribution equipment.

2.2.3 Backup Electrical System Design

2.2.3.1 Overview

To place the role of the MBGF into context, the following information about the overall MDC design is provided. The design objective of the backup electrical system is to provide sufficient equipment and redundancy to ensure that the servers housed in the MDC buildings will never be without electricity to support critical loads. The critical loads include the load to support the building operation in addition to the electricity consumed by the servers themselves. The largest of these building loads is to provide cooling for the server rooms.

For backup supply for a Data Center, it is commonplace to build levels of systems and equipment redundancy and concurrent maintainability into the overall electrical and mechanical infrastructure. The base quantity of systems that are required to serve the design load of the facility is referred to as “N”. When reliability requirements dictate that redundant systems are added to the base quantity of systems, it is commonplace in the industry to refer to the number of redundant systems as “X” in the representation “N+X”.

Each electrical system will consist of an Uninterruptible Power Supply (UPS) system that will be supported by batteries, electrical switchgear, an electrical inverter and portions of the MBGF backup generation. The UPS systems that will be deployed at the MDC will be consist of two (2) 1000KVA UPS units will be paralleled together to provide “N Unit” of redundant Critical Capacity of 2MW. The two UPS units will share a potential 2MW of critical load by employing load sharing capabilities inherent to the UPS

design. The power inputs of the two UPS units will be electrically connected to a single Main Switch Board. This main switchboard will be connected to a dedicated 3750 KVA Utility Transformer as well as dedicated to one of the MBGF proposed backup generators.

Four (4) N Unit 2MW UPS systems will equally share a maximum 6MW critical load. The system works as a distributive redundant (4 to make 3) N+1 system such that if any single N system were to catastrophically fail, the surviving 3 would have sufficient capacity to provide power to the maximum critical load.

The original design selected a 3MW peak rated generator. Vantage completed an analysis of the individual generator system loads as designed in the 4 to make 3 load sharing distribution. In this analysis, it was discovered that at design day conditions an individual generator would only be tasked to a maximum load just under 2.75 MW. This peak loading would only be realized during a normal utility power loss and a single generator in a group of 4 were to fail while the 4 to make 3 electrical system was providing power to a maximum 6MW of critical load, which is 100 percent of the IT loading demand, all during design day temperatures. The design day temperature is the hottest day of the year for the Santa Clara region. As the analysis further detailed, the design day conditions are dynamic based on the outside temperature, and thus over the period of 24 hours, the load analysis showed the average loading of the generator met the manufactures ratings for continuous loading. Therefore, Vantage was able to reduce the generator size from a 3 MW peak capacity to a 2.75 MW peak capacity.

2.2.3.2 UPS System and Batteries

The UPS System and Batteries are part of the MDC and are not part of the MBGF. However, the following description is provided to describe how the UPS will dispatch the individual generators of the MBGF. The UPS will protect the load against surges, sags, under voltage, and voltage fluctuation. The UPS will have built-in protection against permanent damage to itself and the connected load for all predictable types of malfunctions. The load will be automatically transferred to the bypass line without interruption in the event of an internal UPS malfunction. The status of protective devices will be indicated on a LCD graphic display screen on the front of the UPS. The UPS will operate in the following modes:

- **Normal** - IGBT Rectifier converts AC input power to DC power for the inverter and for charging the batteries. The IGBT inverter supplies clean and stable AC power continuously to the critical load. The UPS Inverter

output shall be synchronized with the bypass AC source when the bypass source is within the AC input voltage and frequency specifications.

- **Loss of Main Power** - When Main Power is lost, the battery option shall automatically back up the inverter so there is no interruption of AC power to the critical load.

- **Return of Main Power or Generator Power** - The system shall recover to the Normal Operating Mode and shall cause no disturbance to the critical load while simultaneously recharging the backup battery.

- **Transfer to Bypass AC source** - If the UPS becomes overloaded, or an internal fault is detected, the UPS controls shall automatically transfer the critical load from the inverter output to the bypass AC source without interruption. When the overload or internal warning condition is removed, after a preset "hold" period the UPS will automatically re-transfer the critical load from the bypass to the inverter output without interruption of power to the critical load.

- **Maintenance Bypass** - An optional manual make-before-break maintenance bypass panel may be provided to electrically isolate the UPS for maintenance or test without affecting load operation.

2.2.3.3 Batteries

Similarly, the batteries and battery banks are not part of the MBGF and are described here for informational purposes only. The batteries will likely be supplied by Deka, C&D or Enersys and will be configured in banks. The banks will be connected to the UPS units as described above. The batteries will have tab washers mounted on front terminal posts capable of accepting the wiring components of a battery monitoring system. Batteries will have a minimum design life of 10 years in float applications at 77 degrees F. The battery containers will have a Jar/Cover made of polypropylene with a Heat Seal and 100 percent testing. The LOI rating will be UL-94 VO>28 percent.

The batteries will be configured in banks with matching standalone valve-regulated battery banks with the following characteristics.

a. Each battery bank will provide a minimum of 5 minutes of backup at 100% rated inverter load of 1000kW, @ 77°F/25°C, 1.67 end volts per cell, beginning of life.

b. Internal cabinet temperature sensor to be wired back to the UPS module.

c. Conductor terminations will be NEMA two hole long barrel compression lugs.

2.2.4 Electrical Generation Equipment

Each of the 47 generators will be a Tier-2 emergency diesel fired generator equipped with diesel particulate filters (DPF). The generators will be either Caterpillar Model 3615-E ~~C-175-16 or Cummins Model DQLF~~. The maximum peak generating capacity of each model is ~~3~~2.75 MW with a steady state continuous generating capacity of ~~2.1~~1.93 MW. Specification sheets for each manufacturer and evidence of the steady state continuous ratings are provided in Appendix A.

Each individual generator will be provided with its own package system. Within that package, the prime mover and alternator will be made ready for the immediate call for the request for power controlled by the UPS. Each generator package will integrate a dedicated fuel tank with a capacity of 6,300 gallons. The generators will be configured in three generator yards. There will be two levels. Half of the generators in each yard will be placed on a concrete slab and the other half will be on a second level directly above the ground with the generators mounted on a steel support structure. The generators are approximately 8~~13~~ feet 9~~6~~ inches wide, 27~~48~~ feet ~~5 inches~~ long and 11~~16~~ feet ~~7 inches~~ high. Each generator will have a stack height of approximately 47~~5~~ feet 9~~2~~ inches. When placed on slab, they will be spaced approximately 10 feet apart horizontally, while the second level of generators will be mounted 26 feet 8 inches above the ground. Each generator yard will be located adjacent to the MDC building it serves. The generator yards will be enclosed with 8 feet high chain link fencing to separate them from the balance of the property.

Four individual generators will each be connected to four individual N Unit 2MW UPS Critical Loads and supporting Mechanical equipment, in a distributed redundant distribution, sharing 6MW of critical IT load. All four systems share the approximate 3MW of mechanical load for a total load of 9MW. Should any one system fail, the surviving systems will have enough capacity to completely share the 9MW of total load at the maximum capacity of the surviving generators. During a utility outage, all four generators will start and be connected to their dedicated loads. If none of the generator systems fail during the utility outage, the total maximum load of 9MW will still be shared between the four generators, and will only be running at about 66% of the full capacity of the generator.

2.2.5 Major Electrical Equipment and Systems

At the Generator Alternator, there will be a LOAD Disconnect Breaker that is Normally Closed while the generator is both in and out of operation. From that load disconnect,

600V rated power cables in conduit, rated for the full ampacity output rating of the generator will traverse from the generator into the data center facility terminating on a dedicated MAIN generator input breaker. This breaker is an electrically operated breaker that is normally open when the generator is not in operation, and the Main Switchboard has not requested generator power. This Generator Main Breaker is electrically interlocked with an adjacent Utility Transformer Main Breaker, such that the Generator Main Breaker can never close unless the Utility Transformer Main Breaker is in the open state. The Generator Main Breaker will only closed based upon a gen start request from a PLC control logic that indicates that the Utility Transformer Main Breaker's source power is unavailable, as well as the Generator has started, and is producing 480VAC power, and the Utility Transformer Main Breaker is in the open state. Once the Generator Main Breaker is closed, the power created from the individual generator is then transmitted to the dedicated load of the N Unit 2MW critical load system and connected mechanical. This load is the exact same load that the dedicated Utility Transformer was supplying power to prior to the utility interruption. Power from this individual generator cannot be transferred to any other load or system, or anywhere adjacent N Unit System or mechanical load, or anywhere outside the facility.

2.2.6 Fuel System

The backup generators will use ultra-low sulfur diesel as fuel (< 15 parts per million sulfur by weight). Each generator package will include an integrated fuel tank with a capacity of 6,300 gallons, which is sufficient for operating at steady state continuous load for at least 24 hours.

2.2.7 Cooling System

Each generator will be air cooled independently as part of its integrated package and therefore there is no common cooling system for the MBGF.

2.2.8 Water Supply and Use

The MBGF will not require any consumption of water.

2.2.9 Waste Management

The MBGF will not create any waste materials other than minor amounts of solid waste created during construction and maintenance activities.

2.2.10 Hazardous Materials Management

The MBGF will prepare a Spill Prevention, Control and Countermeasure Plan (SPCC) to address the storage, use and delivery of diesel fuel for the generators. A draft SPCC Plan for Vantage's Campus Data Center is included in Appendix D.

Each generator unit and its integrated fuel tanks have been designed with doublewalls. The interstitial space between the walls of each tanks is continuously monitored electronically for the existence of liquids. This monitoring system is electronically linked to an alarm system in the security office that alerts personnel if a leak is detected. Additionally the standby generator units are housed within a self-sheltering enclosure that prevents the intrusion of storm water.

Diesel fuel will be delivered on an as-needed basis in a compartmentalized tanker truck with maximum capacity of 8,500 gallons. The tanker truck parks at the gated entrances to the generator yard for re-fueling.

There are no loading/unloading racks or containment for re-fueling events; however, a spill catch basin is located at each fill port for the generators. To prevent a release from entering the storm drain system, drains will be blocked off by the truck driver and/or facility staff during fueling events. Rubber pads or similar devices will be kept in the generation yard to allow quick blockage of the storm sewer drains during fueling events.

To further minimize the potential for diesel fuel to come into contact with stormwater, to the extent feasible, fueling operations will be scheduled at times when storm events are improbable.

Warning signs and/or wheel chocks will be used in the loading and/or unloading areas to prevent vehicles from departing before complete disconnection of flexible or fixed transfer lines. An emergency pump shut-off will be utilized if a pump hose breaks while fueling the tanks. Tanker truck loading and unloading procedures will be posted at the loading and unloading areas.

2.2.11 Project Construction

Construction of the MBGF will take place in three phases. Each phase represents a generation yard which will be constructed to serve each of the three MDC Buildings. Therefore Phase I will include 16 generators and the life safety emergency generator; Phase II will include 16 generators; and Phase III will include 15 generators.

Since the site preparation activities for the MDC will include the ground preparation and grading of the entire MDC site, the only construction activities associated with the MDC would involve construction within each generation yard. This will include construction of concrete slabs, fencing, undergrounding and installing above ground conduit to install the electrical cabling to interconnect to the MDC Building switchgear, construction of the

racking system to support the second level of generators, and placement and securing the generators.

The generators themselves will be assembled offsite and delivered to site by truck. Each generator will be placed within the generation yard by a crane.

Construction of the generation yard to support the first MDC Building is anticipated to begin in ~~May~~ October 2018. Construction of each generation yard and placement of the generators is expected to take six months. Construction personnel are estimated to range from 10 to 15 workers per generation yard including one crane operator.

2.2.12 Facility Operation

The backup generators will be run for short periods for testing and maintenance purposes and otherwise will not operate unless there is a disturbance or interruption of the utility supply. BAAQMD's Authority to Construct and the California Air Resources Board's Airborne Toxic Control Measures (ATCM) limits each engine to no more than 50 hours annually for reliability purposes (i.e., testing and maintenance). Please see Section 4.4.3 for further discussion on Vantage's proposed use of an overall site NOx emissions cap.

2.3 MCLAREN DATA CENTER FACILITIES DESCRIPTION

As described in Section 1.2.2 and 1.3, the MDC is not part of this SPPE and is currently undergoing additional environmental review by the City. However, as discussed with Commission Staff in our pre-filing meeting we are providing the following brief description of the MDC, including the modifications to the previously approved configuration, in order to provide context for the MBGF.

The MDC site is 8.97 acres (390,900 square feet [sf]) and located at 651, 725, and 825 Mathew Street in Santa Clara, California (refer to Appendix C, Figures 2.0-1, 2.0-2, and 2.0-3). The MDC site is comprised of three parcels used for industrial warehouse, manufacturing, and office purposes, as well as associated surface parking. The existing buildings on the site have a total footprint of approximately 147,600 sf.

There are no trees and limited landscaping present on the MDC site. The westernmost portion of the project site is the 0.26-acre APN 224-40-011 (located at 825 Mathew Street). Vehicle ingress and egress for this parcel is provided by one gated driveway along Mathew Street. The central portion of the site is the 4.36-acre APN 224-40-002 (located at 725 Mathew Street). Vehicle ingress and egress to this parcel is provided by one gated driveway along Mathew Street. The easternmost portion of the project site is the 4.35-acre APN 224-40-001 (located at 651 Mathew Street). Vehicle ingress and egress to this parcel is provided by one gated driveway along Mathew Street. APNs

224-40-001 and 224-40-002 were developed as canneries in the late 1940s. The limited landscaping includes several non-native volunteer shrubs, including Canary Island date palm, Mexican avocado, tree of heaven, and silk tree. The MDC site is primarily surrounded by industrial and commercial land uses (refer to Appendix C, Figure 2.0-3). The site is located approximately 0.3 mile west of the Norman Y. Mineta San Jose International Airport.

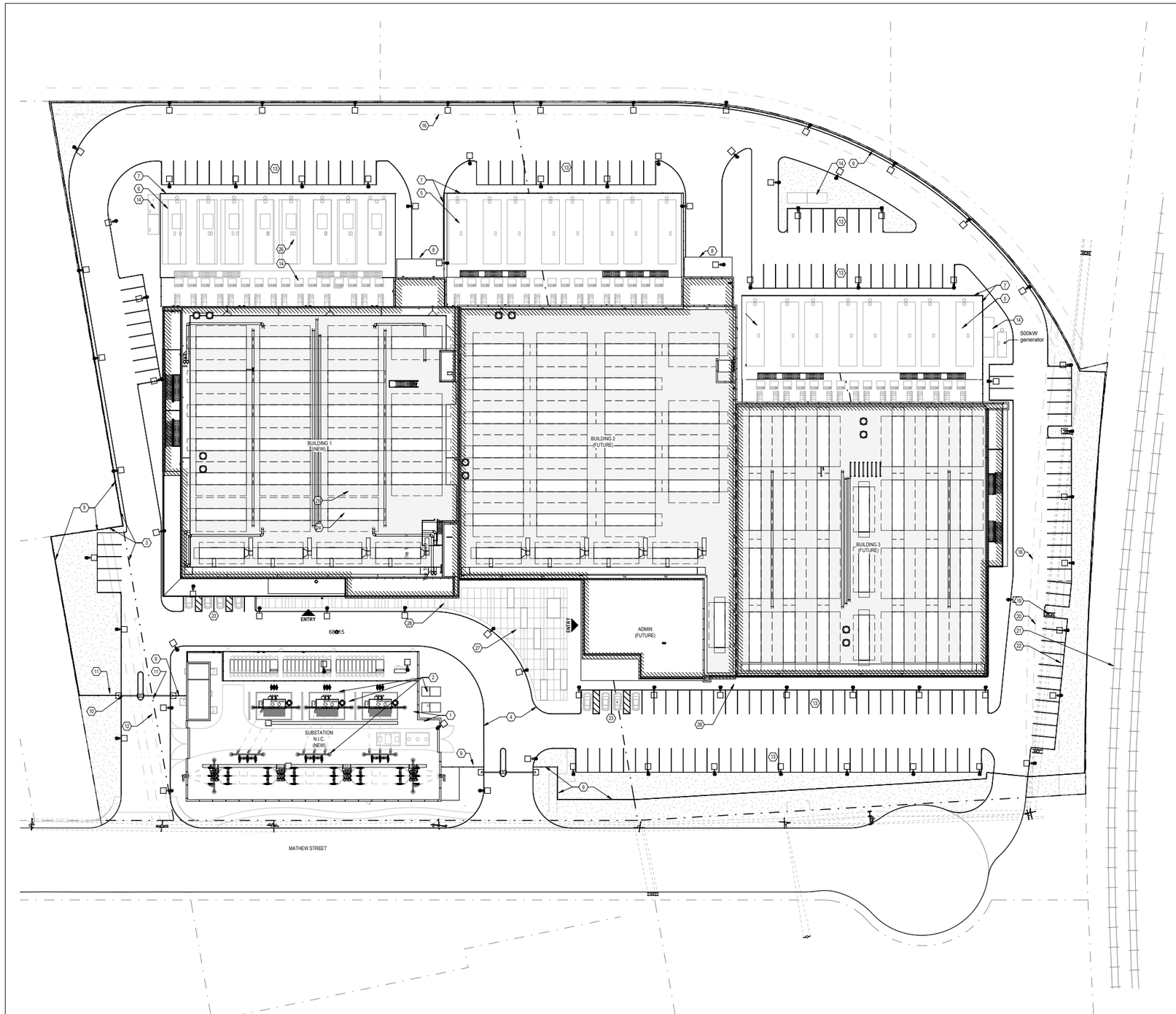
The MDC proposes to demolish the existing industrial warehouse, manufacturing, and office facilities, as well as the associated surface parking. In their place, Vantage would construct three four-story, 175,000-180,000-gross square feet (gsf) data center buildings (a total of approximately 541,000 gsf) and a paved surface parking lot that would become a new Vantage Data Center campus. The MDC would also include an approximately 14,250 sf Silicon Valley Power (SVP) substation along Mathew Street. The MDC would be constructed in three phases. Building A in the western portion of the site would be developed during Phase 1 (refer to Appendix C, Figures 3.0-1 and 3.0-2). The construction of the electrical substation would primarily occur during Phase 1. Building B in the central portion of the campus would be developed during Phase 2, and Building C in the eastern portion of the campus during Phase 3 (refer to Appendix C, Figures 3.0-3 and 3.0-4). The first story of Building A would include the building lobby, multipurpose offices, storage rooms, meeting rooms, break rooms, restrooms, three data center modules, and support facilities including electrical rooms. Six data center modules along with their respective support facilities are located each on the second, third and fourth floor. Floor plans for Building A are depicted in Appendix C, Figures 3.0-5 and 3.0-6, respectively. Buildings B and C are nearly identical in configuration to Building A with six data center modules and support facilities located on each of the first, second, third and fourth floors of the proposed buildings. Each data module provides one megawatt (MW) of critical IT load capacity.

With this new configuration, the total projected critical demand of the MDC has been increased from 54 MW to 69 MW and the total projected building and supporting facility demand increased from 76 MW to a demand not to exceed 100 MW. The height of Buildings A and B to the top of the metal screen would remain approximately 106 feet above ground surface (refer to Appendix C, Figures 3.0-7, 3.0-8, and 3.0-9).

Vehicle ingress and egress would be provided by three new gated driveways along Mathew Street. The central entry would provide the main passenger vehicle and pedestrian access to the site, while the east and west entries would be intended for service vehicles related to loading and deliveries. Service vehicles would drive around the north portion of the MDC site and exit through the middle exit driveway. The landscaped central access drive would be flanked by Building A to the west, Building B in the center, and Building C to the east. There would be a 26-foot wide loop road

around the project site for fire access and general circulation. Approximately 189 parking spots would be provided within the project site. In addition, ten Class I bicycle locker spaces and six Class II bicycle rack spaces would be provided on site.

The MDC site is designated as Heavy Industrial under the City's 2010-2035 General Plan (Santa Clara General Plan) and is zoned as MH (Heavy Industrial). The Heavy Industrial designation allows primary manufacturing, refining and similar activities. It also accommodates warehousing and distribution, as well as data centers.



1 ARCHITECTURAL SITE PLAN - CAMPUS
1" = 30'-0"

Ref. North

GENERAL NOTES

PARKING

THE CITY OF SANTA CLARA'S ZONING ORDINANCE DOES NOT PROVIDE A MINIMUM NUMBER OF PARKING SPACES FOR A DATA CENTER. HOWEVER, THE PROPOSED PROJECT IS ESTIMATED TO PROVIDE ENOUGH PARKING FOR ITS EMPLOYEES AND VISITORS.
APPROXIMATELY 207 PARKING SPOTS WOULD BE PROVIDED WITHIN THE PROJECT SITE. IT IS NOT ANTICIPATED THAT THE 207 PARKING SPACES WOULD BE NECESSARY FOR EMPLOYEES AND VISITORS TO THE SITE ON A CONSISTENT BASIS. THEREFORE, THE PROPOSED PARKING SUPPLY WOULD BE ADEQUATE TO SATISFY THE CITY'S PARKING REQUIREMENTS.

SHEET NOTES

NOTE: NOT ALL SHEET NOTES BELOW MAY BE USED ON THIS SHEET

1	SUBSTATION SCREEN WALL
2	SUBSTATION EQUIPMENT N.I.C.
3	PROPERTY LINE
4	ROADWAY
5	FUTURE GENERATOR YARD
6	GENERATOR YARD
7	8' TALL CHAIN LINK FENCE AROUND GENERATOR YARD
8	LOADING DOCK
9	8' TALL PERIMETER FENCE
10	ENTRY GATE
11	ENTRY GATE OPERATOR
12	ENTRY GATE CARD READER
13	PARKING
14	ELECTRICAL GEAR
16	EXISTING PRIVATE RAIL EASEMENT TO REMAIN
17	EXISTING PUBLIC UTILITY EASEMENT TO REMAIN
18	EXISTING SANITARY SEWER EASEMENT TO REMAIN
19	EXISTING OVERHEAD TRANSMISSION LINES AND POLES
20	EXISTING PUBLIC UTILITY EASEMENT
21	EXISTING RAILROAD TRACKS
22	EXISTING TELECOM EASEMENT
23	ADA PARKING
24	MECHANICAL EQUIPMENT
25	ROOFTOP MECHANICAL DUNNAGE PLATFORM
26	GENERATOR
27	PLAZA
28	SEWER LIFT STATION. SEE CIVIL DWGS
29	EXISTING FENCE TO REMAIN
30	EXISTING PAVEMENT TO REMAIN
31	EXISTING BUILDING TO REMAIN
32	TRAFFIC LINES TO BE PAINTED OVER EXISTING PAVEMENT
33	FIRE LANE: 26'-0" MIN CLEAR

LEGEND

Parking count
177

B	GATE ONE REVISION	11-16-2017
A	GATE ONE	10-02-2017
NO.	DESCRIPTION	DATE

DRAWING ISSUES

OWNER
VANTAGE DATA CENTERS

ARCHITECT
SHEEHAN NAGLE HARTRAY ARCHITECTS
30 West Monroe, Suite 900
Chicago, IL 60603
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LANDSCAPE ARCHITECT
REED ASSOCIATES
LANDSCAPE ARCHITECTURE

PROJECT:

VANTAGE - MCLAREN

Project Status

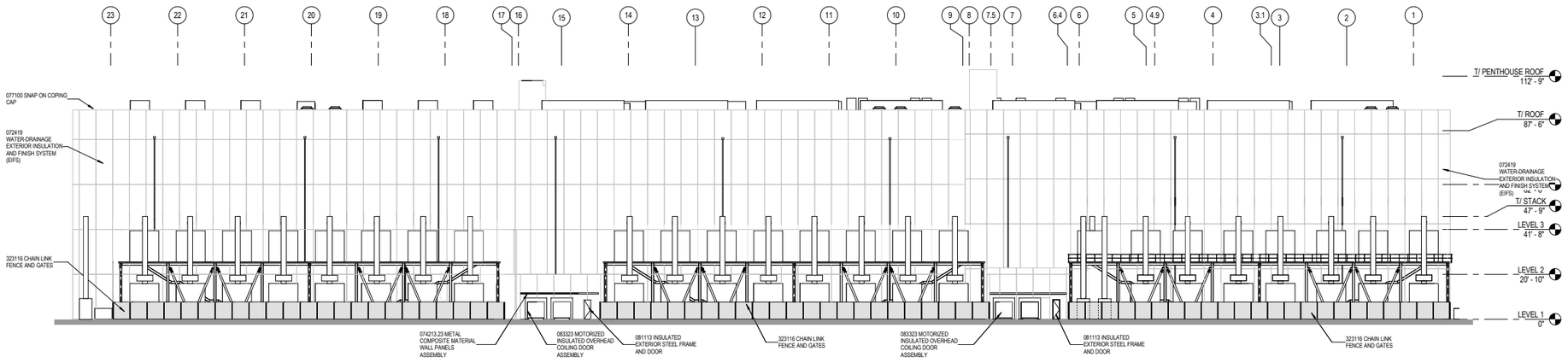
725 MATHEW STREET
SANTA CLARA, CA

DWG. TITLE
ARCHITECTURAL
CAMPUS SITE PLAN

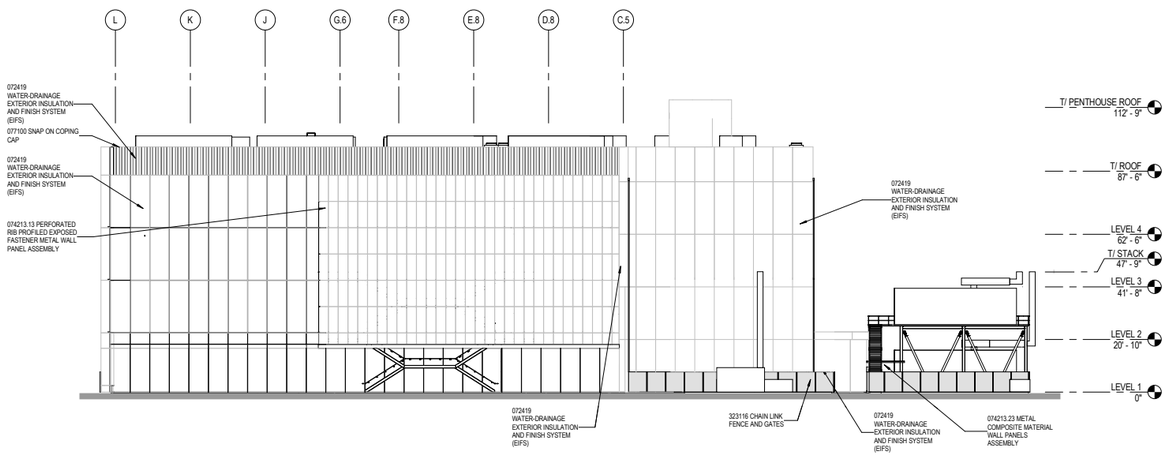
PROJECT NO: Project Number
DATE: Issue Date
SCALE: AS NOTED

DWG. NO:
AS100.02

REVISED FIGURE 2-1



2 (diagram) OVERALL NORTH ELEVATION - CAMPUS
3/64" = 1'-0"



1 (diagram) OVERALL EAST ELEVATION - CAMPUS
3/64" = 1'-0"

E
D
C
B
A

6 | 5 | 4 | 3 | 2 | 1

OWNER

VANTAGE DATA CENTERS

ARCHITECT

SHEEHAN NAGLE HARTRAY ARCHITECTS
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LANDSCAPE ARCHITECT

REED ASSOCIATES
LANDSCAPE ARCHITECTURE
EQUESTRIAN FACILITIES
PHONE: 559.683.LAND

NO.	DESCRIPTION	DATE

DRAWING ISSUES

PROGRESS SET
NOT FOR CONSTRUCTION

PROJECT:

VANTAGE - MCLAREN

Project Status

625, 725 MATHEW STREET
SANTA CLARA, CA

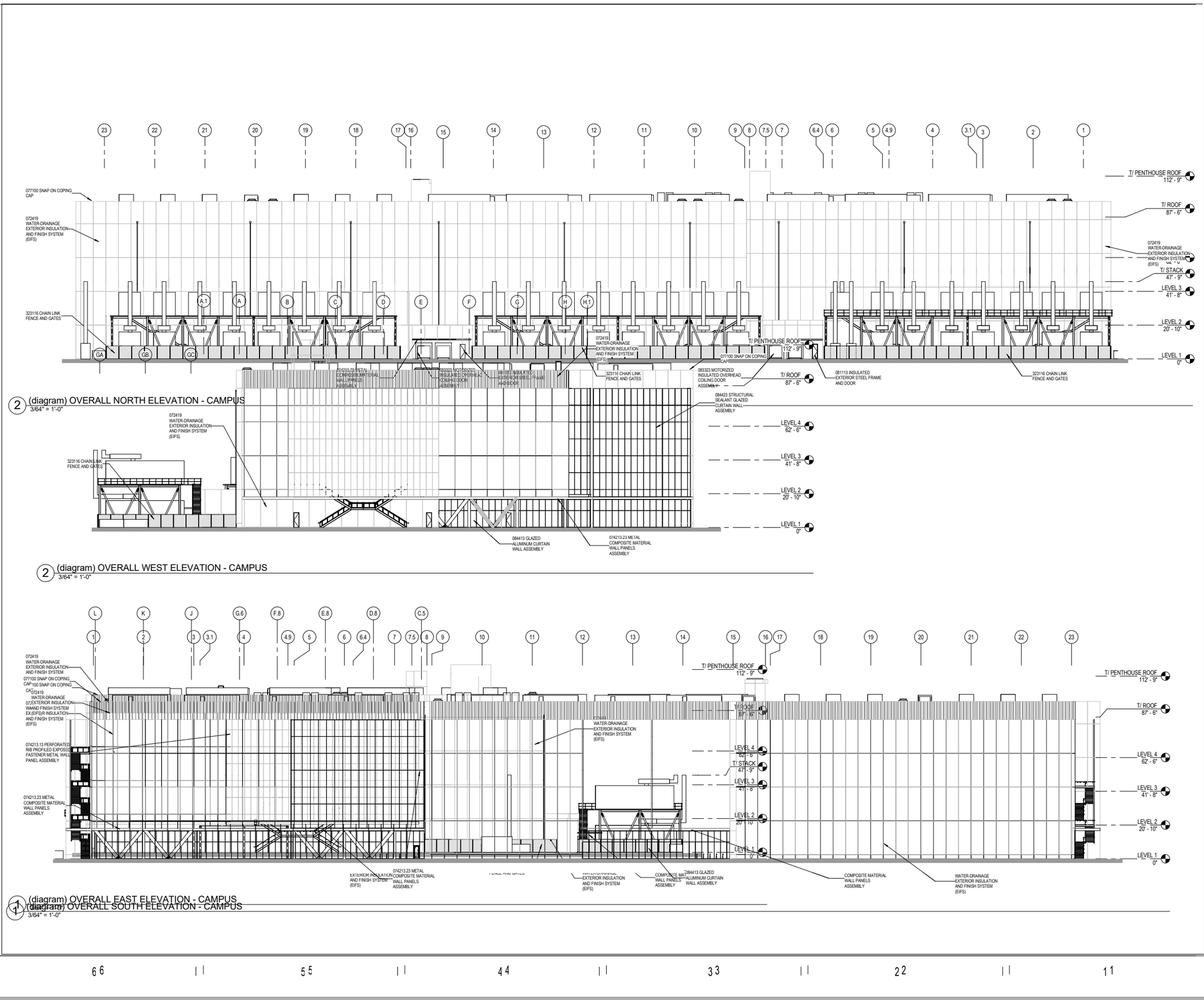
DWG. TITLE

CAMPUS ELEVATIONS

PROJECT NO: Project Number
DATE: Issue Date
SCALE: AS NOTED

DWG. NO:
A211.01

REVISED FIGURE 2-2a



2 (diagram) OVERALL NORTH ELEVATION - CAMPUS
3/64" = 1'-0"

2 (diagram) OVERALL WEST ELEVATION - CAMPUS
3/64" = 1'-0"

1 (diagram) OVERALL EAST ELEVATION - CAMPUS

(diagram) OVERALL SOUTH ELEVATION - CAMPUS
3/64" = 1'-0"

OWNER
VANTAGE DATA CENTERS

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CHICAGO LONDON

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LANDSCAPE ARCHITECT
REED ASSOCIATES
LANDSCAPE ARCHITECTURE

NO.	DESCRIPTION	DATE

DRAWING ISSUES

PROGRESS SET
NOT FOR CONSTRUCTION

PROJECT:
VANTAGE - MCLAREN

Project Status
2057 MATHEW STREET
SANTA CLARA, CA

DWG TITLE
CAMPUS ELEVATIONS

PROJECT NO: Project Number
DATE: Issue Print Date
SCALE: AS NOTED

DWG NO:
A211.02

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REVISED FIGURE 2-2b

Revised Appendix A

Generator Specifications, Ratings and Performance Data

Cat® 3516E
Diesel Generator Sets

Image shown may not reflect actual configuration

Bore – mm (in)	170 (6.69)
Stroke – mm (in)	215 (8.47)
Displacement – L (in^3)	78.1 (4766)
Compression Ratio	14.7:1
Aspiration	TA
Fuel System	EUI
Governor Type	ADEM™ A5

Standby 60 Hz ekW (kVA)	Mission Critical 60 Hz ekW (kVA)	Performance Strategy
2750 (3437)	2750 (3437)	U.S. EPA Certified for Emergency Stationary Applications (Tier 2)

Standard Features

Cat® Diesel Engine
- Meets U.S. EPA Stationary Emergency Use Only (Tier 2) emission standards
- Reliable performance proven in thousands of applications worldwide

Generator Set Package
- Accepts 100% block load in one step and meets other NFPA 110 loading requirements
- Conforms to ISO 8528-5 G3 load acceptance requirements
- Reliability verified through torsional vibration, fuel consumption, oil consumption, transient performance, and endurance testing

Alternators
- Superior motor starting capability minimizes need for oversizing generator
- Designed to match performance and output characteristics of Cat diesel engines

Cooling System
- Cooling systems available to operate in ambient temperatures up to 50°C (122°F)
- Tested to ensure proper generator set cooling

EMCP 4 Control Panels
- User-friendly interface and navigation
- Scalable system to meet a wide range of installation requirements
- Expansion modules and site specific programming for specific customer requirements

Warranty
- 24 months/1000-hour warranty for standby and mission critical ratings
- 12 months/unlimited hour warranty for prime and continuous ratings
- Extended service protection is available to provide extended coverage options

Worldwide Product Support
- Cat dealers have over 1,800 dealer branch stores operating in 200 countries
- Your local Cat dealer provides extensive post-sale support, including maintenance and repair agreements

Financing
- Caterpillar offers an array of financial products to help you succeed through financial service excellence
- Options include loans, finance lease, operating lease, working capital, and revolving line of credit
- Contact your local Cat dealer for availability in your region

Optional Equipment

Engine

Air Cleaner
- ❑ Single element

Muffler
- ❑ Industrial grade (15 dB)
- ❑ Critical grade (25 dB)
- ❑ Hospital grade (35 dB)

Starting
- ❑ Standard batteries
- ❑ Oversized batteries
- ❑ Heavy duty electric starter(s)
- ❑ Air starter(s)
- ❑ Jacket water heater

Alternator

Output voltage
- ❑ 416V ❑ 12470V
- ❑ 480V ❑ 13200V
- ❑ 600V ❑ 13800V
- ❑ 4160V

Temperature Rise (over 40°C ambient)
- ❑ 150°C
- ❑ 125°C/130°C
- ❑ 105°C
- ❑ 80°C

Winding type
- ❑ Form wound

Excitation
- ❑ Permanent magnet (PM)

Attachments
- ❑ Anti-condensation heater
- ❑ Stator and bearing temperature monitoring and protection

Power Termination

Type
- ❑ Bus bar
- ❑ Circuit breaker
- ❑ 1600A ❑ 2000A
- ❑ 2500A ❑ 3000A
- ❑ 3200A ❑ 4000A
- ❑ 5000A
- ❑ IEC ❑ UL
- ❑ 3-pole ❑ 4-pole
- ❑ Manually operated
- ❑ Electrically operated

Trip Unit
- ❑ LSI ❑ LSI-G
- ❑ LSI-P ❑ LSIG-P

Control System

Controller
- ❑ EMCP 4.2B
- ❑ EMCP 4.3
- ❑ EMCP 4.4

Attachments
- ❑ Local annunciator module
- ❑ Remote annunciator module
- ❑ Expansion I/O module
- ❑ Remote monitoring software

Charging

- ❑ Battery charger – 10A
- ❑ Battery charger – 20A
- ❑ Battery charger – 35A

Vibration Isolators

- ❑ Spring
- ❑ Seismic rated

Cat Connect

Connectivity
- ❑ Ethernet
- ❑ Cellular
- ❑ Satellite

Extended Service Options

Terms
- ❑ 2 year (prime)
- ❑ 3 year
- ❑ 5 year
- ❑ 10 year

Coverage
- ❑ Silver
- ❑ Gold
- ❑ Platinum
- ❑ Platinum Plus

Ancillary Equipment

- ❑ Automatic transfer switch (ATS)
- ❑ Uninterruptible power supply (UPS)
- ❑ Paralleling switchgear
- ❑ Paralleling controls

Certifications

- ❑ UL2200
- ❑ CSA
- ❑ IBC seismic certification
- ❑ OSHPD pre-approval
- ❑ EEC Declaration of Conformity
- ❑ EU Declaraton of Incorporation
- ❑ Eurasian Conformity (EAC) Mark

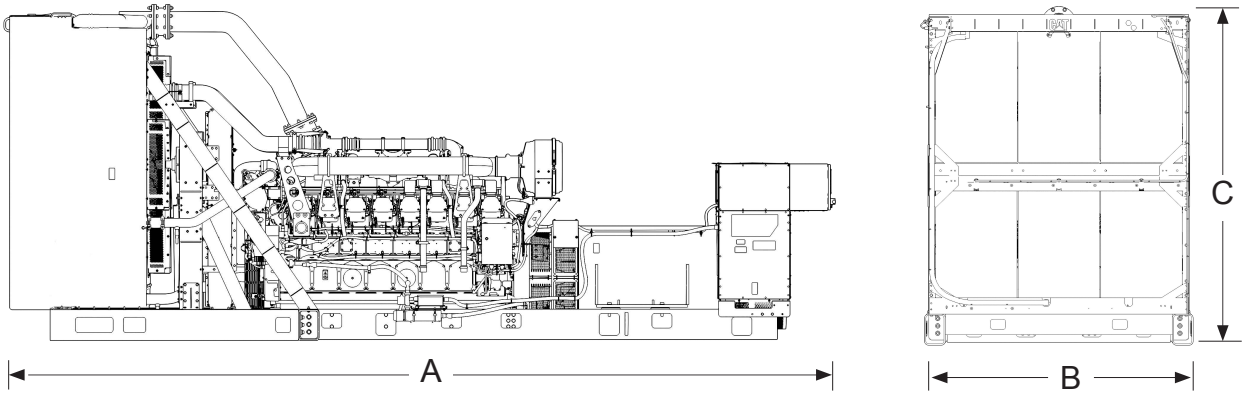
Note: *Some options may not be available on all models. Certifications may not be available with all model configurations. Consult factory for availability.*

Package Performance

Performance	Standby		Mission Critical	
Frequency	60 Hz		60 Hz	
Genset Power rating with fan	2750 ekW		2750 ekW	
Genset Power rating with fan @ 0.8 Power Factor	3437 kVA		3437 kVA	
Emissions	EPA ESE (Tier 2)		EPA ESE (Tier 2)	
Performance Number	EM2026-00		EM2116-00	
Fuel Consumption				
100% load with fan - L/hr (gal/hr)	735.6	(194.3)	735.6	(194.3)
75% load with fan - L/hr (gal/hr)	559.9	(147.9)	559.9	(147.9)
50% load with fan - L/hr (gal/hr)	406.7	(107.4)	406.7	(107.4)
25% load with fan - L/hr (gal/hr)	236.8	(62.6)	236.8	(62.6)
Cooling System				
Radiator Air flow restriction (system) - kPa (in. water)	0.12	(0.5)	0.12	(0.5)
kPa (in. water) Radiator airflow - m3/min (cfm)	3026	(106862)	3026	(106862)
Engine coolant capacity - L (gal)	233	(61.6)	233	(61.6)
Radiator coolant capacity - L (gal)	202	(53.3)	202	(53.3)
Total coolant capacity; L (gal)	435	(114.9)	435	(114.9)
Inlet Air				
Combustion air inlet flow rate; m^3/min (cfm)	235.4	(8313.0)	235.4	(8313.0)
Exhaust System				
Exhaust stack gas temperature - °C (°F)	480.6	(897)	480.6	(897)
Exhaust gas flow rate - m^3/min (cfm)	615.2	(21724.6)	615.2	(21724.6)
Exhaust system backpressure (maximum allowable) -	6.7	(27.0)	6.7	(27.0)
Heat Rejection				
Heat rejection to jacket water - kW (Btu/min)	898	(51083)	898	(51083)
Heat rejection to exhaust (total) - kW (Btu/min)	2867	(163046)	2867	(163046)
Heat rejection to aftercooler - kW (Btu/min)	874	(49686)	874	(49686)
Heat rejection to atmosphere from engine - kW (Btu/min)	160	(9085)	160	(9085)
Heat rejection from alternator - kW (Btu/min)	126	(7172)	126	(7172)

3516E Diesel Generator Sets
Electric Power

Weights and Dimensions



Dim "A" mm (in)	Dim "B" mm (in)	Dim "C" mm (in)	Dry Weight kg (lb)
8238 (324)	2640 (104)	3342 (132)	18 480 (40,750)

Note: *For reference only. Do not use for installation design. Contact your local Cat dealer for precise weights and dimensions.*

Ratings Definitions

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.

Mission Critical
Output available with varying load for the duration of the interruption of the normal source power. Average power output is 85% of the mission critical power rating. Typical peak demand up to 100% of rated power for up to 5% of the operating time. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

Applicable Codes and Standards
AS1359, CSA C22.2 No100-04, UL142, UL489, UL869, UL2200, NFPA37, NFPA70, NFPA99, NFPA110, IBC, IEC60034-1, ISO3046, ISO8528, NEMA MG1-22, NEMA MG1-33, 2014/35/EU, 2006/42/EC, 2014/30/EU.

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

Data Center Applications
Tier III/Tier IV compliant per Uptime Institute requirements. ANSI/TIA-942 compliant for Rated-1 through Rated-4 data centers.

Fuel Rates
Fuel rates are based on fuel oil of 35º API [16°C (60ºF)] gravity having an LHV of 42,780 kJ/kg (18,390 Btu/lb) when used at 29ºC (85ºF) and weighing 838.9 g/liter (7.001 lbs/U.S. gal.)

3516 PGFL
LEHE1351-02 (8-17)

MANUFACTURER'S EMISSIONS DATA

CERTIFICATION YEAR: 2017 CERT AGENCY: EPA
EPA ENGINE FAMILY NAME: HCPXL78.1NZS

MODEL: 3516E
GENSET RATING (W/ FAN): 2750.0 EKW STANDBY 60 HERTZ @ 1800 RPM
ENGINE DISCPLACEMENT: 4766 CU IN
EMISSIONS POWER CATEGORY: >560 BKW
ENGINE TYPE: 4 Stroke Compression Ignition (Diesel)

GENERAL PERFORMANCE DATA

GEN W/F	ENG PWR	FUEL RATE	FUEL RATE	EXHAUST STACK TEMP	EXHAUST GAS FLOW
EKW	BHP	LB/BHP-HR	GPH	°F	CFM
2750.0	4043	0.337	194.3	897.0	21724.6

DATA REF NO.: EM2116-00

EPA D2 CYCLE CERTIFICATION

	UNITS	CO	HC	NOX	NOX + HC	PM
CERTIFICATION TEST LEVELS	GM/BHP-HR	0.67	0.19	3.78	3.95	0.09
	GM/BKW-HR	.9	0.26	5.07	5.3	0.12
EPA Tier 2 Max limits*	GM/BHP-HR	2.6	-	-	4.7	0.15
	GM/BKW-HR	3.5	-	-	6.4	0.2

DATA REF: https://www3.epa.gov/otaq/documents/eng-cert/nrci-cert-ghg-2017.xls
REF DATE: 01/20/2017

Gaseous emissions data measurements are consistent with those described in EPA 40 CFR PART 89 SUBPART D and ISO 8178 for measuring HC, CO, PM, and NOx.

***Gaseous emissions values are WEIGHTED CYCLE AVERAGES and are in compliance with the EPA non-road regulations.**

PERFORMANCE DATA [EM2026]

MAY 17, 2017

For Help Desk Phone Numbers Click here

Help

Perf No: EM2026 **Change Level:** 00

General | Heat Rejection | Emissions | Regulatory | Altitude Derate | Cross Reference | Perf Param Ref

View PDF

SALES MODEL:	3516E	**COMBUSTION:**	DI
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,800
ENGINE POWER (BHP):	4,043	**HERTZ:**	60
GEN POWER WITH FAN (EKW):	2,750.0	**FAN POWER (HP):**	160.9
COMPRESSION RATIO:	14.7	**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):**	122
MANIFOLD TYPE:	DRY	**JACKET WATER TEMP (F):**	219.2
GOVERNOR TYPE:	ADEM5	**TURBO CONFIGURATION:**	PARALLEL
ELECTRONICS TYPE:	ADEM5	**TURBO QUANTITY:**	4
IGNITION TYPE:	CI	**TURBOCHARGER MODEL:**	GTB6051N-44T-1.25
INJECTOR TYPE:	EUI	**CERTIFICATION YEAR:**	2017
FUEL INJECTOR:	3920221	**CRANKCASE BLOWBY RATE (FT3/HR):**	4,039.5
UNIT INJECTOR TIMING (IN):	64.34	**FUEL RATE (RATED RPM) NO LOAD (GAL/HR):**	15.8
REF EXH STACK DIAMETER (IN):	12	**PISTON SPD @ RATED ENG SPD (FT/MIN):**	2,539.4

INDUSTRY	SUB INDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET

General Performance Data Top

Note(s)
THIS STANDBY RATING IS FOR A STANDBY ONLY ENGINE ARRANGEMENT. RERATING THE ENGINE TO A PRIME OR CONTINUOUS RATING IS NOT PERMITTED.

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP
EKW	%	BHP	PSI	LB/BHP-HR	GAL/HR	IN-HG	DEG F	DEG F	IN-HG	DEG F
2,750.0	100	4,043	373	0.337	194.3	89.0	124.7	1,248.7	69.3	897.0
2,475.0	90	3,655	337	0.332	173.2	78.5	119.6	1,200.8	60.2	874.3
2,200.0	80	3,266	302	0.334	156.1	70.3	115.1	1,168.4	53.8	862.1
2,062.5	75	3,072	284	0.337	147.9	66.2	114.4	1,156.4	50.7	859.3
1,925.0	70	2,878	266	0.340	139.8	62.1	113.3	1,144.6	47.6	857.1
1,650.0	60	2,490	230	0.348	123.7	53.9	110.5	1,119.4	41.4	852.3
1,375.0	50	2,102	194	0.358	107.4	45.7	107.2	1,088.4	35.3	844.3
1,100.0	40	1,714	158	0.367	89.7	35.3	105.0	1,053.2	28.0	836.6
825.0	30	1,325	122	0.378	71.5	24.5	103.4	1,002.0	20.9	816.3
687.5	25	1,131	104	0.387	62.6	19.7	102.8	959.8	17.9	788.1

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP
550.0	20	937	87	0.399	53.5	15.3	102.0	900.5	15.0	745.1
275.0	10	549	51	0.444	34.8	7.5	100.0	707.7	9.6	600.4

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP	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	IN-HG	DEG F	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
2,750.0	100	4,043	95	459.3	8,311.0	21,724.6	36,043.6	37,404.6	7,873.2	7,173.7
2,475.0	90	3,655	84	424.9	7,644.3	19,597.8	33,105.4	34,316.5	7,223.3	6,600.5
2,200.0	80	3,266	76	398.7	7,134.8	18,059.1	30,814.3	31,907.0	6,717.5	6,163.1
2,062.5	75	3,072	71	386.6	6,868.3	17,312.6	29,600.4	30,637.2	6,453.6	5,928.8
1,925.0	70	2,878	67	373.5	6,592.5	16,561.5	28,375.0	29,355.4	6,184.0	5,685.4
1,650.0	60	2,490	58	345.0	6,037.4	15,050.4	25,928.9	26,795.9	5,640.3	5,194.1
1,375.0	50	2,102	50	312.1	5,508.7	13,534.6	23,489.4	24,242.0	5,103.3	4,718.9
1,100.0	40	1,714	39	272.3	4,755.3	11,552.1	20,219.6	20,847.9	4,381.7	4,062.9
825.0	30	1,325	27	228.1	3,957.2	9,452.4	16,797.6	17,298.4	3,642.2	3,388.1
687.5	25	1,131	22	205.3	3,608.1	8,401.7	15,278.6	15,716.4	3,310.6	3,087.4
550.0	20	937	18	182.7	3,284.0	7,356.2	13,863.7	14,238.0	3,002.1	2,810.0
275.0	10	549	9	139.5	2,714.7	5,306.2	11,377.1	11,621.0	2,461.2	2,333.0

Heat Rejection Data Top

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHUAST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HI HE VA EN
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BT
2,750.0	100	4,043	51,083	9,085	163,046	86,850	22,219	49,686	171,445	417,162	44
2,475.0	90	3,655	46,867	8,504	143,853	76,167	19,796	41,719	154,983	371,670	39
2,200.0	80	3,266	43,337	8,132	130,635	69,029	17,838	36,156	138,521	334,904	35
2,062.5	75	3,072	41,619	8,001	124,853	65,872	16,904	33,326	130,290	317,372	33

Emissions Data Top

Units Filter All Units

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITH FAN		EKW	2,750.0	2,062.5	1,375.0	687.5	275.0
ENGINE POWER		BHP	4,043	3,072	2,102	1,131	549
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	24,635	15,352	7,747	3,924	4,756
TOTAL CO		G/HR	4,653	2,391	1,447	2,444	2,051
TOTAL HC		G/HR	557	539	539	433	309
PART MATTER		G/HR	379.2	181.2	175.4	284.9	130.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,634.2	2,198.0	1,531.8	1,354.4	3,405.8
TOTAL CO	(CORR 5% O2)	MG/NM3	510.1	343.8	279.0	818.5	1,221.9
TOTAL HC	(CORR 5% O2)	MG/NM3	52.9	66.7	91.4	126.1	158.1
PART MATTER	(CORR 5% O2)	MG/NM3	34.5	21.9	30.3	82.5	57.9
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,283	1,071	746	660	1,659
TOTAL CO	(CORR 5% O2)	PPM	408	275	223	655	978
TOTAL HC	(CORR 5% O2)	PPM	99	125	171	235	295
TOTAL NOX (AS NO2)		G/HP-HR	6.14	5.03	3.70	3.48	8.68
TOTAL CO		G/HP-HR	1.16	0.78	0.69	2.17	3.74
TOTAL HC		G/HP-HR	0.14	0.18	0.26	0.38	0.56

GENSET POWER WITH FAN		EKW	2,750.0	2,062.5	1,375.0	687.5	275.0
ENGINE POWER		BHP	4,043	3,072	2,102	1,131	549
PERCENT LOAD		%	100	75	50	25	10
PART MATTER		G/HP-HR	0.09	0.06	0.08	0.25	0.24
TOTAL NOX (AS NO2)		LB/HR	54.31	33.85	17.08	8.65	10.49
TOTAL CO		LB/HR	10.26	5.27	3.19	5.39	4.52
TOTAL HC		LB/HR	1.23	1.19	1.19	0.95	0.68
PART MATTER		LB/HR	0.84	0.40	0.39	0.63	0.29

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITH FAN		EKW	2,750.0	2,062.5	1,375.0	687.5	275.0
ENGINE POWER		BHP	4,043	3,072	2,102	1,131	549
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	20,529	12,794	6,456	3,270	3,964
TOTAL CO		G/HR	2,585	1,328	804	1,358	1,140
TOTAL HC		G/HR	419	406	405	325	232
TOTAL CO2		KG/HR	1,950	1,485	1,076	623	345
PART MATTER		G/HR	270.9	129.4	125.3	203.5	92.9
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	2,195.2	1,831.7	1,276.5	1,128.7	2,838.2
TOTAL CO	(CORR 5% O2)	MG/NM3	283.4	191.0	155.0	454.7	678.9
TOTAL HC	(CORR 5% O2)	MG/NM3	39.8	50.2	68.8	94.8	118.9
PART MATTER	(CORR 5% O2)	MG/NM3	24.7	15.7	21.6	59.0	41.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	1,069	892	622	550	1,382
TOTAL CO	(CORR 5% O2)	PPM	227	153	124	364	543
TOTAL HC	(CORR 5% O2)	PPM	74	94	128	177	222
TOTAL NOX (AS NO2)		G/HP-HR	5.12	4.19	3.08	2.90	7.23
TOTAL CO		G/HP-HR	0.64	0.43	0.38	1.20	2.08
TOTAL HC		G/HP-HR	0.10	0.13	0.19	0.29	0.42
PART MATTER		G/HP-HR	0.07	0.04	0.06	0.18	0.17
TOTAL NOX (AS NO2)		LB/HR	45.26	28.20	14.23	7.21	8.74
TOTAL CO		LB/HR	5.70	2.93	1.77	2.99	2.51
TOTAL HC		LB/HR	0.92	0.89	0.89	0.72	0.51
TOTAL CO2		LB/HR	4,299	3,274	2,372	1,373	761
PART MATTER		LB/HR	0.60	0.29	0.28	0.45	0.20
OXYGEN IN EXH		%	8.8	9.7	10.6	11.7	14.1
DRY SMOKE OPACITY		%	2.5	1.7	2.0	4.3	2.4
BOSCH SMOKE NUMBER			0.91	0.57	0.67	1.35	0.84

Regulatory Information Top

EPA EMERGENCY STATIONARY	2011 - ----

GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 60 SUBPART IIII AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE EMERGENCY STATIONARY REGULATIONS.

Locality	Agency	Regulation	Tier/Stage	Max Limits - G/BKW - HR
U.S. (INCL CALIF)	EPA	STATIONARY	EMERGENCY STATIONARY	CO: 3.5 NOx + HC: 6.4 PM: 0.20

Altitude Derate Data Top

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	30	40	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)													
0	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043
1,000	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043	3,969	4,043
2,000	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,043	4,030	3,996	3,824	4,043
3,000	4,043	4,043	4,043	4,043	4,042	4,031	4,009	4,006	4,003	3,964	3,864	3,678	4,043
4,000	4,043	4,043	4,026	3,990	3,958	3,926	3,908	3,913	3,904	3,870	3,747	3,510	3,976
5,000	3,988	3,959	3,925	3,892	3,859	3,827	3,809	3,814	3,798	3,759	3,628	3,331	3,889
6,000	3,926	3,890	3,854	3,818	3,784	3,750	3,723	3,706	3,676	3,634	3,483	3,173	3,828
7,000	3,862	3,824	3,781	3,741	3,699	3,661	3,623	3,584	3,544	3,502	3,325	3,040	3,767

AMBIENT OPERATING TEMP (F)	30	40	50	60	70	80	90	100	110	120	130	140	NORMAL
8,000	3,763	3,724	3,679	3,629	3,579	3,533	3,488	3,440	3,395	3,353	3,177	2,941	3,679
9,000	3,630	3,582	3,530	3,480	3,431	3,383	3,336	3,291	3,250	3,211	3,051	2,825	3,549
10,000	3,490	3,433	3,380	3,330	3,282	3,238	3,196	3,156	3,117	3,085	2,945	2,686	3,418
11,000	3,336	3,285	3,235	3,191	3,147	3,108	3,078	3,049	3,020	2,988	2,831	2,518	3,289
12,000	3,197	3,150	3,110	3,078	3,047	3,017	2,985	2,952	2,918	2,870	2,680	2,346	3,171
13,000	3,087	3,051	3,017	2,983	2,953	2,920	2,881	2,842	2,802	2,735	2,512	2,205	3,080
14,000	3,000	2,958	2,920	2,877	2,840	2,799	2,758	2,713	2,671	2,577	2,348	2,088	3,005
15,000	2,891	2,844	2,803	2,761	2,715	2,668	2,625	2,581	2,537	2,418	2,213	2,024	2,914

Cross Reference Top

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
4577276	LL1866	4558023	PG266	-	JD700001	

Performance Parameter Reference Top

Parameters Reference: DM9600 - 08

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600

APPLICATION:
Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS:
Power +/- 3%
Torque +/- 3%
Exhaust stack temperature +/- 8%
Inlet airflow +/- 5%
Intake manifold pressure-gage +/- 10%
Exhaust flow +/- 6%
Specific fuel consumption +/- 3%
Fuel rate +/- 5%
Specific DEF consumption +/- 3%
DEF rate +/- 5%
Heat rejection +/- 5%
Heat rejection exhaust only +/- 10%
Heat rejection CEM only +/- 10%

Heat Rejection values based on using treated water.

Torque is included for truck and industrial applications, do not

use for Gen Set or steady state applications.

On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.

These values do not apply to C280/3600. For these models, see the tolerances listed below.

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

TEST CELL TRANSDUCER TOLERANCE FACTORS:

Torque +/- 0.5%
Speed +/- 0.2%
Fuel flow +/- 1.0%
Temperature +/- 2.0 C degrees
Intake manifold pressure +/- 0.1 kPa

OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR
FOR 3500 ENGINES AND SMALLER
SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.

FOR 3600 ENGINES
Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

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

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

REFERENCE FUEL

DIESEL

Reference fuel is #2 distillate diesel with a 35API gravity;
A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 29 (84.2), where the density is 838.9 G/Liter (7.001 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.

EMISSIONS DEFINITIONS:
Emissions : DM1176

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 : 7/7/15

DESIGN PARAMETERS

The following conditions were used to design the CRT® Particulate Filter System:

Table 1. Design parameters at 100% load

Engine	**Caterpillar**
Model Number	**3516C-E**
Application	Generator
kW Rating	2750
Operating Hours per Year	TBD
Number of Systems	36
Type of Fuel	ULSD
Design Exhaust Flow Rate, ACFM	21724
Design Exhaust Temperature, °F	897
Recommended Size Load Bank/kW for Regeneration using CRTdM™	1250
Maximum Allowable Engine Back Pressure	26.9 " H_2O
Typical (full load) Clean Back Pressure*	16.7 " H_2O
Typical (full load) Operational Back Pressure*	23 " H_2O
*Across the JM Product (Scope of Supply)	

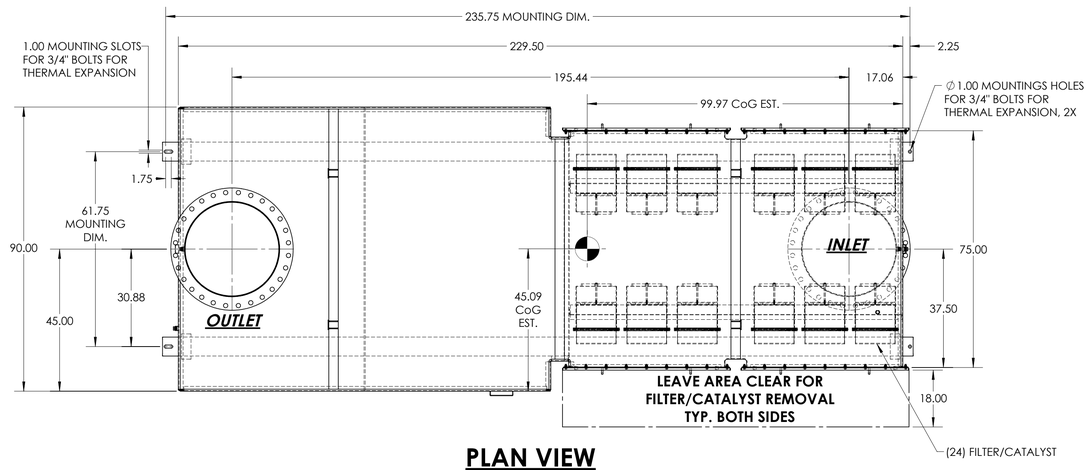
Table 2. Emissions Data (all values in gms/Bhp-hr at 100% load)

Pollutant	Inlet Level	Outlet Level	% Reduction
CO	1.16	80% Reduction	80
PM	.09	85% reduction	85
NO_x	6.14	NA	NA
HC	.14	70% Reduction	70

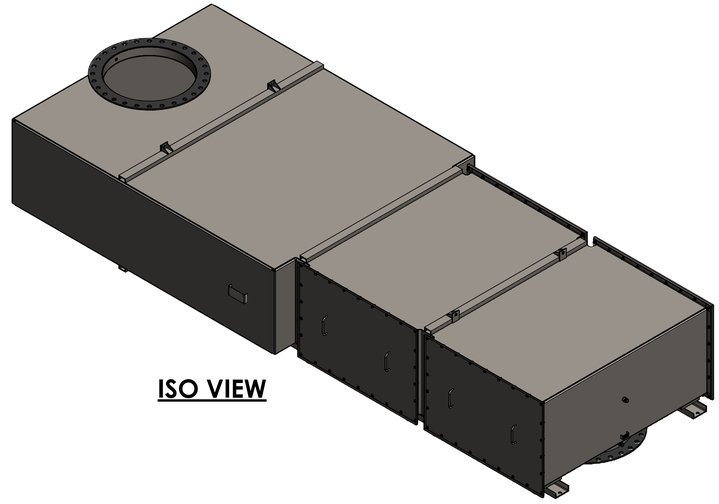
Johnson Matthey has calculated the appropriate catalyst volume and equipment required based on the above design parameters supplied. If actual operating conditions vary from above conditions, then more catalyst or filters may be required for the system to achieve desired destruction efficiencies. For this reason, all operating conditions must be closely reviewed, as different conditions will void the warranty.

In addition, CRTdM alarms must be responded to in the recommended manner, and sufficient engine load must be used to regenerate the CRT(+) unit, when necessary.

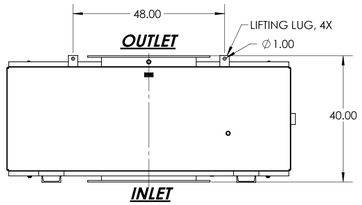
REVISIONS					
REV.	DATE	DESCRIPTION	BY	ENG	APPROVED
0	10/18/16	INITIAL RELEASE	M.D.C.		EJB 8/28/17



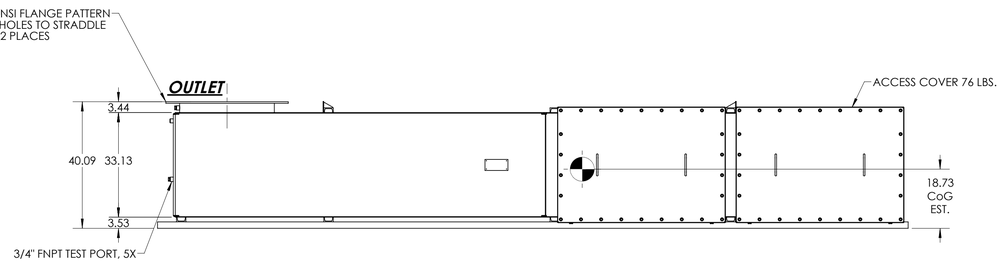
PLAN VIEW



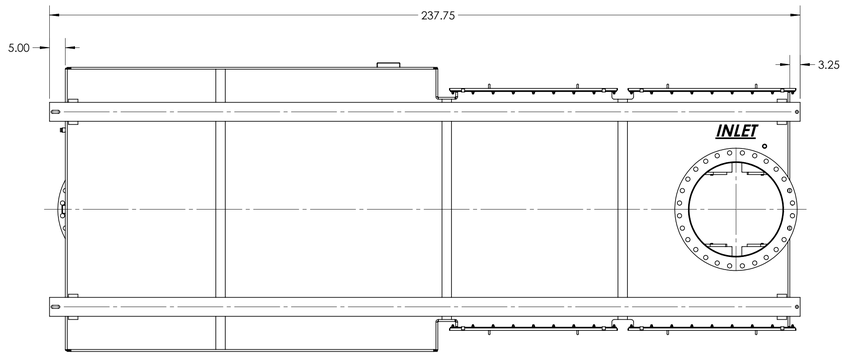
ISO VIEW



SIDE VIEW



ELEVATION VIEW



BOTTOM VIEW

FLANGE CONFIGURATION AND PART NUMBER		
FLANGE SIZE "A"	CS PART NO.	SS PART NO.
26	190157	190831
28	190158	190832
30	190159	190833

* BOLD FLANGE SIZE SHOWN

NOTES:

1. WEIGHT IS ESTIMATED AND IS BASED UPON THE SHOWN CONFIGURATION.
2. SILENCER: HOSPITAL GRADE 30-35 dBA.
3. ALL WELDING TO BE IN ACCORDANCE WITH WELDING GUIDELINES, SEE DRAWING 609826.
4. MATERIAL (MS): 7 GA. ASTM A36 CARBON STEEL or 304 STAINLESS STEEL.
5. FINISH: HIGH TEMPERATURE BLACK PAINT TO HOUSING AND FLANGES (CARBON STEEL ONLY). PER JM PAINT SPEC SEC-EN-P-026.
6. PIPE DIAMETER OF CUSTOMER'S EXHAUST LINE(S) SHALL BE NO LESS THAN THE FLOW AREA OF THE INLET CONNECTION(S) PROVIDED BY JOHNSON MATTHEY.
7. JM BACKPRESSURE GUARANTEE EXTENDS FROM THE CRT INLET CONNECTION TO THE CRT OUTLET CONNECTION ONLY. CUSTOMER IS RESPONSIBLE FOR BACKPRESSURE OR PRESSURE DROP OF ALL OTHER COMPONENTS IN THE ENGINE EXHAUST SYSTEM.

STANDARD TOLERANCES UNLESS SPECIFIED OTHERWISE
[ ] ALTERNATE DIMENSION UNITS ARE FOR REFERENCE ONLY.

MACHINING				GENERAL FABRICATION	
0.0	±0.0300"	FRACTIONS	±1/32"	< 36"	±1/32"
0.00	±0.0100	ANGLES	±0.2 °	> 36"	±1/16"
0.000	±0.0050	SURFACE FINISH	125 µ"AA	ANGLES	±0.5 °

FILLETS SHOWN SHARP = .03"R MAX.

BREAK CORNERS .03" X 45° CHAMFER

TAPPED HOLES - MIN. DEPTH FOR FULL THREADS = 1.8 X DIAMETER
CHAMFER ALL TAPPED HOLES TO ROOT OF FIRST THREAD

ALL DIMENSIONS ARE INCHES UNLESS SPECIFIED OTHERWISE

Shipping Dims		
Length L"	Width W"	Height H"
Material		
Finish		
Weight (lbs) 6104	Model Rev.	

Johnson Matthey
STATIONARY EMISSION CONTROL LLC
900 FORGE AVE
AUDUBON, PA 19403-2305

CRT(+) 24-H-MS-BITO-A/A-RT GENERAL ARRANGEMENT

DRAWN BY	CHECKED	DATE	WHERE USED	DISCIP.	PROJECTION: THIRD ANGLE	SHEET NO.	SIZE
MDC	EJB	10-18-16				1 OF 7	D
ENGINEER	APPROVED	SCALE	EWR NO.	SO NO.	DRAWING NO.	SHT.	REV.
	BAT	1:24			609893 -1-		0

C:\JM\Environmental\SEC_America\Audubon\Standard Products\609xxx - CRT & SDPF\ CRT, SDPF, GEN 2\ Engineering\Fabrication Drawing\609893 (CRT 16 THRU 24 BITO RT) Friday, September 01, 2017 12:47:19 PM

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER DE-08-009-09

Pursuant to the authority vested in the California Air Resources Board (CARB) by Health and Safety Code, Division 26, Part 5, Chapter 2; and pursuant to the authority vested in the undersigned by Health and Safety Code section 39515 and 39516 and Executive Order G-14-012;

This action relates to Verification under sections 2700 through 2711 of title 13 of the California Code of Regulations

Johnson Matthey Inc.
CRT(+) Diesel Particulate Filter

CARB has reviewed the request by Johnson Matthey Inc. for verification of the CRT(+) diesel particulate filter (DPF). Based on an evaluation of the data provided, and pursuant to the terms and conditions specified below, the Executive Officer of the CARB hereby finds that the CRT(+) DPF reduces emissions of diesel particulate matter (PM) consistent with a Level 3 device (greater than or equal to 85 percent reductions) (California Code of Regulations (CCR), title 13, sections 2702 (f) and section 2708) and complies with the CARB January 1, 2009, nitrogen dioxide (NO_2) limit (CCR, title 13, section 2702 (f) and section 2706 (a)). Accordingly, the Executive Officer determines that the system merits verification and, subject to the terms and conditions specified below, classifies the CRT(+) DPF as a Level 3 Plus system, for use with stationary emergency standby and prime generators using engine families listed in Attachment 1.

This verification is subject to the following terms and conditions:

- The engine must be used in a stationary application associated with emergency standby or prime generators.
- The engines are model years 1996 or newer having the engine family names listed in Attachment 1.
- The engine must be a Tier 1, Tier 2, Tier 3, Tier 4i with a rated horse power between 50 and 75 or over 750, or Tier 4 Alt 20% NOx and PM certified off-road engine meeting 0.2 grams per brake horsepower hour (g/bhp-hr) diesel particulate matter (PM) or less based on certification or in-use emissions testing (as tested on an appropriate steady-state certification cycle outlined in the CARB off-road regulations – similar to ISO 8178 D2).
- The engine must be in its original certified configuration.
- The engine must not employ exhaust gas recirculation.
- The engine must not have a pre-existing selective catalytic reduction system.
- The engine must not have a pre-existing oxidation catalyst.
- The engine must not have a pre-existing diesel particulate filter.
- The engine must be four-stroke.
- The engine can be turbocharged or naturally-aspirated.
- The engine must be certified in California.

- Johnson Matthey Inc. must review actual operating conditions (duty cycle, baseline emissions, exhaust temperature profiles, and engine backpressure) prior to retrofitting an engine with the CRT(+) DPF to ensure compatibility.
- The engine should be well maintained and not consume lubricating oil at a rate greater than that specified by the engine manufacturer.
- The engine must not be operated with fuel additives, as defined in section 2701 of title 13, of the CCR, unless explicitly verified for use with fuel additive(s).
- The other terms and conditions specified in Table 1.

Table 1: Conditions for the CRT(+) DPF

Parameter	Value
Application	Stationary Emergency Standby and Prime Power Generation
Engine Type	Diesel, with or without turbocharger, without exhaust gas recirculation (EGR), mechanically or electronically controlled, Tier 1, Tier 2, Tier 3, Tier 4i with a rated horse power between 50 and 75 or over 750, or Tier 4 Alt 20% NOx and PM certified off-road engines meeting 0.2 g/bhp-hr diesel PM or less based on certification or in-use emissions testing.
Minimum Exhaust Temperature for Filter Regeneration	The engine must operate at the load level required to achieve 240 degrees Celsius (°C) for a minimum of 40 percent of the engine's operating time and an oxides of nitrogen (NOx)/PM ratio of 15 @ ≥ 300°C and 20 @ ≤ 300°C. Operation at lower temperatures is allowed, but only for a limited duration as specified below.
Maximum Consecutive Minutes Operating Below Passive Regeneration Temperature	720 Minutes
NOx/PM Ratio Requirements	NOx/PM ratio of at least 8 with a preference for 20 or higher.
Number of Consecutive Cold Starts and 30 Minute Idle Sessions before Regeneration Required	24
Number of Months of Operation Before Cleaning of Filter Required	Filter cleaning is not required till after 150 half-hour cold starts with associated regenerations or 1000 hours of emergency/standby use or 6 to 12 months of prime operation depending on hours of operation, maintenance practice, and oil used. The CRTdm, which monitors engine exhaust back pressure and temperature will determine the actual cleaning interval and provide an alert when filter cleaning is required.
Fuel	California diesel fuel with less than or equal to 15 ppm sulfur or a biodiesel blend provided that the biodiesel portion of the blend complies with ASTM D6751, the diesel portion of the blend complies with title 13 (CCR), sections 2281 and 2282, and the blend contains no more than 20 percent biodiesel by volume. Other alternative diesel fuels such as, but not limited to, ethanol diesel blends and water emulsified diesel fuel are excluded from this Executive Order.
Verification Level	Level 3 Plus Verification: • PM - at least 85% reduction • NO_2 - meets January 2009 limit

The CRT(+) DPF consists of an oxidation catalyst and diesel particulate filter, referred to as a catalyzed passive continuously regenerated diesel particulate filter, and a backpressure monitor and data logger combination, CRTdm. A schematic of the approved label is shown in Attachment 2. Labels attached to the DPF and the engine must be identical.

This Executive Order is valid provided that installation instructions for the CRT(+) DPF do not recommend tuning the engine to specifications different from those of the engine manufacturer. The product must not be used with any other systems or engine modifications without CARB and manufacturer written approval.

Changes made to the design or operating conditions of the CRT(+) DPF, as exempted by CARB, which adversely affect the performance of the engine's pollution control system, shall invalidate this Executive Order. As such, no changes are permitted to the device.

If Johnson Matthey Inc. plans to make changes to the design of CRT(+) DPF, the CARB must be notified in writing of any changes to any part of the CRT(+) DPF. Any changes to the device must be evaluated and approved in writing by CARB. Failure to do so shall invalidate this Executive Order.

Marketing of the CRT(+) DPF using identification other than that shown in this Executive Order or for an application other than that listed in this Executive Order shall be prohibited unless prior approval is obtained from CARB.

As specified in the Diesel Emission Control Strategy Verification Procedure (title 13 CCR section 2706 (g)), the CARB assigns each Diesel Emission Control Strategy a family name. The designated family name for the verification as outlined above is:

CA/JMI/2008/PM3+/N00/ST/DPF01

Additionally, as stated in the Diesel Emission Control Strategy Verification Procedure, Johnson Matthey Inc. is responsible for record keeping requirements (section 2702), honoring the required warranty (section 2707), and conducting in-use compliance testing (section 2709).

Johnson Matthey Inc. must ensure that the installation of the CRT(+) DPF system conforms to all applicable industrial safety requirements.

A copy of this Executive Order must be provided to the ultimate purchaser at the time of sale.

Proper engine maintenance is critical for the proper functioning of the diesel emission control strategy. The owner and/or operator of the engine on which the diesel emission control strategy is installed, is strongly advised to adhere to all good engine maintenance practices. Failure to document proper engine maintenance, including

keeping records of the engine's oil consumption, may be grounds for denial of a warranty claim.

In addition, CARB reserves the right in the future to review this Executive Order and verification provided herein to assure that the verified add-on or modified part continues to meet the standards and procedures of CCR, title 13, section 2222, et seq. and CCR, title 13, sections 2700 through 2711.

Systems verified under this Executive Order shall conform to all applicable California emissions regulations.

This Executive Order does not release Johnson Matthey Inc. from complying with all other applicable regulations.

Violation of any of the above conditions shall be grounds for revocation of this Executive Order.

Executive Order DE-08-009-08 is hereby superseded and is of no further force and effect.

Executed at Sacramento, California, this 5th day of December, 2017.

Richard W. Corey
Executive Officer
by

Cynthia Marvin, Chief
Transportation and Toxics Division

Attachment 1: Johnson Matthey CRT(+) Diesel Particulate Filter Off-Road Certified Engine Family List (0<=0.2 g/hp-hr PM)
Attachment 2: Diesel Emission Control System Label