

DATE: February 28, 2024

DEPARTMENT OF GENERAL SERVICES  
BUREAU OF CAPITAL PROJECT DESIGN MANAGEMENT  
1800 HERR STREET  
HARRISBURG, PENNSYLVANIA

**ADDENDUM NO. 9**

on

**PROJECT NO. DGS C-1576-0010 PHASE 001**  
**PROJECT TITLE - SCI Frackville - Electrical Upgrades**

**PROFESSIONAL:**

Greenman-Pedersen, Inc.  
52 Glenmaura National Blvd  
Scranton, PA, 18505

**If you submitted a bid prior to this Addendum being issued, your bid has been discarded and you must re-submit your bid(s) prior to the bid opening date and time.**

ADMINISTRATIVE CHANGES – ALL CONTRACTS

Item 1 - Addendum's 1, 2, 3 and 4 were related to the Phase 1.4 Electric portion of the work that was previously issued as a 'Best Value' proposal. Contractors on all portions of the Work shall be familiar with those Addendums.

Item 2 - Addendums 1 and 2 are administrative in nature dealing with BDISBO and an additional site visit for the Phase 1.4 portion of the Work. Addendum 1 is not relevant to this "Re-Bid" as it was information related to the BDISBO meeting and is not attached. Addendum 2 documents the meeting took place and includes the PowerPoint presentation. Addendum 2 is included in this Addendum.

Item 3 - Addendum 3 addressed changes to Drawing E8.1 and is included in this Addendum.

Item 4 - Addendum 4 addressed modifications to Specification Section 263213.13 and is included in this Addendum.

Item 5 - Addendum 5 was a summary of Addendums 1, 2, 3, and 4 issued as part of the Low Bid Bids for Contracts 1.1 (General) and 1.2 (HVAC). Addendum 5 is not attached.

Item 6 - Addendum 6 was administrative in nature dealing with BDISBO and is not relevant to this "Re-Bid" as it was information related to the BDISBO meeting. The DISBO meeting presentation duplicates what is provided in Addendum 2, Addendum 6 is not attached.

Item 7 - Addendum 7 provided clarifications to RFI's submitted by Bidders on Contract 1.1 and 1.2 and is included in this addendum.

Item 8 - Addendum 8 documents the BDISBO meeting took place and includes the PowerPoint presentation. Addendum 8 is not attached in this Addendum as the information is a duplication of previously provided information.

SPECIFICATION CHANGES – ALL CONTRACTS

Item 1 - Addendum 9 is new information and revisions to Specification Sections. See Attached.

DRAWING CHANGES – ALL CONTRACTS

None



DEPARTMENT OF GENERAL SERVICES  
 BUREAU PRE-CONSTRUCTION  
 1800 HERR STREET  
 HARRISBURG, PENNSYLVANIA

**ADDENDUM NO. 9**

on

**PROJECT NO. DGS C-1576-0010 PHASE 1**  
**PROJECT TITLE – SCI Frackville – Electrical Upgrades**  
**LOCATION – Frackville, PA**  
**Greenman Pedersen Inc, Scranton, PA 18505**

**ADMINISTRATIVE CHANGES – ALL CONTRACTS**

Item 1 - Addendum's 1, 2, 3 and 4 were related to the Phase 1.4 Electric portion of the work that was previously issued as a 'Best Value' proposal. Contractors on all portions of the Work shall be familiar with those Addendums.

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**GENERAL CHANGES – ALL CONTRACTS**

None

**SPECIFICATION CHANGES – ALL CONTRACTS**

Item 1 - Section 010300: Revised specification as noted below. See attachment for complete spec section.

Section 010300-1.3-A2a:

**2) Provide 80% rated automatic load bank, additional switchgear circuit breaker, controls, and feeders.**

**3) Provide all required accessory items necessary for the additional equipment including but not limited to equipment pads, switches, junction boxes, mounting hardware, supports and isolation pads, etc.**

Section 010300-1.3-A3a:

**2) Provide 80% rated automatic load bank, additional switchgear circuit breaker, controls, and feeders.**

**4) Provide all required accessory items necessary for the additional equipment including but not limited to equipment pads, switches, junction boxes, mufflers, exhaust stacks, mounting hardware, supporting steel, supports and isolation pads, etc.**

Item 2 - Section 010400: Revised specification as noted below. See attachment for complete spec section.

Section 010400-1.31:

### **1.31 OPERATING SYSTEM LOGIC**

**A. All subcontracts or purchase orders between the Contractor and manufacturers must:**

**1. Require all manufacturers contracted under the operating system logic provision to provide the Commonwealth with the source code and access to operating system logic with a complete, fully licensed programming development suite and final, tested copies of all programming to include source code, logic, documentation, configuration, data files and any other required files. Load all files on a new laptop computer, fully configured as a maintenance programming laptop and including all required communication devices and cables to connect to system components.**

**Provide a complete system backup of all software and files on a secured USB hard drive for offsite storage. Provide hard copies of all component lists, system configuration settings, passwords, and sources as part of O&M manual. Demonstrate the successful use and completeness of the programming laptop and the hard drive backup after all system startup and commissioning and to qualify for final system acceptance.**

**2. Authorize the Commonwealth and Agency to provide access to operating system logic to a Commonwealth or Agency third party that is under contract with the Commonwealth or Agency as determined necessary by the Commonwealth or Agency.**

**B. A manufacturer may only retain access to the operating system logic if the manufacturer enters a Service or Maintenance Agreement with the Agency for its continued maintenance on the operating system. If a manufacturer's performance under the Service or Maintenance Agreement is deemed unsatisfactory by the Agency or is insufficient to meet the Agency's needs, the manufacturer shall no longer be permitted to retain access to the operating system logic. Upon termination of the Service or Maintenance Agreement, the manufacturer shall provide the Agency with access to the operating system logic and authorize the Agency to provide it to a third-party that is under contract with the Commonwealth or Agency.**

Item 3 - Section 261100: Revised specification as noted below. See attachment for complete spec section.

Section 261100-2.1:

**A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:**

**4. Siemens ITE**

Item 4 - Section 261335: Revised specification as noted below. See attachment for complete spec section.

Section 261335-2.1:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:  
10. Siemens Industry., Energy Management Division**

Section 261335-2.4:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:  
10. Siemens Industry., Energy Management Division**

Section 261335-2.13:

- A. See specification section 010400-1.3 for Operating System Logic requirements.**

Item 5 - Section 263213.13: Revised specification as noted below. See attachment for complete spec section.

Section 263213.13-2.6:

- A. See specification section 010400-1.3 for Operating System Logic requirements.**

DRAWING CHANGES – ALL CONTRACTS

None

DATE: October 27, 2023

DEPARTMENT OF GENERAL SERVICES  
BUREAU OF CAPITAL PROJECT DESIGN MANAGEMENT  
1800 HERR STREET  
HARRISBURG, PENNSYLVANIA

**ADDENDUM NO. 2**

**on**

**PROJECT NO. DGS C-1576-0010 PHASE 001**  
**PROJECT TITLE - SCI Frackville - Electrical Upgrades**

**PROFESSIONAL:**

Greenman-Pedersen, Inc.  
52 Glenmaura National Blvd  
Scranton, PA, 18505

**If you submitted a bid prior to this Addendum being issued, your bid has been discarded and you must re-submit your bid(s) prior to the bid opening date and time.**

**GENERAL CHANGES – ALL CONTRACTS**

Item 1 - As this project requires Veteran-owned Business Enterprises (VBE) and Small/Diverse Business (SDB) participation, the informational presentation on solicitation hosted by BDISBO to providing instruction on what is required to comply with the bidding requirements was held Friday, October 27, 2023, at 1:00 PM. This was a PowerPoint presentation that was about 1/2 an hour. In addition to the attached document a PDF of the slide show has been added to the 45 Bidding / 01 Bid Documents / 01 Project Manual folder in eBuilder.

**SPECIFICATION CHANGES – ALL CONTRACTS**

Item 1 -

**DRAWING CHANGES – ALL CONTRACTS**

Item 1 -



**pennsylvania**

BUREAU OF DIVERSITY, INCLUSION  
AND SMALL BUSINESS OPPORTUNITIES

## DGS 1576-0010 Phase 1 (RFP SCI Frackville - Electrical Upgrades

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Issuing Officer -  
Susan Stanisic -sstanisic@pa.gov

October 27, 2023 1:00 PM

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# What's the Point?



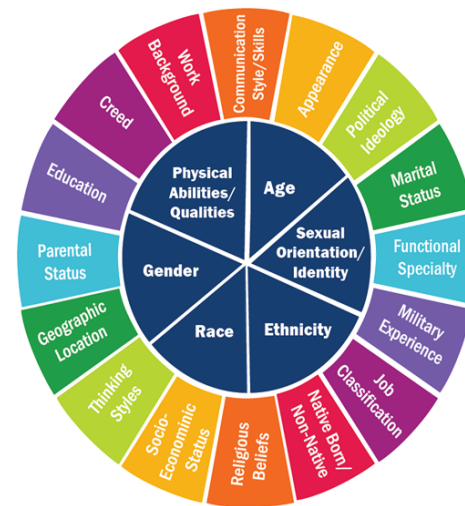
Diversity, Equity, and Inclusion  
RE- IMAGINING THE CULTURE OF YOUR WORKPLACE





# Diversity Defined

- Diversity is...
  - everything that makes us unique,
  - our cognitive skills and personality traits, and
  - also the things that shape our identity (*e.g. race, age, gender, religion, sexual orientation, cultural background*), etc.



# Diversity is the Mix Inclusion is making the mix work. ~Andres Tapia

Baking a  
cake

Each  
ingredient  
has its own  
*distinct* taste  
and  
quality...



Baking a  
cake

Each  
ingredient  
adds *value*  
to  
the recipe...



Baking a  
cake

Recognizing the  
individuality  
and the value  
of *every* person  
is essential to  
understanding  
the concept of  
diversity.



©SheWearsMany

**EQUALITY IS THE  
END GOAL.  
EQUITY IS THE  
MEANS TO GET  
THERE.**

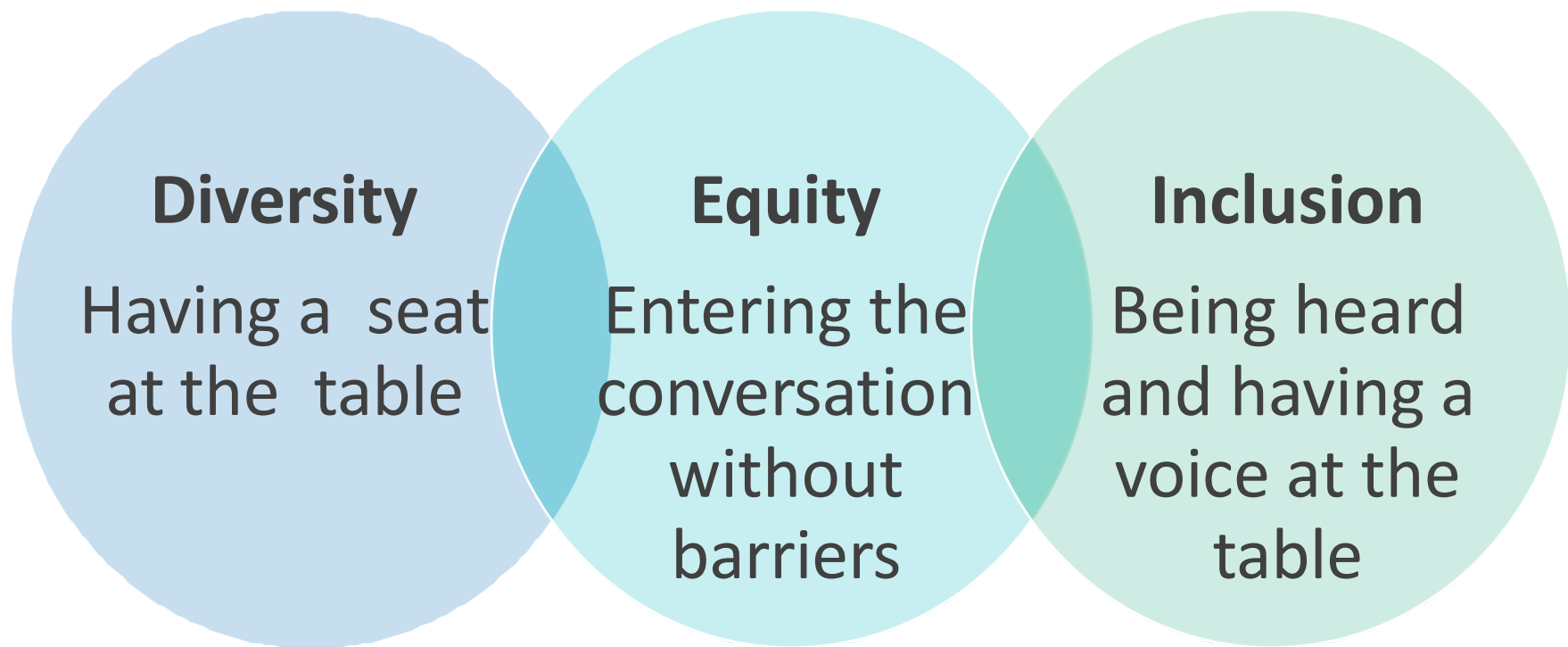


**Equality**



**Equity**

# Diversity, Equity, and Inclusion



# Small Diverse Business Enterprise (SDB) and Veteran Business Enterprise (VBE) Bid References

## Instructions to Bidders

- Section 5 – Submission/Signing of Bids
- Section 30 – Small Diverse Business and Veteran Business Participation Information

## Administrative Procedures

- No. 13 – Small Diverse Business and Veteran Business Enterprise Participation

## Attachments

- SDB Participation Packet 2023.05.05.pdf
- VBE Participation Packet 2023.05.05.pdf

**A Bidder/Offeror's failure to meet the SDB participation goal in full and the VBE participation goal in full, or their failure to receive an approved Good Faith Efforts waiver for any unmet portion of either the SDB or VBE participation goal will result in the rejection of the Bid or Proposal as nonresponsive.**



# Solicitation Specific Goals



## DGS 1576-0010 Phase 1

.4 Electrical Construction -ALL BASE BIDS (#1, #2 & #3)

SDB

VBE

**11%**

**3%**

- Available subcontracting opportunities across the entire state for the applicable services,
- Availability of DGS-verified SDB/VBEs to perform commercially useful functions, and
- Historical analysis of similar projects within the last 3 years.

**Primes are welcome to exceed the goal!**



# SDB and VBE Classification

Vendors must self-certify as a Small Business (SB) prior to SDB/VBE validation.

## SB Eligibility Requirements

- The business must be a for-profit, United States business.
- The business must be independently owned.
- The business may not be dominant in its field of operation.
- The business may not employ more than 100 full-time equivalent employees.
- The business may not exceed three-year average gross revenues of \$38.5 Million, regardless of business type (effective 11/1/2018).

## Small Diverse Business (SDB)

Goal oriented

- Woman Business Enterprise (WBE)
- Service-Disabled Veteran Business Enterprise (SDVBE)
- Minority Business Enterprise (MBE)
- LGBT Business Enterprise (LGBTBE)
- Disability-Owned Business Enterprise (DOBE)

## Veteran Business Enterprise (VBE)

Goal oriented

- Veteran Business Enterprise (VBE)
- Service-Disabled Veteran Business Enterprise (SDVBE)

**SDBs and VBEs must be certified/valid as of bid close due date and time.**



# Finding SDB/VBE vendors

- <http://www.dgs.internet.state.pa.us/suppliersearch>
- Access Search Guide - <https://www.dgs.pa.gov/Small%20Diverse%20Business%20Program/Documents/Finding%20SBs%20and%20SDBs.pdf>
- Supplier Search assistance available from Issuing Officer or Bureau of Diversity Procurement Liaison





# Finding SDBs and VBEs

Utilization Compliance will be closely monitored and enforced

The screenshot shows the 'Supplier Search' page of the Pennsylvania Department of General Services. At the top left is the state logo and the text 'pennsylvania DEPARTMENT OF GENERAL SERVICES'. The page title is 'Supplier Search'. Below the title is a navigation bar with 'Home', 'PA eMarketplace', and 'Search Contracts'. A note explains that searches will find suppliers qualified for Invitation to Qualify (ITQ) contracts and registered with the Bureau of Diversity, Inclusion and Small Business Opportunities (BDISBO). There are two search sections: 'Quick Search' with a text input for 'Supplier Name or SAP Number', a 'Search' button, and a 'Reset' button; and 'Advanced Search'. At the bottom, there is a 'Show 10 entries' dropdown, 'Export to Excel' and 'Reset Search Criteria' buttons, and a table header with columns: 'Supplier (click on name to display full record)', 'Contact', 'Address', 'SB Exp Date', 'SDB', and 'COSTARS'.

<http://www.dgs.internet.state.pa.us/suppliersearch>



# Quick Search

Home PA eMarketplace Search Contracts

**Note:** The below searches (Quick Search and Advanced Search) will search suppliers who are qualified for one or more Invitation to Qualify (ITQ) Contracts AND suppliers registered with the Bureau of Diversity, Inclusion and Small Business Opportunities (BDISBO) as a small business or small diverse business. Use the Quick Search to search by Vendor Name or Vendor Number. Use the Advanced Search to search by Small, Small Diverse, ITQ Contracts, COSTARS and UNSPC codes.

Quick Search

Supplier Name or SAP Number  Search Reset

**IMPORTANT:** Always click **Reset** prior to a new search to clear parameters from previous searches

Advanced Search

Show 10 entries Export to Excel Reset Search Criteria

Supplier (click on name to display full record)	Contact	Address	SB Validity Dates	SDB Validity Dates	VBE Validity Dates	COSTARS
<a href="#">21ST CENTURY MEDIA NEWSPAPER LLC</a>	ROBERT BUTKINS <a href="mailto:sales@nittanyvalley.com">sales@nittanyvalley.com</a>					No
<a href="#">22 GROUP, LLC ()</a>	Caroline M. Harper	757 PUBLIC RD	9/23/2019-	9/23/2019-		No

To search or browse ALL Small and Small Diverse Businesses by Name OR 6-digit SAP Number (option also available through Advanced Search)



# Advanced Search

Hierarchy	Category Number
Segment	<u>44</u> 000000
Family	44 <u>12</u> 0000
Class	4412 <u>17</u> 00
Commodity	441217 <u>06</u>

**Supplier Classifications**

- Minority Business Enterprise
- Woman Business Enterprise
- LGBT Business Enterprise
- Disabled-Owned Business Enterprise
- Service-Disabled Veteran Business Enterprise
- Veteran Business Enterprise
- Small Business
- Stocking Supplier
- Non-Stocking Supplier

Select all Classifications  
 Select all Small Diverse Business Classifications

Find only vendors that have all selected classifications  
 Find only vendors that have at least one selected classification

**UNSPSC Description**

Enter a brief code description (e.g. Door) ←

When searching by UNSPSC code, only enter the first 6 digits (UNSPSC Class Level) as the last 2 digits (Commodity Level) are not tracked in this database.  
Or, type in any part of a UNSPSC code description to find vendors who have a code that matches. ex: Searching for "landscaping" will find vendors who have selected any code that has "landscaping" anywhere in the description.  
For more information visit [UNSPSC > Home](#)

**UNSPSC Code** →

- 10000000 - Live Plant and Animal Material and Accessories and Supplies
- 11000000 - Mineral and Textile and Inedible Plant and Animal Materials
- 12000000 - Chemicals including Bio Chemicals and Gas Materials
- 13000000 - Resin and Rosin and Rubber and Foam and Film and Elastomeric Materials
- 14000000 - Paper Materials and Products
- 15000000 - Fuels and Fuel Additives and Lubricants and Anti corrosive Materials
- 20000000 - Mining and Well Drilling Machinery and Accessories
- 21000000 - Farming and Fishing and Forestry and Wildlife Machinery and Accessories
- 22000000 - Building and Construction Machinery and Accessories
- 23000000 - Industrial Manufacturing and Processing Machinery and Accessories
- 24000000 - Material Handling and Conditioning and Storage Machinery and their Accessories and
- 25000000 - Commercial and Military and Private Vehicles and their Accessories and Components

Find only vendors that have all selected UNSPSC codes  
 Find only vendors that have at least one selected UNSPSC code

Select one or more classifications. To pull only SDBs, check "Select all Small Diverse Business Classifications" below. To Include SBs, check "Small Business".

← OR ↓

Browse and select one or more codes. Don't know the codes you want? Search for codes at [www.UNSPSC.org](http://www.UNSPSC.org).

Click arrow to expand Segment for additional codes



# UNSPSC Commodity Code Search

## UNSPSC Code List

Hierarchy	Category Number	Name
Segment	<u>44</u> 000000	Office equipment and accessories & supplies
Family	44 <u>12</u> 0000	Office supplies
Class	4412 <u>17</u> 00	Writing Instruments
<del>Commodity</del>	<del>441217<u>06</u></del>	<del>Wooden pencils</del>

### UNSPSC Codes

- ▶  43000000 - Information Technology Broadcasting and Telecommunications
- ▶  44000000 - Office Equipment and Accessories and Supplies
  - ▶  44100000 - Office machines and their supplies and accessories
  - ▶  44110000 - Office and desk accessories
  - ▶  44120000 - Office supplies
    - ▶  44121500 - Mailing supplies
    - ▶  44121600 - Desk supplies
    - ▶  **44121700 - Writing instruments**
    - ▶  44121800 - Correction media
    - ▶  44121900 - Ink and lead refills
    - ▶  44122000 - Folders and binders and indexes
    - ▶  44122100 - Fastening supplies



# UNSPSC Commodity Code Search



Find A Partner

Menu

UNv24.0301 of the UNSPSC Codeset is now available. [Access codesets.](#)

## Search the Code

Version 24.0301  
Code Number: (2-8  
digits)

Code Name:

## Welcome

The **United Nations Standard Products and Services Code® (UNSPSC®)**, managed by GS1 US® for the UN Development Programme (UNDP), is an open, global, multi-sector standard for efficient, accurate classification of products and services.

The UNSPSC offers a single global classification system that can be used for:

- Company-wide visibility of spend analysis
- Cost-effective procurement optimization
- Full exploitation of electronic commerce capabilities



# UNSPSC Commodity Code Search

Write down  
your code  
selections



[HOME](#) [FAQS](#) [SUBSCRIBE](#) [LIBRARY](#) [CODESET-DOWNLOADS](#) [INITIATIVES](#) [EDUCATION](#) [FINDAPARTNER](#)

Version 24.0301

Search Code

Search Title

Code	Title
31211900	Paint applicators and painting accessories
60121001	Paintings
60121225	Watercolor painting mediums
60124101	Multicultural painting products
72151300	Painting and paper hanging services
72151301	Residential painting service
72151302	Commercial painting service
72151303	Industrial painting service
72151304	Aircraft painting service
72151305	Bridge painting service
72151307	Ship painting service
73181104	Painting services
78181501	Vehicle body repair or painting service
78181836	Aircraft fixed wing coating and painting service
86121502	Painting



# Advanced Search

Use multiple filters to restrict your search results to exactly what and where you need.

**PA Counties**

- Grant County
- Clearfield County
- Clinton County
- Columbia County
- Crawford County
- Cumberland County
- Dauphin County
- Delaware County
- Elk County
- Erie County

Select all Counties

Find only vendors that s

Find only vendors that s

**Supplier Classifications**

- Minority Business Enterprise
- Woman Business Enterprise
- LGBT Business Enterprise
- Disabled-Owned Business Enterprise
- Service-Disabled Veteran-Owned Business Enterprise
- Veteran Business Enterprise
- Small Business
- Stocking Supplier
- Non-Stocking Supplier

**UNSPSC Codes**

- 30100000 - Structural components and basic shapes
- 30110000 - Concrete and cement and plaster
- 30120000 - Roads and landscape
- 30130000 - Structural building products
- 30140000 - Insulation
- 30150000 - Exterior finishing materials
  - 30151500 - Roofing materials
  - 30151600 - Roofing accessories
  - 30151700 - Rain gutters and accessories
  - 30151800 - Siding and exterior wall materials
  - 30151900 - Finishing materials and products
  - 30152000 - Fencing

Find only vendors that have all selected UNSPSC codes

Find only vendors that have at least one selected UNSPSC code



# Search Results

Advanced Search

Show 25 entries

Export to Excel Reset Search Criteria

Supplier (click on name to display full record)	Contact	Address	SB Validity Dates	SDB Validity Dates	VBE Validity Dates	COSTARS
<a href="#">ADVANCED AUDIO VISUAL SALES INC</a>	JOHN GREENE DIRECTOR OF SALES <a href="mailto:John.Green@advancedav.com">John.Green@advancedav.com</a> (Phone) 610-719-6194 (Fax) 610-692-8421	208 CARTER DRIVE SUITE 7 WEST CHESTER, PENNSYLVANIA 19382 (Phone) 610-719-6194				No
<a href="#">ADVANCED BUILDING CONTROLS LLC (DBA ADVANCED BUILDING CONTROLS LLC)</a>	Craig Connelly <a href="mailto:CCONNELLY@ADVANCEDBLDGCNTOLS.COM">CCONNELLY@ADVANCEDBLDGCNTOLS.COM</a> (Phone) 215-520-9964	PO BOX 303 HOLICONG, PENNSYLVANIA 18928 (Phone) 215-520-9964	2/11/2019-2/28/2021			No
<a href="#">ADVANCED BUILDING PERFORMANCE INC ()</a>	Pei Pei Cavalier <a href="mailto:PEIPEI@ABPCX.COM">PEIPEI@ABPCX.COM</a> (Phone) 301-760-9989	11225 HURDLE HILL DR POTOMAC, MARYLAND 20854 (Phone) 301-760-9989 <a href="http://abpcx.com">abpcx.com</a>	12/20/2019-12/20/2021	12/20/2019-12/20/2021		No
<a href="#">ADVANCED CLEANING SOLUTIONS LLC (ADVANCED CLEANING SOLUTIONS LLC)</a>	Nicholas Ward <a href="mailto:cleanteam@advancedsolutionsPA.com">cleanteam@advancedsolutionsPA.com</a> (Phone) 610-597-0012	PO BOX 3223 ALLENTOWN, PENNSYLVANIA 18106	2/27/2018-2/27/2020	2/27/2018-3/31/2020	2/27/2018-3/31/2020	No

### Certified Small Businesses

- Advanced Building Controls LLC
- Advanced Building Performance Inc
- Advanced Cleaning Solutions LLC

### Small Diverse Businesses

- Advanced Building Performance Inc
- Advanced Cleaning Solutions LLC

### Veteran Business Enterprise

- Advanced Cleaning Solutions LLC





# Supplier Profile

<b>Name:</b>	ADVANCED CLEANING SOLUTIONS LLC
<b>SAP Number:</b>	511377
<b>Doing Business As:</b>	ADVANCED CLEANING SOLUTIONS LLC
<b>Other Names:</b>	
<b>Keywords:</b>	
<b>Web site:</b>	
<b>SB Validity Dates:</b>	02/27/2018 - 03/31/2020
<b>SDB Validity Dates:</b>	02/27/2018 - 03/31/2020
<b>VBE Validity Dates:</b>	02/27/2018 - 03/31/2020
<b>COSTARS Participant:</b>	No

← SB, SDB & VBE Expiration Dates

## Supplier Classifications

- Small Business
- Service-Disabled Veteran Business Enterprise
- Veteran Business Enterprise

← SB, SDB & VBE Classifications

## Contact Information

### Contacts

Contact Type	Contact Details	Phone
CORPORATE	Email: <a href="mailto:CLEANTEAM@ADVANCEDSOLUTIONSPA.COM">CLEANTEAM@ADVANCEDSOLUTIONSPA.COM</a>	
SB MAIN	Nicholas Ward Title: Email: <a href="mailto:cleanteam@advancedsolutionsPA.com">cleanteam@advancedsolutionsPA.com</a>	610-597-0012



# Search Results

Advanced Search

Show  entries

[Export to Excel](#) [Reset Search Criteria](#)

Supplier (click on name to display full record)	Contact	Address	SB Validity Dates	DB Validity Dates	VBE Validity Dates	COSTARS
<a href="#">ADVANCED AUDIO VISUAL SALES INC</a>	JOHN GREENE DIRECTOR OF SALES <a href="mailto:John.Green@advancedav.com">John.Green@advancedav.com</a> (Phone) 610-719-6194 (Fax) 610-692-8421	208 CARTER DRIVE SUITE 7 WEST CHESTER, PENNSYLVANIA 19382 (Phone) 610-719-6194				No
<a href="#">ADVANCED BUILDING CONTROLS LLC (DBA ADVANCED BUILDING CONTROLS LLC)</a>	Craig Connelly  <a href="mailto:CCONNELLY@ADVANCEDBLDGCONTOLS.COM">CCONNELLY@ADVANCEDBLDGCONTOLS.COM</a> (Phone) 215-520-9964	PO BOX 303  HOLICONG, PENNSYLVANIA 18928 (Phone) 215-520-9964	2/11/2019-2/28/2021			No
<a href="#">ADVANCED BUILDING PERFORMANCE INC ()</a>	Pei Pei Cavalier  <a href="mailto:PEIPEI@ABPCX.COM">PEIPEI@ABPCX.COM</a> (Phone) 301-760-9989	11225 HURDLE HILL DR  POTOMAC, MARYLAND 20854 (Phone) 301-760-9989 <a href="http://abpcx.com">abpcx.com</a>	12/20/2019-12/20/2021	12/20/2019-12/20/2021		No
<a href="#">ADVANCED CLEANING SOLUTIONS LLC (ADVANCED CLEANING SOLUTIONS LLC)</a>	Nicholas Ward  <a href="mailto:cleanteam@advancedsolutionsPA.com">cleanteam@advancedsolutionsPA.com</a> (Phone) 610-597-0012	PO BOX 3223  ALLENTOWN, PENNSYLVANIA 18106	2/27/2018-3/31/2020	2/27/2018-3/31/2020	2/27/2018-3/31/2020	No

### Certified Small Businesses

- Advanced Building Controls LLC
- Advanced Building Performance Inc
- Advanced Cleaning Solutions LLC

### Small Diverse Businesses

- Advanced Building Performance Inc
- Advanced Cleaning Solutions LLC

### Veteran Business Enterprise

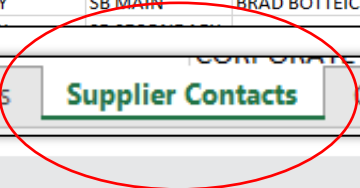
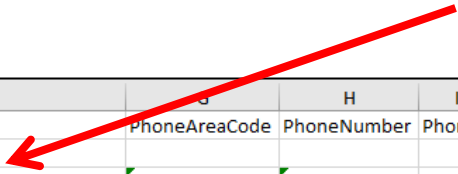
- Advanced Cleaning Solutions LLC



# Excel Export Results – Supplier Contacts

Excel Export Results includes Vendor ID, Supplier Name, Contact Name, Email, Phone, Fax

	A	B	C	D	E	F	G	H	I	J	K
1	SAP Number	Supplier Name	Contact Name	Name	Title	Email	PhoneAreaCode	PhoneNumber	PhoneEx	FaxAreaCo	FaxNumber
2	104279	CA WEISS SALES LLC	CORPORATE			caweiss@comcast.net					
3	104279	CA WEISS SALES LLC	SB MAIN	KRISTY ZARICHNIAK		kristyz@comcast.net	610	4588864		610	4588875
4	119565	DUFF SUPPLY COMPANY	CORPORATE	ALEX DUFFINE	VP	DFRANK@DUFFCOMPANY.COM	610	2754453	147	610	2796299
5	119565	DUFF SUPPLY COMPANY	REMITTO	BARB COHEN		bcohen@duffco.com	610	2754453	149	610	2756761
6	119565	DUFF SUPPLY COMPANY	SB MAIN	ALEX DUFFINE		aduffine@duffco.com	610	2754453			
7	119565	DUFF SUPPLY COMPANY	SB SECONDARY			info@duffco.com					
8	122594	HOUCK SERVICES INC	CORPORATE			jherrold@houcks.com					
9	122594	HOUCK SERVICES INC	SB MAIN	JARROD HERROLD		jherrold@houcks.com	717	6573302		717	6579805
10	122594	HOUCK SERVICES INC	SB SECONDARY			kgussler@houcks.com					
11	134717	PENN STATE ELECTRIC MECHANICAL	CORPORATE			razmataz33@aol.com					
12	134717	PENN STATE ELECTRIC MECHANICAL	SB MAIN	RAZ SUGARWALA		razmataz33@aol.com	717	2992090		717	2992297
13	134717	PENN STATE ELECTRIC MECHANICAL	SB SECONDARY			ksing6027@yahoo.com					
14	135270	BARBARA J SALES ASSOC INC	CORPORATE			barb@barbarajsles.com					
15	135270	BARBARA J SALES ASSOC INC	SB MAIN	BARBARA SMITH		barb@barbarajsales.com	412	5233398		800	8137122
16	135270	BARBARA J SALES ASSOC INC	SB SECONDARY			willsmith@willjservices.com					
17	137893	IDA YEAGER SALES INC	CORPORATE			idayeagersales@zoominternet.net					
18	137893	IDA YEAGER SALES INC	SB MAIN	IDA LAQUATRAYEAGER		idayeagersales@zoominternet.net	724	4525260		724	4521072
19	144061	CONSTRUCTION TOOL SERVICE INC	CORPORATE			ehuss@constructiontoolservice.com					
20	144061	CONSTRUCTION TOOL SERVICE INC	SB MAIN	BETTY CONNELLY		bconnelly@constructiontoolservice.com	412	6816673		412	6819185
21	144061	CONSTRUCTION TOOL SERVICE INC	SB SECONDARY			bcgoodwork@aol.com					
22	145576	BURKE & MICHAEL INC	CORPORATE			MARYFRANCES@BURKEANDMICHAEL.COM					
23	145576	BURKE & MICHAEL INC	SB MAIN	MARY FRANCES HOGAN		maryfrances@burkeandmichael.com	412	3212301		412	3214582
24	153927	COOPER TRADING INC	CORPORATE			cti@ctipa.com					
25	153927	COOPER TRADING INC	SB MAIN	PETER COOPER		pete@ctipa.com	724	8618830		724	8618832
26	153927	COOPER TRADING INC	SB SECONDARY			debbie@ctipa.com					
27	157009	CONTRACT HARDWARE AND SUPPLY	CORPORATE			cristil@chsupplyinc.com					
28	157009	CONTRACT HARDWARE AND SUPPLY	SB MAIN	BRAD BOTTEICHER		bradb@chsupplyinc.com	814	9412340		814	9412342



Suppliers	Supplier Addresses	<b>Supplier Contacts</b>	Counties	Supplier Classifications	ITQs	ITQ Contracts	UNSPSC Codes
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# Upcoming Supplier Search Training

The training will focus on the basics of the supplier search process including recognizing the UNSPSC Codes Structure, accessing the DGS Supplier Search Database and Searching for Small, Small Diverse and Small Veteran Owned Businesses to gain a better understanding of supplier search results.

The 30-minute sessions will be offered via Teams on-line presentations on the following dates in 2023: **(No RSVP Required)**

**Targeted Audience (External):** Potential prime contractors that conduct business with the commonwealth who want to learn the basics of finding DGS certified small diverse and veteran owned businesses.

- Thursday, October 26<sup>th</sup>, 10:00 am – 10:30 am
- Thursday, November 2<sup>nd</sup>, 10:00 am – 10:30 am
- Thursday, November 16<sup>th</sup>, 10:00 am – 10:30 am
- Thursday, November 30<sup>th</sup>, 10:00 am – 10:30 am
- Thursday, December 7<sup>th</sup>, 10:00 am – 10:30 am

---

Microsoft Teams meeting

**Join on your computer or mobile app**

[Click here to join the meeting](#)

Meeting ID: 293 754 842 172

Passcode: Uhqm2D

[Download Teams](#) | [Join on the web](#)

**Or call in (audio only)**

[+1 267-332-8737,,690952530#](#) United States, Philadelphia

Phone Conference ID: 690 952 530#

[Find a local number](#) | [Reset PIN](#)

Recording or transcription of this meeting may not occur without consent of all participants, as required by law, and must adhere to Commonwealth policies. For more information click the legal link.

[Learn More](#) | [Meeting options](#) | [Legal](#)

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[BDISBO Events Page](#)



# New Forms and Processes

- SDB/VBE Instructions – *SDB-1/VBE-1* **READ**
- SDB/VBE Participation Submittal – *SDB-2/VBE-2*
- SDB/VBE Utilization Schedule – *SDB-3/VBE-3*
- Letter of Commitment – *SDB 3.1/VBE-3.1*
- Guidance for Good Faith Effort (GFE) Waiver – *SDB-4/VBE-4* **READ**
- GFE Waiver – *SDB-5/VBE-5*



# SDB/VBE Forms in e-Builder

Pennsylvania Department of General Services / SCI Frackville - Electrical Upgrades

↳ DGS C-1576-0010 Phase 1.4 - RFP Electrical

**Status**

Bid Package	Open
Bidding	Pending
Response Submitted	No

**18 Days 19 Hours 3 Minutes Left**

Due on 11.14.2023 at 2:00 PM  
(GMT-05:00) Eastern Time (US & Canada)


**Package Invitation** (circled in red)



Accept Decline

Scroll down to find SDB and VBE Participation Packets

Bid Info Invitation Documents (17) Addenda (1)

Hide All | Show All

Click this icon  to download files. Clicking the icon next to a folder will download all files and subfolders within it.

File / Folder Name	Uploaded on	File Size
  01 Bid Documents (2)	10.22.2020 10:50 AM	



# SDB Submittal Instructions – SDB-1

## SDB-1 INSTRUCTIONS FOR COMPLETING THE SMALL DIVERSE BUSINESS (SDB) PARTICIPATION SUBMITTAL AND SDB UTILIZATION SCHEDULE.

***PLEASE READ BEFORE COMPLETING THESE DOCUMENTS***  
*Bidders/Offerors do not need to return SDB-1 with their SDB Participation Submittal*

The following instructions include details for completing the SDB Participation Submittal (SDB-2) which Bidders or Offerors must submit in order to be considered responsive.

The following instructions also include details for completing the SDB Utilization Schedule (SDB-3), which Bidders or Offerors must submit for any portion of the SDB participation goal the Bidder or Offeror commits to meeting.

**A Bidder/Offeror's failure to meet the SDB participation goal in full or their failure to receive an approved Good Faith Efforts waiver for any unmet portion of the SDB participation goal will result in the rejection of the Bid or Proposal as nonresponsive.**

- I. **SDB Participation Goal:** The SDB participation goal is set forth in the eMarketplace advertisement and also in the Notice to Bidders. The Bidder/Offeror is encouraged to use a diverse group of subcontractors and suppliers from the SDB classifications to meet the SDB participation goal.
- II. **SDB Eligibility:**
  1. **Finding SDB firms:** Offerors can access the directory of **DGS-verified** SDB firms from the DGS Supplier Search directory at: <http://www.dgs.internet.state.pa.us/suppliersearch>.
  2. **Only SDBs verified by DGS** and as defined herein may be counted for purposes of achieving the SDB participation goal. In order to be counted for purposes of achieving the SDB participation goal, the SDB firm, including an SDB prime, **must be DGS-verified for the services, materials or supplies that it has committed to perform on the SDB Utilization Schedule (SDB-3). A firm whose SDB verification is pending or**



# SDB Submittal – SDB-2

**CRITICAL**  
 ✓ Check One, and Only One, Box

## SDB-2 SDB PARTICIPATION SUBMITTAL

Bidder/Offeror: \_\_\_\_\_ Solicitation # : \_\_\_\_\_  
 Solicitation Title: \_\_\_\_\_  
 Discipline: \_\_\_\_\_ (.1 GC, .2 HVAC, .3 Plumbing, or .4 Electrical)  
 Base Bid: \_\_\_\_\_ (identify the corresponding Base Bid for this SDB Participation Submittal)

**CHECK ONE, AND ONLY ONE, BOX. FAILURE TO COMPLY WILL RESULT IN**

*Click on bold titles to navigate to that specific page.*

**I agree to meet**  **I am requesting a partial**  **I am requesting a full**

**participation goal in full.**

I have completed and am submitting with my bid or proposal an **SDB Utilization Schedule (SDB-3)**, which is required in order to be considered for award.

**participation goal.**

After making good faith outreach efforts as more fully described in the **Guidance for Documenting Good Faith Efforts to Meet the SDB Participation Goal**, I am unable to achieve the total SDB participation goal for this solicitation and am requesting a partial waiver of the SDB participation goal.

I have completed and am submitting with my bid or proposal both of the following, which are required in order to be considered for award:

1. an **SDB Utilization Schedule (SDB-3)** for that portion of the SDB participation goal that I will meet; AND
2. a **Good Faith Efforts Waiver Request** for the portion of the SDB participation goals that I am unable to meet.

**participation goal**

After making good faith outreach efforts as more fully described in the **Guidance for Documenting Good Faith Efforts to Meet the SDB Participation Goal**, I am unable to achieve any part of the SDB participation goal for this solicitation and am requesting a full waiver of the SDB participation goal.

I have completed and am submitting with my bid or proposal a **Good Faith Efforts Waiver Request** for the complete SDB participation goal, which is required in order to be considered for award.

NOTE: SDB primes who are submitting as bidders or offerors must complete an **SDB Utilization Schedule (SDB-3)** identifying any self-performance towards the SDB participation goal.





# SDB Utilization Schedule – SDB-3

**CRITICAL**  
 ✓ Verify SDB/VBE validity

## SDB-3 SDB UTILIZATION SCHEDULE

Bidder/Offeror: \_\_\_\_\_

Solicitation # : \_\_\_\_\_ Solicitation Title: \_\_\_\_\_

List in the chart below SDBs (including where applicable a prime bidder or offeror is self-performing a portion of the work) that will be used to meet the SDB participation goal (add additional pages if necessary). Submit a **Letter of Commitment (SDB-3.1)** for each SDB subcontractor, supplier, or manufacturer (add additional Letters of Commitment as necessary).

SDB Name SAP Vendor Number (6-digit number provided by SDB) SDB Verification Number (located on DGS SDB verification)	Type of SDB (check all that apply)	Description of Work to be Performed (Statement of Work/Specification reference)	% Commitment (or % of work to be self-performed by SDB bidder/offeror)	Dollar Value of Commitment (after applying any calculation per SDB-1, Section IV, Calculating SDB participation)
Name: <u>ABC IT Solutions</u> SAP Vendor Number: <u>123456</u> SDB Verification Number: <u>123456-2023-09-SB-M</u>	<input checked="" type="checkbox"/> MBE	IT staffing resources	%	\$
Name: _____ SAP Vendor Number: _____ SDB Verification Number: _____	<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> LGBTBE <input type="checkbox"/> DOBE <input type="checkbox"/> SDVBE		%	
Name: _____ SAP Vendor Number: _____ SDB Verification Number: _____	<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> LGBTBE <input type="checkbox"/> DOBE <input type="checkbox"/> SDVBE		%	
Name: _____ SAP Vendor Number: _____ SDB Verification Number: _____	<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> LGBTBE <input type="checkbox"/> DOBE <input type="checkbox"/> SDVBE		%	
Name: _____ SAP Vendor Number: _____ SDB Verification Number: _____	<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> LGBTBE <input type="checkbox"/> DOBE <input type="checkbox"/> SDVBE		%	
Attach additional sheets if necessary			Total % SDB commitment: 0	Total \$ amount: \$ 0

Revised: May 5, 2023

SDB-3-1



# Letter of Commitment SDB-3.1

**CRITICAL**  
 ✓ Complete all shaded areas.

**SDB-3.1  
 LETTER OF COMMITMENT**

This Letter of Commitment serves as confirmation of the commitment by the prime Bidder or Offeror to utilize the Small Diverse Business (SDB) on the below-referenced Solicitation/Project.

Solicitation #: \_\_\_\_\_ Solicitation Name: \_\_\_\_\_

	Bidder/Offeror Information	SDB Information
Name		
Address		
Point of Contact		
Telephone #		
Email address		

Services/Supplies and Time Frame. If Bidder/Offeror is the successful vendor, the SDB shall perform or provide the following services or supplies during the term of the prime contract, as more specifically set forth below:

Services or supplies the SDB will provide:	
Specific Time Frame the SDB will provide the services or supplies:	

Dollar Value of Commitment. These service or supplies for contract/fee indicated in the table below shall be for the term of the contract.

COMMITMENT TABLE	Total Contract/Fee Commitment Value	Allowable Participation Percentage	Allowable Participation Value equals Dollar Value Commitment on SDB-3
	(c)	(d)	(c) x (d) = (e)
SDB Subcontractor - performs at least 50% of the value of the subcontract with its own forces		100%	
SDB Manufacturer - produces on premise material, supplies, articles or equipment required for contract.		100%	
SDB Stocking Suppliers - maintains materials on premises that are bought and stored and required for the contract.		60%	
SDB Non-stocking Supplier - Service Fee Only - Does not carry inventory.		100%	

SDB verified. By signing below, the SDB represents that it meets the SDB requirements set forth in the Solicitation and all required documentation has been provided to the Bidder/Offeror for its SDB submission.

Sincerely, \_\_\_\_\_ Acknowledged \_\_\_\_\_

Bidder/Offeror Point of Contact Printed name SDB Point of Contact Printed name

Bidder/Offeror Point of Contact Signature SDB Point of Contact Signature

*\* For purposes of monitoring compliance with SDB and VBE commitments, the work performed by a firm that is both an SDB and a VBE will be counted by BDISBO towards fulfilling both the SDB and VBE commitments unless otherwise agreed to by the parties in writing and approved by BDISBO and the Issuing Office.*

Revised: May 5, 2023

SDB-3-1

**SDB to expect a letter and SIGN it!**



# Guidance to Document GFE SDB-4

## READ, READ, READ

- The ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the Offeror of the responsibility to make Good Faith Efforts to meet the stated participation goal.
- Prime must complete all components of the GFE paperwork. Details/Evidence are important, proof is required.
- Carefully review SDB and VBE submittal Instructions, specifically Section VI of SDB/VBE-1 which lists pertinent items as Fatal errors.



# Good Faith Efforts Packet SDB-5

## Good Faith Efforts (GFE) Partial or Full Waiver

- Identified Items of Work Applicant Made Available to SDBs (Part 1)
- Identified SDBs and Record of Solicitations (Part 2)
- SDB Outreach Compliance Statement (Part 3)
- Additional Information Regarding Rejected SDB Quotes (Part 4)
- SDB Subcontractor Unavailability Certificate (Part 5)



# SDB GFE Documentation – SDB-5

## SDB-5

### GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF SDB PARTICIPATION GOAL

<b>Project Description:</b>	
<b>Commonwealth Agency Name:</b>	
<b>Solicitation #:</b>	
<b>Solicitation Due Date and Time:</b>	
<b>Bidder/Offeror Company Name:</b>	
<b>Bidder/Offeror Contact Name:</b>	
<b>Bidder/Offeror Contact Email:</b>	
<b>Bidder/Offeror Contact Phone Number:</b>	

Complete all five parts

#### Part 1 – Identified Items of Work Offeror Made Available to SDBs

Identify those items of work that the Offeror made available to SDBs. This includes, where appropriate, those items the Offeror identified and subdivided into economically feasible units to facilitate the SDB participation. For each item listed, show the anticipated percentage of the total contract amount. It is the Offeror's responsibility to demonstrate that enough work to meet the SDB participation goal was made available to SDBs, and the total percentage of the items of work identified for SDB participation met or exceeded the SDB participation goal set for the procurement.

Identified Items of Work	Was this work listed in the solicitation?	Does Offeror normally self-perform this work?	Was this work made available to SDB Firms? If not, explain why.
	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no



# GFE Waiver – Part 1

## Identify Items of Work Offeror Made Available to SDBs

**CRITICAL**  
 ✓ List all components of work offered for subcontracting.

Identify all items of work that the Offeror made available to SDBs. This includes, where appropriate, those items the Offeror identified as possible units to facilitate the SDB participation. For each item listed, show the anticipated percentage of the total work that enough work to meet the SDB participation goal was made available to SDBs, and the total percentage of SDB participation met or exceeded the SDB participation goal set for the procurement.

Work	Was this work listed in the solicitation?	Does Offeror normally self-perform this work?	Was this work made available to SDB Firms? If not, explain why.
	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no
	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no
	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no
	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no
	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no

Attach additional sheets if necessary.



# GFE Waiver – Part 2

## Identified SDBs and Record of Solicitations

**CRITICAL**  
 ✓ Specifics and Details are important

Offeror must provide quotes for the Identified Items of Work made available for SDB participation. Include the name of the SDB for which quotes were solicited, date and manner of initial and follow-up solicitations, whether the SDB provided a quote, and whether the SDB is being used toward meeting the SDB participation goal. SDBs used to meet the SDB participation goal must be listed on the Solicitation Schedule (SDB-2).

Copies of all written solicitations and documentation of follow-up calls to SDBs must be attached to this form. For each Identified SDB below, Offeror should submit an SDB Subcontractor Unavailability Certificate signed by the SDB or a statement from the Offeror that the SDB refused to sign the SDB Subcontractor Unavailability Certificate.

Name of Identified SDB and Classification	Describe Item of Work Solicited	Initial Solicitation Date & Method	Follow-up Solicitation Date & Method	Details for Follow-up Calls	Quote Received?	Quote Used?	Reason Quote Rejected
SDB Name:  <input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> LGBTBE <input type="checkbox"/> DOBE <input type="checkbox"/> SDVBE		Date:  <input type="checkbox"/> mail <input type="checkbox"/> email <input type="checkbox"/> fax	Date:  <input type="checkbox"/> mail <input type="checkbox"/> email <input type="checkbox"/> fax	Date and Time of Call:  Spoke with:  Left Message:	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> Used other SDB <input type="checkbox"/> Used non-SDB <input type="checkbox"/> Self performing
SDB Name:  <input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> LGBTBE <input type="checkbox"/> DOBE <input type="checkbox"/> SDVBE		Date:  <input type="checkbox"/> mail <input type="checkbox"/> email <input type="checkbox"/> fax	Date:  <input type="checkbox"/> mail <input type="checkbox"/> email <input type="checkbox"/> fax	Date and Time of Call:  Spoke with:  Left Message:	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> Used other SDB <input type="checkbox"/> Used non-SDB <input type="checkbox"/> Self performing

Attach additional sheets as necessary.



# GFE Waiver – Part 3

## SDB Outreach Compliance Statement

**CRITICAL**  
✓ Documentation for  
Part 1

1. List the Identified Items of Work for subcontracting opportunities for the solicitation along with specific work categories:

2. Attach to this form copies of written solicitations (with Bid or Proposal instructions) used to solicit Identified SDBs for these subcontract opportunities.

3. Offeror made the following attempts to contact the Identified SDBs:

4. Bonding Requirements (Please Check One):

This project does not involve bonding requirements.

Offeror assisted Identified SDBs to fulfill or seek waiver of bonding requirements.  
(DESCRIBE EFFORTS):

5. Pre-Bid/Proposal Conference or Supplier Forum (Please Check One):





# GFE Waiver – Part 4

## Additional Information Regarding Rejected SDB Quotes

**CRITICAL**  
 ✓ Documentation for  
 Part 2

Part 2 indicates that an SDB quote was rejected because the Offeror is using a non-SDB or is self-performing the work. For the Identified Items of Work, state whether the work will be self-performed or performed by a non-SDB, and if performed by a non-SDB, provide the name of the non-SDB firm. Also include the names of all SDBs and non-SDB firms that provided a quote and the amount of

Describe Identified Items of Work not being performed by SDBs (include specific section from bid or proposal)	Self-performing or using non-SDB (provide name of non-SDB if applicable)	Amount of non-SDB quote \$	Name of other firms that provided quotes and whether they are SDB	Amount quoted \$	Reason why SDB quote was rejected along with brief explanation
	<input type="checkbox"/> self-performing <input type="checkbox"/> using Non-SDB Name:		<input type="checkbox"/> SDB <input type="checkbox"/> Non-SDB Name:		<input type="checkbox"/> price <input type="checkbox"/> capabilities <input type="checkbox"/> other
	<input type="checkbox"/> self-performing <input type="checkbox"/> using Non-SDB Name:		<input type="checkbox"/> SDB <input type="checkbox"/> Non-SDB Name:		<input type="checkbox"/> price <input type="checkbox"/> capabilities <input type="checkbox"/> other
	<input type="checkbox"/> self-performing <input type="checkbox"/> using Non-SDB Name:		<input type="checkbox"/> SDB <input type="checkbox"/> Non-SDB Name:		<input type="checkbox"/> price <input type="checkbox"/> capabilities <input type="checkbox"/> other
	<input type="checkbox"/> self-performing <input type="checkbox"/> using Non-SDB Name:		<input type="checkbox"/> SDB <input type="checkbox"/> Non-SDB Name:		<input type="checkbox"/> price <input type="checkbox"/> capabilities



# GFE Waiver – Part 5

## Subcontractor Unavailability Certificate

**CRITICAL**  
✓ Required for each vendor listed in Part 1

\_\_\_\_\_ is hereby certified that the firm of \_\_\_\_\_  
(Name of SDB)

located at \_\_\_\_\_  
(Number) (Street)

\_\_\_\_\_  
(City) (State) (Zip)

was offered an opportunity to bid on Solicitation No. \_\_\_\_\_

by \_\_\_\_\_  
(Name of Prime Contractor's Firm)

\*\*\*\*\*

2. \_\_\_\_\_ (SDB), is either unavailable for the work/service or unable to prepare a Proposal for this project for the following reason(s):

\_\_\_\_\_

\_\_\_\_\_  
(Signature of SDB's Representative) (Title) (Date)



# SDB/VBE Response Submittal

## Electronic Bid Submission Disabled

Electronic bid submission has been disabled for this project. Hard copy bids must be submitted.



# Best Practices

## Do's

- Read the solicitation and all instructions completely.
- Submit SEPARATE SDB and VBE submittal forms.
- Validate subcontractor SDB/VBE status in DGS Supplier Database.
- Ensure that all appropriate forms are completed and signed correctly.
- Submit questions early per the solicitation requirements.

## Don'ts

- Make any assumptions.
- Copy SDB submittal paperwork. Download and complete the VBE submittal separately, titles and accuracy matter.
- Skip any portion of the GFE request documentation.
- Forget to verify subcontractor status as current SDB/VBE in DGS Supplier Database.




# Notes

- READ, READ, READ, solicitation instructions completely.
- Subcontractors identified in SDB-3, Utilization Schedule must be validated as of bid due date and time.
- Model Form SDB/VBE Subcontractor Agreement is provided for informational purposes only. To be completed by award winning vendor only.



# REMINDER



**Failure to submit  
fully completed SDB  
and VBE submittal  
packets or GFE  
waiver request  
documentation will  
result in removal of  
your bid for award  
consideration**



# Questions?



# BDISBO Contact Info

## **Bureau of Diversity, Inclusion and Small Business Opportunities**

North Office Building  
401 North Street, Room 611  
Harrisburg, PA 17120-0500  
717.783.3119

[GS-BDISBO@pa.gov](mailto:GS-BDISBO@pa.gov)





DATE: November 3, 2023

DEPARTMENT OF GENERAL SERVICES  
BUREAU OF CAPITAL PROJECT DESIGN MANAGEMENT  
1800 HERR STREET  
HARRISBURG, PENNSYLVANIA

**ADDENDUM NO. 3**

on

**PROJECT NO. DGS C-1576-0010 PHASE 001**  
**PROJECT TITLE - SCI Frackville - Electrical Upgrades**

**PROFESSIONAL:**

Greenman-Pedersen, Inc.  
52 Glenmaura National Blvd  
Scranton, PA, 18505

**If you submitted a bid prior to this Addendum being issued, your bid has been discarded and you must re-submit your bid(s) prior to the bid opening date and time.**

GENERAL CHANGES – ALL CONTRACTS

Item 1 - n/a

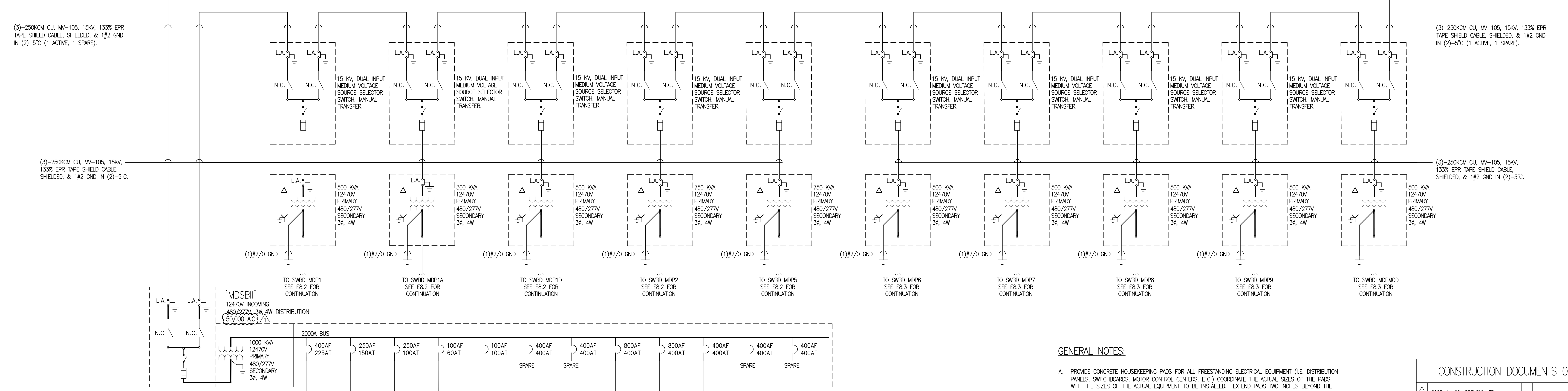
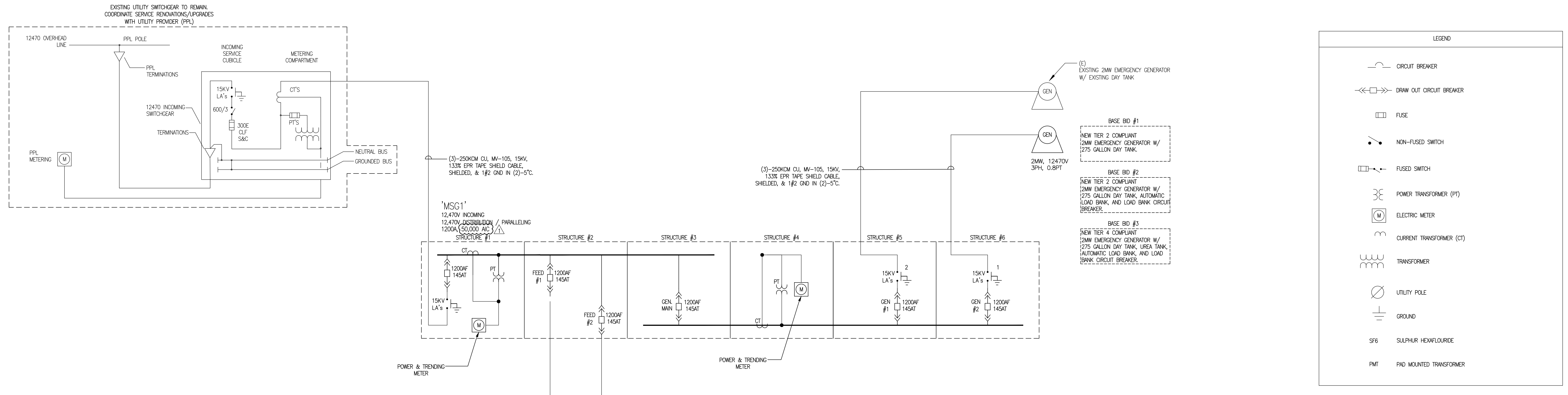
SPECIFICATION CHANGES – ALL CONTRACTS

Item 1 - n/a

DRAWING CHANGES – ALL CONTRACTS

Item 1 - Sheet E8.1 - NEW ONE-LINE DIAGRAM - Change AIC rating of main substation 'MSG1' to 50,000 AIC.

Item 2 - Sheet E8.1 - NEW ONE-LINE DIAGRAM - Change AIC rating of switchboard 'MDSBII' to 50,000 AIC.



- GENERAL NOTES:**
- PROVIDE CONCRETE HOUSEKEEPING PADS FOR ALL FREESTANDING ELECTRICAL EQUIPMENT (I.E. DISTRIBUTION PANELS, SWITCHBOARDS, MOTOR CONTROL CENTERS, ETC) COORDINATE THE ACTUAL SIZES OF THE PADS WITH THE SIZES OF THE ACTUAL EQUIPMENT TO BE INSTALLED. EXTEND PADS TWO INCHES BEYOND THE EQUIPMENT ON ALL SIDES, AND PROVIDE 3/4" CHAMFERED EDGES.
  - ALL SWITCHGEAR, SWITCHBOARDS, DISTRIBUTION PANELS AND BUSWAYS ARE TO BE 100% FULLY RATED.
  - FURNISH AND INSTALL GROUNDING AND BONDING CONDUCTORS TO INCOMING WATER SERVICE, STRUCTURAL METAL BUILDING FRAME, LIGHTNING PROTECTION SYSTEM, AND CONCRETE ENCASED ELECTRODE IN ACCORDANCE WITH NEC.
  - ANY FEEDER NOT SHOWN IN DETAIL MUST STILL BE PROVIDED BY CONTRACTOR. SIZE FEEDER AND CONDUIT TO MEET THE CURRENT NATIONAL ELECTRIC CODE.
  - PARALLELING SWITCHGEAR, GENERATOR, & PROTECTIVE RELAYING SHOP DRAWINGS MUST BE REVIEWED AND APPROVED BY THE LOCAL UTILITY.
  - A.I.C. RATING OF ALL EQUIPMENT (SWITCHGEAR, SWITCHBOARDS AND PANELBOARDS) ARE PRELIMINARY "MINIMUM" RATINGS AND SHALL BE FINALIZED WITH THE REQUIRED FAULT CURRENT & COORDINATION STUDIES AS OUTLINED IN SPECIFICATION SECTIONS 260572 & 260573. THESE STUDIES SHALL BE SUBMITTED BEFORE TO OR WITH THE SWITCHBOARD AND PANELBOARD SUBMITTALS. THE CONTRACTOR SHALL PROVIDE ALL LABOR REQUIRED TO GATHER INFORMATION FOR THE STUDIES. COORDINATE AVAILABLE FAULT CURRENT WITH LOCAL UTILITY.
- NOTES**
- SEE SHEET E-8.4 "TYPICAL LIGHTNING ARRESTER DIAGRAM" FOR FURTHER INFORMATION. TYPICAL FOR ALL.
  - SEE SHEET E-8.4 "PROTECTIVE RELAY DIAGRAM" FOR FURTHER INFORMATION.

CONSTRUCTION DOCUMENTS 09/15/2023	
2023-11-02 ADDENDUM #3	
RECORD REVISIONS	
SEAL	SEAL
SIGNATURE	DATE

**GREENMAN-PEDERSEN, INC**  
 62 GLENMAURA NATIONAL BOULEVARD  
 SCRANTON, PENNSYLVANIA 18505

**COMMONWEALTH OF PENNSYLVANIA**  
 DEPARTMENT OF GENERAL SERVICES  
 HARRISBURG, PENNSYLVANIA

D.G.S. PROJECT No. 1576-0010 PHASE 1

**VERIFY SCALE**  
 BAR IS ONE (1) INCH LONG ON ORIGINAL DRAWING:  
 0 1  
 IF BAR IS NOT ONE (1) INCH LONG, ADJUST SCALE ACCORDINGLY

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS. VARIANCE FROM CONTRACT DOCUMENTS NOT PERMITTED WITHOUT PROFESSIONAL & BUREAU OF CONSTRUCTION APPROVAL.

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS. VARIANCE FROM CONTRACT DOCUMENTS NOT PERMITTED WITHOUT PROFESSIONAL & BUREAU OF CONSTRUCTION APPROVAL.

DRAWN BY: S. SKORANSKI  
 CHECKED BY: J. MURPHY

DATE: 09/15/23  
 SCALE: AS NOTED

DRAWING No. E8.1

SCI FRACKVILLE  
 ELECTRICAL UPGRADES  
 DEPARTMENT OF CORRECTIONS  
 FRACKVILLE, SCHUYLKILL COUNTY, PA

NEW ONE-LINE DIAGRAMS

DATE: November 8, 2023

DEPARTMENT OF GENERAL SERVICES  
BUREAU OF CAPITAL PROJECT DESIGN MANAGEMENT  
1800 HERR STREET  
HARRISBURG, PENNSYLVANIA

**ADDENDUM NO. 4**

on

**PROJECT NO. DGS C-1576-0010 PHASE 001**  
**PROJECT TITLE - SCI Frackville - Electrical Upgrades**

**PROFESSIONAL:**

Greenman-Pedersen, Inc.  
52 Glenmaura National Blvd  
Scranton, PA, 18505

**If you submitted a bid prior to this Addendum being issued, your bid has been discarded and you must re-submit your bid(s) prior to the bid opening date and time.**

GENERAL CHANGES – ALL CONTRACTS

Item 1 - n/a

SPECIFICATION CHANGES – ALL CONTRACTS

Specification section 263213.13 - DIESEL-ENGINE-DRIVEN GENERATOR SETS has been modified. Section shall be replaced with attached section with changes noted below.

Item 1 - 263213.13 - DIESEL-ENGINE-DRIVEN GENERATOR SETS - 2.2D - Delete "UL Compliance: Comply with UL 2200."

Item 2 - 263213.13 - DIESEL-ENGINE-DRIVEN GENERATOR SETS - 2.4-H.4 -Replace battery requirements with the following "Battery: Calcium lead alloy (4)x12V 1500CCA, 210Amp Hr"

Item 3 - 263213.13 - DIESEL-ENGINE-DRIVEN GENERATOR SETS - 2.7B - Delete references to generator mounted circuit breakers.

Item 4 - 263213.13 - DIESEL-ENGINE-DRIVEN GENERATOR SETS - 2.9A.1 - Delete references to reactive load banks. Load bank shall be resistive only. Replace section with: " Permanent, outdoor, weatherproof, remote-controlled, forced-air-cooled, resistive unit capable of providing a balanced three-phase, delta-connected load to engine generator at 100 percent rated-system capacity, at 80 percent power factor, lagging. Unit shall be capable of selective control of load in 25 percent steps and with minimum step changes of approximately 5 and 10 percent available.

Item 5 - 263213.13 - DIESEL-ENGINE-DRIVEN GENERATOR SETS - 2.9C - Delete "Reactive Load Elements: Epoxy-encapsulated reactor coils."

DRAWING CHANGES – ALL CONTRACTS

Item 1 - n/a

## SECTION 263213.13 - DIESEL-ENGINE-DRIVEN GENERATOR SETS

### PART 1 - GENERAL

#### 1.1 STIPULATIONS

- A. The specifications sections " General Conditions of the Construction Contract ", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.SUMMARY
- B. Section Includes:
  - 1. Diesel engine.
  - 2. Diesel fuel-oil system.
  - 3. Control and monitoring.
  - 4. Generator overcurrent and fault protection.
  - 5. Generator, exciter, and voltage regulator.
  - 6. Load bank.
  - 7. Vibration isolation devices.
- C. Related Requirements:
  - 1. Section 261335 "Distribution Switchgear Medium Voltage 15kv" for controls and paralleling equipment for large or multiple parallel engine generators.
  - 2. Section 263343 "Battery Chargers" for remote engine battery chargers.

#### 1.2 DEFINITIONS

- A. EPS: Emergency power supply.
- B. EPSS: Emergency power supply system.
- C. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
  - 2. Include thermal damage curve for generator.
  - 3. Include time-current characteristic curves for generator protective device.
  - 4. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
  - 5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
  - 6. Include airflow requirements for cooling and combustion air in cubic feet per minute at 0.8

- power factor, with air-supply temperature of 95, 80, 70, and 50 deg F. Provide Drawings indicating requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.
  8. Include control diagrams and sequence of operations for paralleled generator controls. Controls shall be coordinated with Switchgear submittals.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for engine generators and functional relationship between all electrical components.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for engine generator, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight, skid-mounted load bank, and each piece of equipment not integral to the engine generator, and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Source Quality-Control Reports: Including, but not limited to, the following:

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
5. Report of sound generation.
6. Report of exhaust emissions showing compliance with applicable regulations.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

C. Field quality-control reports.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.
  - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
    - b. Operating instructions laminated and mounted adjacent to generator location.
    - c. Training plan.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
  - 2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
  - 3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
  - 4. Belts: One set of each type and size.
  - 5. Tools: Each tool listed by part number in operations and maintenance manual.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Testing Agency Qualifications: Accredited by NETA.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

## 1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 2 years from date of Substantial Completion.

## 1.9 Generator Controls

- A. All aspects related to generator control system (programming elements and password access) shall be open source to permit facilities team to gain access to controls and make adjustments as necessary. Proprietary systems are not permitted

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include the following:
  - 1. Caterpillar, Inc.; Electric Power Division.
- B. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Engine generator housing, day tank, engine generator, batteries, battery racks, silencers, load banks (as Base Bid #2 and 3), sound attenuating equipment, accessories, and components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
  - 2. Shake-table testing shall comply with ICC-ES AC156. Testing shall be performed with all fluids at worst-case normal levels. Water shall be substituted for diesel fuel in fuel tank during test.
  - 3. Component Importance Factor: 1.5.
- B. B11 Compliance: Comply with B11.19.
- C. NFPA Compliance:
  - 1. Comply with NFPA 37.
  - 2. Comply with NFPA 70.
  - 3. Comply with NFPA 99.
  - 4. Comply with NFPA 110 requirements for Level 1 EPSS.
- ~~D. UL Compliance: Comply with UL 2200.~~
- E.D. Engine Exhaust Emissions: Comply with EPA Tier 2 (Base Bid #3, Tier 4) requirements and applicable state and local government requirements.
- F.E. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
- G.F. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
  - 1. Ambient Temperature: 41 to 104 deg F
  - 2. Relative Humidity: Zero to 95 percent.

3. Altitude: Sea level to 1000 feet .

H.G. Unusual Service Conditions: Engine generator equipment and installation are required to operate under the following conditions:

1. High salt-dust content in the air due to sea-spray evaporation.

## 2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Power Rating: Prime Industrial Standby.

D. Overload Capacity: 110 percent of service load for 1 hour in 12 consecutive hours.

E. EPSS Class: Engine generator shall be classified as a Class

F. Service Load: 2500 kVA/2000kW.

G. Power Factor: 0.8, lagging.

H. Frequency: 60 Hz.

I. Voltage: 12470-V ac.

J. Phase: Three-phase, three wire, wye delta.

K. Induction Method: Naturally aspirated Turbocharged.

L. Governor: Adjustable isochronous, with speed sensing.

M. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and engine generator center of gravity.

N. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries, with capacity as required to operate as a unit as evidenced by records of prototype testing.

2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

O. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no



- load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
  3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
  4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
  5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
  6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
  7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
  8. Start Time:
    - a. Comply with NFPA 110, Type 10 system requirements.
    - b. 10 seconds.

P. Engine Generator Performance for Sensitive Loads:

1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.
  - a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.
2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
8. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.

- a. Provide permanent magnet excitation for power source to voltage regulator.
- 10. Start Time:
  - a. Comply with NFPA 110, Type 10 system requirements.
  - b. 10 seconds.
- Q. Parallel Engine Generators:
  1. Automatic reactive output power control and load sharing between engine generators operated in parallel.
  2. Automatic regulation, automatic connection to a common bus, and automatic synchronization, with manual controls and instruments to monitor and control paralleling functions.
  3. Protective relays required for equipment and personnel safety.
  4. Paralleling suppressors to protect excitation systems.
  5. Reverse power protection.
  6. Loss of field protection.

## 2.4 DIESEL ENGINE

- A. Fuel: ASTM D975, diesel fuel oil, Grade 2-D S15.
- B. Rated Engine Speed: 1800 rpm.
- C. Lubrication System: Engine or skid-mounted.
  1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
  2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
  3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499 and with NFPA 110 requirements for Level 1 equipment for heater capacity.
- E. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator set mounting frame and integral engine-driven coolant pump.
  1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
  2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
  3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
  4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
  5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.

- a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and non-collapsible under vacuum.
  - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- F. Muffler/Silencer:
- 1. Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
    - a. Minimum sound attenuation of 25 dB at 500 Hz.
    - b. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be 78 number dBA or less.
- G. Air-Intake Filter: Standard Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- H. Starting System: 24-V electric, with negative ground.
- 1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
  - 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
  - 3. Cranking Cycle: As required by NFPA 110 for system level specified 60 seconds.
  - ~~4. Battery: Lead acid Nickel cadmium, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least twice three times without recharging. Calcium lead alloy (4)x12V 1500CCA, 210Amp Hr.~~
  - 4. Coordinate "Battery Cable" Subparagraph below with Drawings.
  - 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
  - 6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
  - 7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
  - 8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
  - 9. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for lead-acid nickel-cadmium batteries. Unit shall comply with UL 1236 and include the following features:
    - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 to 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.
    - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    - d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.

- e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
- f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

## 2.5 DIESEL FUEL-OIL SYSTEM

- A. Comply with NFPA 37.
- B. Piping: Fuel-oil piping shall be Schedule 40 black steel, complying with requirements in Section 231113 "Facility Fuel-Oil Piping." Cast iron, aluminum, copper, and galvanized steel shall not be used in the fuel-oil system.
- C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.
- D. Fuel Filtering: Remove water and contaminants larger than 1 micron.
- E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
- F. Day Tank: Comply with UL 142, freestanding, factory-fabricated fuel tank assembly, with integral, float-controlled transfer pumps and the following features:
  - 1. Containment: Integral rupture basin with a capacity of 150 percent of nominal capacity of day tank.
    - a. Leak Detector: Locate in rupture basin and connect to provide audible and visual alarm in the event of day-tank leak.
  - 2. Tank Capacity: 275 gallons
  - 3. Pumps:
    - a. Provide pump package for fuel supply and return to main tank.
    - b. Pump Capacity: Exceeds maximum flow of fuel drawn by engine-mounted fuel supply pump at 110 percent of rated capacity, including fuel returned from engine.
  - 4. Low-Level Alarm Sensor: Liquid-level device operates alarm contacts at 25 percent of normal fuel level.
  - 5. High-Level Alarm Sensor: Liquid-level device operates alarm and redundant fuel shutoff contacts at midpoint between overflow level and 100 percent of normal fuel level.
  - 6. Piping Connections: Factory-installed fuel supply and return lines from tank to engine; local fuel fill, vent line, overflow line; and tank drain line with shutoff valve.
  - 7. Redundant High-Level Fuel Shutoff: Actuated by high-level alarm sensor in day tank to operate a separate motor-control device that disconnects day-tank pump motor. Sensor shall signal solenoid valve, located in fuel suction line between fuel storage tank and day tank, to close. Both actions shall remain in shutoff state until manually reset. Shutoff action shall initiate an alarm signal to control panel but shall not shut down engine generator.
  - 8. Tank shall be provided and installed by a qualified Tank Installer approved by PA DEP.

## 2.6 CONTROL AND MONITORING

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts engine generator. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- C. Provide minimum run time control set for 10 minutes with override only by operation of a remote emergency-stop switch.
- D. Comply with UL 508A.
- E. Configuration:
  - 1. Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel shall be powered from the engine generator battery.
- F. Control and Monitoring Panel:
  - 1. Digital engine generator controller with integrated LCD display, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
  - 2. Analog control panel with dedicated gages and indicator lights for the instruments and alarms indicated below.
  - 3. Instruments: Located on the control and monitoring panel and viewable during operation.
    - a. Engine lubricating-oil pressure gage.
    - b. Engine-coolant temperature gage.
    - c. DC voltmeter (alternator battery charging).
    - d. Running-time meter.
    - e. AC voltmeter, for each phase connected to a phase selector switch.
    - f. AC ammeter, for each phase connected to a phase selector switch.
    - g. AC frequency meter.
    - h. Generator-voltage adjusting rheostat.
  - 4. Controls and Protective Devices: Controls, shutdown devices, and common alarm indication, including the following:
    - a. Cranking control equipment.
    - b. Run-Off-Auto switch.
    - c. Control switch not in automatic position alarm.
    - d. Overcrank alarm.
    - e. Overcrank shutdown device.
    - f. Low-water temperature alarm.
    - g. High engine temperature prealarm.

- h. High engine temperature.
- i. High engine temperature shutdown device.
- j. Overspeed alarm.
- k. Overspeed shutdown device.
- l. Low fuel main tank.

- 1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for duration required [for the indicated EPSS class] [in "Fuel Tank Capacity" Subparagraph in "Diesel Fuel-Oil System" Article].

- m. Coolant low-level alarm.
- n. Coolant low-level shutdown device.
- o. Coolant high-temperature prealarm.
- p. Coolant high-temperature alarm.
- q. Coolant low-temperature alarm.
- r. Coolant high-temperature shutdown device.
- s. EPS load indicator.
- t. Battery high-voltage alarm.
- u. Low cranking voltage alarm.
- v. Battery-charger malfunction alarm.
- w. Battery low-voltage alarm.
- x. Lamp test.
- y. Contacts for local and remote common alarm.
- z. Low-starting air pressure alarm.
- aa. Low-starting hydraulic pressure alarm.
- bb. Remote manual stop shutdown device.
- cc. Air shutdown damper alarm when used.
- dd. Air shutdown damper shutdown device when used.
- ee. Generator overcurrent-protective-device not-closed alarm.
- ff. Hours of operation.
- gg. Engine generator metering, including voltage, current, hertz, kilowatt, kilovolt ampere, and power factor.

G. Engine Generator Metering: Comply with Section 260913 "Electrical Power Monitoring and Control." Section 262713 "Electricity Metering." Section 260913 "Electrical Power Monitoring and Control" and Section 262713 "Electricity Metering."

H. Connection to Datalink:

- 1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.
- 2. Provide connections for datalink transmission of indications to remote data terminals via ModBus or Ethernet.

I. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.

J. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

- 1. Overcrank alarm.

2. Low water-temperature alarm.
3. High engine temperature pre-alarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel main tank alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Contacts for local and remote common alarm.
11. Audible-alarm silencing switch.
12. Air shutdown damper when used.
13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Lamp test.
18. Low-cranking voltage alarm.
19. Generator overcurrent-protective-device not-closed alarm.

- K. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator unless otherwise indicated.
- L. Remote Emergency-Stop Switch: Flush; wall mounted unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

## 2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.
1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
  2. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

### ~~B. Generator Overcurrent Protective Device:~~

- ~~1. Molded-case circuit breaker, thermal-magnetic type; 100 percent rated; complying with UL 489:
 
  - ~~a. Tripping Characteristic: Designed specifically for generator protection.~~
  - ~~b. Trip Rating: Matched to generator output rating.~~
  - ~~c. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.~~
  - ~~d. Mounting: Adjacent to, or integrated with, control and monitoring panel.~~~~
- ~~2. Molded-case type disconnect switch; 100 percent rated:
 
  - ~~a. Trip Rating: Matched to generator output rating.~~
  - ~~b. Shunt Trip: Connected to trip switch when signaled by generator protector or by other protective devices.~~~~

**C.B.** Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other engine generator protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other engine generator malfunction alarms. Contacts shall be available for load shed functions.
2. Under single- or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

**D.C.** Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.

1. Indicate ground fault with other engine generator alarm indications.
2. Trip generator protective device on ground fault.

## 2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class F.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six 12-lead alternator.
- E. Range: Provide limited broad extended range of output voltage by adjusting the excitation level.
- F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- G. Enclosure: Drip proof.
- H. Instrument Transformers: Mounted within generator enclosure.
- I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.
  1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
  2. Maintain voltage within 20 percent on one step, full load.
  3. Provide anti-hunt provision to stabilize voltage.
  4. Maintain frequency within 10 percent and stabilize at rated frequency within 2 5



seconds.

- J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
- K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- L. Sub-transient Reactance: 12 percent, maximum.

## 2.9 LOAD BANK (Base Bid #2 and 3)

### A. Description:

1. Permanent, outdoor, weatherproof, remote-controlled, forced-air-cooled, resistive ~~and reactive~~ unit capable of providing a balanced three-phase, delta-connected load to engine generator at 100 percent rated-system capacity, at 80 percent power factor, lagging. ~~Unit may contain separate resistive and reactive load banks controlled by a common control panel.~~ Unit shall be capable of selective control of load in 25 percent steps and with minimum step changes of approximately 5 and 10 percent available.

- B. Resistive Load Elements: Corrosion-resistant chromium alloy with ceramic and stainless-steel supports. Elements shall be double insulated and designed for repetitive on-off cycling. Elements shall be mounted in removable aluminized-steel heater cases. Galvanized steel is prohibited. Element's maximum resistance shall be between 100 and 105 percent of rated resistance.

### ~~C. Reactive Load Elements: Epoxy-encapsulated reactor coils.~~

- ~~D.C.~~ Load-Bank Heat Dissipation: Integral fan with totally enclosed motor shall provide uniform cooling airflow through load elements. Airflow and coil operating current shall be such that, at maximum load, with ambient temperature at the upper end of specified range, load-bank elements operate at not more than 50 percent of maximum continuous temperature rating of resistance elements.

- ~~E.D.~~ Load-Element Switching: Remote-controlled contactors switch groups of load elements. Contactor coils are rated 120 V. Contactors shall be located in a separate NEMA 250, Type 3R enclosure within load-bank enclosure, accessible from exterior through hinged doors with tumbler locks.

- ~~F.E.~~ Contactor Enclosures: Heated by thermostatically controlled strip heaters to prevent condensation.

- ~~G.F.~~ Load-Bank Enclosures: NEMA 250, Type 3R, aluminized steel complying with NEMA ICS 6. Louvers at cooling-air intake and discharge openings shall prevent entry of rain and snow. Openings for airflow shall be screened with 1/2-inch- square, galvanized-steel mesh. Reactive load bank shall include automatic shutters at air intake and discharge. Components other than resistive elements shall receive exterior epoxy coating with compatible primer. Comply with requirements in Section 099600 "High-Performance Coatings."

- ~~H.G.~~ Protective Devices: Power input circuits to load banks shall be fused, and fuses shall be selected to coordinate with generator circuit breaker. Fuse blocks shall be located in contactor enclosure. Cooling airflow and overtemperature sensors shall automatically shut down and lock out load bank until manually reset. Safety interlocks on access panels and doors shall disconnect load power, control, and heater circuits. Fan motor shall be separately protected by

overload and short-circuit devices. Short-circuit devices shall be noninterchangeable fuses with 200,000-A interrupting capacity.

- ⚡. Load-Bank Remote-Control Panel: Separate from load bank in NEMA 250, Type 1 enclosure with a control power switch and pilot light, and switches controlling groups of load elements.
- ⚡. Control Sequence: Control panel may be preset for adjustable single-step loading of generator during automatic exercising.

## 2.10 VIBRATION ISOLATION DEVICES

- A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
  - 1. Material: Standard neoprene Natural rubber Bridge-bearing neoprene, complying with AASHTO M 251 separated by steel shims.
  - 2. Shore A Scale Durometer Rating: 50.
  - 3. Number of Layers: Three.
  - 4. Minimum Deflection: 1 inch.
- B. 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.
  - 6. Minimum Deflection: 1 inch.
- C. Comply with requirements in Section 232116 "Hydronic Piping Specialties" for vibration isolation and flexible connector materials for steel piping.
- D. Comply with requirements in Section 233113 "Metal Ducts" for vibration isolation and flexible connector materials for exhaust shroud and ductwork.
- E. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

## 2.11 FINISHES

- A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

## 2.12 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine generator using same engine model, constructed of

identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with IEEE 115 and with NFPA 110, Level 1 Energy Converters.
- B. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
  2. Test generator, exciter, and voltage regulator as a unit.
  3. Full load run.
  4. Maximum power.
  5. Voltage regulation.
  6. Transient and steady-state governing.
  7. Single-step load pickup.
  8. Safety shutdown.
  9. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
  10. Report factory test results within 10 days of completion of test.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.
- B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
  1. Notify Architect/Engineer, DGS Construction Manager, and Owner no fewer than 21 working days in advance of proposed interruption of electrical service.
  2. Do not proceed with interruption of electrical service without Owner's written permission.

#### 3.3 INSTALLATION

- A. Comply with NECA 1 and NECA 404.
- B. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.

- C. Equipment Mounting:
1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
  2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
  3. Install packaged engine generator with elastomeric isolator pads restrained spring isolators having a minimum deflection of 1 inch static deflection on 4-inch- high concrete base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- E. Cooling System: Install Schedule 40 black steel piping with welded joints for cooling water piping between engine generator.
1. Install isolating thimbles where exhaust piping penetrates combustible surfaces. Provide a minimum of 9 inches of clearance from combustibles.
  2. Insulate cooling-system piping and components as per manufacturer instructions.
- F. Exhaust System: Install Schedule 40 black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.
1. Piping materials and installation requirements are specified in Section 232113 "Hydronic Piping."
  2. Install flexible connectors and steel piping materials according to requirements in Section 232116 "Hydronic Piping Specialties."
  3. Insulate muffler/silencer and exhaust system components according to requirements in Section 230719 "HVAC Piping Insulation."
  4. Install isolating thimbles where exhaust piping penetrates combustible surfaces with a minimum of 9 inches of clearance from combustibles.
- G. Drain Piping: Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40 black steel pipe with welded joints.
1. Piping materials and installation requirements are specified in Section 232113 "Hydronic Piping."
  2. Drain piping valves, connectors, and installation requirements are specified in Section 232116 "Hydronic Piping Specialties."
- H. Fuel Piping:
1. Diesel storage tanks, tank accessories, piping, valves, and specialties for fuel systems are specified in Section 231113 "Facility Fuel-Oil Piping."
  2. Copper and galvanized steel shall not be used in the fuel-oil piping system.
- I. Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

### 3.4 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.
- B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow space for service and maintenance.
- C. Connect cooling-system water piping to engine generator and heat exchanger with flexible connectors.
- D. Connect engine exhaust pipe to engine with flexible connector.
- E. Connect fuel piping to engines with a gate valve and union and flexible connector.
- F. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- G. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.
- H. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

### 3.5 IDENTIFICATION

- A. Identify system components according to Section 230553 "Identification for HVAC Piping and Equipment" and Section 260553 "Identification for Electrical Systems."
- B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency:
  - 1. Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
  - 1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below, as specified in NETA ATS. Certify compliance with test parameters.
    - a. Visual and Mechanical Inspection:
      - 1) Compare equipment nameplate data with Drawings and the Specifications.
      - 2) Inspect physical and mechanical condition.
      - 3) Inspect anchorage, alignment, and grounding.
      - 4) Verify that the unit is clean.
    - b. Electrical and Mechanical Tests:

- 1) Perform insulation-resistance tests according to IEEE 43.
    - a) Machines Larger Than 200 hp: Test duration shall be 10 minutes. Calculate polarization index.
    - b) Machines 200 hp or Less: Test duration shall be one minute. Calculate the dielectric-absorption ratio.
  - 2) Test protective relay devices.
  - 3) Verify phase rotation, phasing, and synchronized operation as required by the application.
  - 4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
  - 5) Perform vibration test for each main bearing cap.
  - 6) Verify correct functioning of the governor and regulator.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
  3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
    - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
    - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
    - c. Verify acceptance of charge for each element of the battery after discharge.
    - d. Verify that measurements are within manufacturer's specifications.
  4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
  5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
  6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
  7. Exhaust Emissions Test: Comply with applicable government test criteria.
  8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
  9. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 and 100 percent of rated linear load. Verify that harmonic content is within specified limits.
  10. Noise Level Tests: Measure A-weighted level of noise emanating from engine generator installation, including engine exhaust and cooling-air intake and discharge, at four locations.
- C. Coordinate tests with tests for transfer switches and run them concurrently.
- D. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.
- E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

- F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
- G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- H. Remove and replace malfunctioning units and retest as specified above.
- I. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.
- J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- K. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels so terminations and connections are accessible to portable scanner.
  - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
  - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - 3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.7 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's authorized service representative. Include quarterly preventive maintenance and exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Parts shall be manufacturer's authorized replacement parts and supplies.

### 3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.
- B. All on-site training shall be digitally recorded by the Contractor. The digital video files are to be turned over to the Client Agency.

END OF SECTION

DATE: December 11, 2023

DEPARTMENT OF GENERAL SERVICES  
BUREAU OF CAPITAL PROJECT DESIGN MANAGEMENT  
1800 HERR STREET  
HARRISBURG, PENNSYLVANIA

**ADDENDUM NO. 7**

on

**PROJECT NO. DGS C-1576-0010 PHASE 001**  
**PROJECT TITLE - SCI Frackville - Electrical Upgrades**  
**PROFESSIONAL:**

Greenman-Pedersen, Inc.  
52 Glenmaura National Blvd  
Scranton, PA, 18505

**If you submitted a bid prior to this Addendum being issued, your bid has been discarded and you must re-submit your bid(s) prior to the bid opening date and time.**

**ADMINISTRATIVE CHANGES – ALL CONTRACTS**

Item 1 – Bidders are reminded the contract duration is 847 days. See specification 013100-1.5A, for additional details regarding the Sequencing of Construction.

**GENERAL CHANGES – ALL CONTRACTS**

Item 1 - Phase 1.1 General. There will be an opportunity for bidders to include any additional ancillary work related to the BB2 and BB3 due to work by Phase 1.2 HVAC and Phase 1.4 Electrical under their BB2 and BB3. If the work by 1.2 and 1.4 contractors has \$0 impact on Phase 1.1 General, the costs will be the same for BB2 and BB3. Please keep in mind each base bid is additive to the previous base bid. So BB2= BB1 plus any additional work for BB2., same for BB3.

Item 2 - Reference specification section 010100, all architectural drawings, and structural drawings for Phase 1.1 work associated with Utility Building 11 Addition.

Item 3 - Reference drawing M1.0 for Louver location and drawing M2.0 for Louver Detail & Schedule.

Item 4 - Core drilling required for the installation of electrical systems shall be completed by the Phase 1.4 Contractor as a means and methods of installation.

Item 5 - Reference Drawing Note #1 on M1.0 for information on steel structure for CEM module and dosing cabinet.

Item 6- Reference Drawing S4.1 and Drawing Note 2 on M1.0 for fuel sump pit information.

Item 7- Reference General Notes and Drawings notes on M1.0 for information on generator exhaust stack venting requirements and scope of work.



Item 8- Reference specification Section 014000 Quality Assurance Testing for testing and third party testing requirements.

#### SPECIFICATION CHANGES – ALL CONTRACTS

Item 1 - Page 010100: Revised specification as noted below. See attachments for complete spec section.

1.4.A The Construction Contract duration shall be 847 calendar days commencing on the date of the Initial Job Conference.

1.5B. General Construction (.1) Contract:

1. Demolition and new construction associated with Utility Building 11 Addition.
2. Removal and reinstallation of existing ceiling systems.
3. Partitions, doors,
4. New ceiling systems.
5. Soffits.
6. Painting.
7. Fencing and concrete pads.

1.6B General Construction (.1) Contract: Divisions 01, 02, 03, 05, 07, 08, 09, and Divisions 31, 32 and applicable Sections of Division 33

1.6C HVAC Construction (.2) Contract: Divisions 01, 22, 23, and applicable Sections of Divisions 02, 03, 05, 07, and 09.

1.6D. Electrical Construction (.4) Contract: Divisions 01, 02, 03, 05, 07, 08, 09, 26, 28 and applicable Sections of 31 and 32.

#### DRAWING CHANGES – ALL CONTRACTS

Item 1 - Sheet A2.1: Revised Keyed Notes. See attached drawing.

Item 2- Sheet A2.3: Added ceiling detail to sheet. See attached drawing.

## SECTION 010100 - SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.1 STIPULATIONS

- A. The specifications sections "General Conditions of the Construction Contract", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

#### 1.2 PROJECT LOCATION

- A. 1111 Altamont Blvd, Frackville, PA 17931

#### 1.3 PROJECT DESCRIPTION

- A. Provide 15KV switchgear to replace existing equipment in Utility Building 11. Provide new 15KV medium voltage campus loop via underground ductbank to new source selector switches and pad mounted transformers for each building as shown on the plans. Project also includes installation of a new 2MW emergency generator configured for n+1 redundancy with the existing 2MW emergency generator

#### 1.4 CONTRACT DURATION

- A. The Construction Contract duration shall be 847 calendar days commencing on the date of the Initial Job Conference.

#### 1.5 WORK INCLUDED

- A. The Work of this Project consists of, but is not necessarily limited to, the following. Detailed requirements of the Work are described in the pertinent specification Sections and/or shown on the Drawings.
- B. General Construction (.1) Contract:
  - 1. Demolition and new construction associated with Utility Building 11 Addition.
  - 2. Removal and reinstallation of existing ceiling systems.
  - 3. Partitions, doors,
  - 4. New ceiling systems.
  - 5. Soffits.
  - 6. Painting.
  - 7. Fencing and concrete pads.
- C. HVAC Construction (.2) Contract:
  - 1. Removal of existing mechanical systems.
  - 2. New mechanical equipment.
  - 3. Hot water piping.

4. Steam piping.
5. Ductwork and diffusers.
6. HVAC controls.

D. Electrical Construction (.4) Contract (Lead Contractor):

1. Installation of medium voltage loop, switches, and pad mounted transformers to re-feed all buildings across the institution.
2. Installation of underground ductbanks and manholes for routing medium voltage loop.
3. Installation of new distribution panels and feeders to re-feed existing panelboards.
4. Installation of medium voltage paralleling switchgear in Utility Building 11.
5. Installation of new medium voltage emergency generator.
6. Installation of new electrical devices and lighting for Utility Building 11 addition.
7. Demolition of existing switchgear in Utility Building.
8. Demolition of existing feeders from ductbanks no longer in use.

E. Earthwork and Concrete: Each Prime Contractor shall be responsible for providing all trenching, excavation, filling, backfilling, and concrete work required by their respective contract work, and shall comply with the requirements of the applicable specification sections of Division 3 and Division 31 for same.

## 1.6 SPECIFICATION FORMAT

- A. The Specifications for the work of the separate prime Contracts are bound in one volume. Technical provisions which apply to each prime Contract are included in the Divisions listed below:
- B. General Construction (.1) Contract: Divisions 01, 02, 03, 05, 07, 08, 09, and Divisions 31, 32 and applicable Sections of Division 33
- C. HVAC Construction (.2) Contract: Divisions 01, 22, 23, and applicable Sections of Divisions 02, 03, 05, 07, and 09.
- D. Electrical Construction (.4) Contract: Divisions 01, 02, 03, 05, 07, 08, 09, 26, 28 and applicable Sections of 31 and 32.
- E. Earthwork and Concrete: Each Prime Contractor shall be responsible for providing all trenching, excavation, filling, backfilling, and concrete work required by their respective contract work, and shall comply with the requirements of the applicable specification sections of Division 3 and Division 31 for same.
- F. When one (1) Prime Contractor is required to perform items of work that are normally included under a different Prime Contract, those items of work shall be performed in strict accordance with the appropriate specification sections of that other Division. The specifications shall be written in such a manner as to refer the Contractor to the appropriate sections, rather than including duplicate specifications. For example, if incidental electrical wiring is required of the General Contractor, do not include electrical specifications in the General Contractors sections, but rather the General Contractor's specifications shall be written to indicate that the work should be performed in accordance with appropriate sections of Division 26, 27, and/or 28. Deviations from this instruction must be discussed with the DPM.

1.7 E-BUILDER CONSTRUCTION MANAGEMENT SOFTWARE

- A. The electronic document repository to improve productivity and efficiency, and to streamline the process of construction management during all phases of design, procurement, award and contract administration. The Department and all Prime Contractors will utilize the e-Builder Enterprise Software Program (e-Builder) for all Work and administrative duties provided under this Contract. Any and all notifications, request, submittals, approvals, etc. tween the Department, The Prime Contractors, the Professional, and/or the Construction Manager (if a CM is assigned to the Project) shall be through the e-Builder system.

1.8 QUESTIONS DURING BIDDING PERIOD

- A. Direct all questions pertaining to the Project to the Project Professional utilizing the e-Builder Enterprise Software Program (e-Builder) as described in the Instructions To Bidders.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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DEPARTMENT OF GENERAL SERVICES  
BUREAU PRE-CONSTRUCTION  
1800 HERR STREET  
HARRISBURG, PENNSYLVANIA

**ADDENDUM NO. 7**

on

**PROJECT NO. DGS C-1576-0010 PHASE 1**  
**PROJECT TITLE – SCI Frackville – Electrical Upgrades**  
**LOCATION – Frackville, PA**  
**Greenman Pedersen Inc, Scranton, PA 18505**

**ADMINISTRATIVE CHANGES – ALL CONTRACTS**

Item 1 – Bidders are reminded the contract duration is 847 days. See specification 013100-1.5A, for additional details regarding the Sequencing of Construction.

**GENERAL CHANGES – ALL CONTRACTS**

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- Item 2 - Reference specification section 010100, all architectural drawings, and structural drawings for Phase 1.1 work associated with Utility Building 11 Addition.
- Item 3 - Reference drawing M1.0 for Louver location and drawing M2.0 for Louver Detail & Schedule.
- Item 4 - Core drilling required for the installation of electrical systems shall be completed by the Phase 1.4 Contractor as a means and methods of installation.
- Item 5 - Reference Drawing Note #1 on M1.0 for information on steel structure for CEM module and dosing cabinet.
- Item 6- Reference Drawing S4.1 and Drawing Note 2 on M1.0 for fuel sump pit information.
- Item 7- Reference General Notes and Drawings notes on M1.0 for information on generator exhaust stack venting requirements and scope of work.
- Item 8- Reference specification Section 014000 Quality Assurance Testing for testing and third party testing requirements.

**SPECIFICATION CHANGES – ALL CONTRACTS**

Item 1 - Page 010100: Revised specification as noted below. See attachment for complete spec section.

1.4.A The Construction Contract duration shall be 847 calendar days commencing on the date of the Initial Job Conference.

1.5B. General Construction (.1) Contract:



1. Demolition and new construction associated with Utility Building 11 Addition.
2. Removal and reinstallation of existing ceiling systems.
3. Partitions, doors,
4. New ceiling systems.
5. Soffits.
6. Painting.
7. Fencing and concrete pads.

1.6B General Construction (.1) Contract: Divisions 01, 02, 03, 05, 07, 08, 09, and Divisions 31, 32 and applicable Sections of Division 33

1.6C HVAC Construction (.2) Contract: Divisions 01, 22, 23, and applicable Sections of Divisions 02, 03, 05, 07, and 09.

1.6D. Electrical Construction (.4) Contract: Divisions 01, 02, 03, 05, 07, 08, 09, 26, 28 and applicable Sections of 31 and 32.

#### DRAWING CHANGES – ALL CONTRACTS

- Item 1 - Sheet A2.1: Revised Keyed Notes. See attached drawing.  
Item 2- Sheet A2.3: Added ceiling detail to sheet. See attached drawing.

## SECTION 010300 - BASE BID DESCRIPTIONS

### PART 1 - GENERAL

#### 1.1 STIPULATIONS

- A. The specifications sections "General Conditions of the Construction Contract", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

#### 1.2 SECTION INCLUDES

- A. This Section includes identification of each Base Bid and description of the changes to be associated with each Base Bid.

#### 1.3 DESCRIPTION OF SEPARATE BASE BIDS

##### A. ELECTRICAL CONSTRUCTION CONTRACT (DGS C-1578-0010 PHASE 1.4)

###### 1. Base Bid No. 1:

- a. Shall include all the work indicated on the contract drawings except that work specifically being called out under another base bid including:

- 1) Tier 2 rated emergency generator.

###### 2. Base Bid No. 2:

- a. Same as Base Bid no. 1 except add:

- 1) Tier 2 rated emergency generator.
- 2) Provide 80% rated automatic load bank, **additional switchgear** circuit breaker, controls, and feeders.
- 3) **Provide all required accessory items necessary for the additional equipment including but not limited to equipment pads, switches, junction boxes, mounting hardware, supports and isolation pads, etc.**

###### 3. Base Bid No. 3:

- a. Same as Base Bid no. 2 except add:

- 1) Tier 4 compliant emergency generator.
- 2) Provide 80% rated automatic load bank, **additional switchgear** circuit breaker, controls and feeders.
- 3) Provide all required emissions modules and urea tanks required to meet Tier 4 compliant installation
- 4) **Provide all required accessory items necessary for the additional equipment including but not limited to equipment pads, switches,**

***junction boxes, mufflers, exhaust stacks, mounting hardware,  
supporting steel, supports and isolation pads, etc.***

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 010300

## SECTION 010400 - COORDINATION AND CONTROL

### PART 1 - GENERAL

#### 1.1 STIPULATIONS

- A. The specifications sections " General Conditions of the Construction Contract ", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

#### 1.2 SECTION INCLUDES

- A. This section includes the on-site provisions that govern the performance of the work to complete this Project.

#### 1.3 CONTRACTS - FOR THIS PROJECT CONSTRUCTION

- A. DGS C-1578-0010 PHASE 0001.1 General Construction
- B. DGS C-1578-0010 PHASE 0001.2 HVAC Construction
- C. DGS C-1578-0010 PHASE 0001.4 Electrical Construction (Lead Contractor)

#### 1.4 VISIT TO SITE

- A. Access to the facility during the bidding period will be restricted to a tour associated with the Pre-Bid Conference or other scheduled events.
- B. Security Clearance Check: The Department of Corrections requires that all attending the Pre-Bid Conference receive a Security Clearance Check in advance. See Specification Section 016100, Article 1.13, Paragraph A, for the requirements. The pre-proposal conference will be the only opportunity to visit the site. Submit the required information at least ten (10) working days in advance of the Pre-Bid Conference to:
  - 1. Client Agency Site Representative: Shawn Kane DOC
  - 2. Telephone Number: (570) 874-4516 ext 2249, email: shakane@pa.gov

#### 1.5 UNIDENTIFIED HAZARDOUS MATERIALS (ASBESTOS, CHEMICALS, ETC.)

- A. There is a possibility that hazardous materials not identified in the contract documents may be discovered on this project. Should it be determined that some or all of the hazardous materials must be removed, the Contractor shall obtain an estimate for said removal from a Subcontractor who is experienced in the field, has insurance and is knowledgeable of the regulations as they apply. The Contractor may provide the estimate itself if it is qualified in the applicable hazardous materials field. The Department shall consider authorizing a Change Order for the removal of the hazardous material to the extent necessary.

- B. The Contractor or Subcontractor must comply with all requirements of the General Conditions, including the maintenance of insurance up to the limit required under the General Conditions.
- C. Should a hazardous material be encountered on the job, the Contractor shall comply with all statutes and regulations of the Commonwealth of Pennsylvania and all rules and regulations of the United States Environmental Protection Agency as they apply during construction and demolition work and the disposal of hazardous material. Particular attention is drawn to Code of Federal Regulations, Title 40, Part 61, Section 112 of Clean Air Act and PA Department of Labor and Industry, Act 194 for asbestos.
- D. The Contractor shall comply fully with the regulations of OSHA as they pertain to the protection of workers exposed to the emission of asbestos fibers, chemicals, etc. and shall take all steps necessary to protect its employees, as well as all other people occupying the building.
- E. Whenever a hazardous material is to be removed or disposed of, the Contractor is required to make proper notification to the Bureau of Air Quality in the PA Department of Environmental Protections' Regional Office, PA Department of Labor and Industry and EPA as applicable, and is required to obtain and pay for any permits required. Disposal shall conform to all applicable regulations and documentation shall be required when, applicable.

#### 1.6 LEAD PAINT

- A. All work is to be performed with the assumption that all painted surfaces are lead containing. Each Prime Contractor is responsible for following all required OSHA 1926.62 'Lead In Construction' standards when disturbing or impacting these painted surfaces during the course of the renovations, including but not limited to activities such as: cutting and patching, core drilling, penetration, anchoring, fastening, etc. The area(s) shall be visually clean upon completion of any of these activities.
  - 1. Action Plan: Contractor(s) shall submit an Action Plan that conforms to Paragraph 1.6.A.1-3 herein for approval at the Initial Job Conference, which specifically outlines details of means and methods to be used for each dust-generating activity involving lead-painted surfaces, erection of critical barriers and plastic sheeting for dust control, subsequent exposure assessment, personal protective equipment, hygiene and clean-up.
  - 2. Contractor(s) shall utilize means and methods that preclude dust generation to complete work that disturbs/impacts lead-containing paint (i.e., paint stripper, HEPA-assisted drills, etc.).
  - 3. Contractor(s) shall ensure areas beyond work area are not contaminated, and shall immediately stop work and erect plastic sheeting to prevent the spread of dust, anytime means and methods inadvertently create dust.

#### 1.7 MOLD

- A. In the event mold is encountered, the Contractor shall implement corrective actions to protect workers, other building occupants, and to prevent the disturbance of mold in affected areas. Although not presently regulated by EPA and/or OSHA, the EPA does provide industry standards regarding worker safety and abatement procedures, which are the minimum procedures to be followed if mold is encountered.
- B. Any mold that appears as a result of construction shall be abated immediately by the Contractor responsible for this condition. The affected surface shall be cleaned, removed, and

replaced. Inspection and testing shall be done by a qualified testing agency to confirm the mold has been removed in its entirety.

#### 1.8 TESTING OF EQUIPMENT

- A. After any equipment furnished under the contract and any permanent heating, ventilating, plumbing, drainage or electrical systems and equipment have been installed or modified, it shall be the responsibility of the Contractor to operate its equipment for a satisfactory period of time, as required by the Department for proper testing and instructing the operating personnel. Fuel, electricity and water required for proper testing of permanent equipment and for the period of instructing personnel, shall be paid for by the Contractor testing its equipment.

#### 1.9 PROJECT PHOTOGRAPHS

- A. Contractor will be required to take digital photos showing project progress and submit to the DGS. All photography requires approval from DOC.

#### 1.10 INSTRUCTIONS AND TRAINING

- A. Refer to the General Conditions of the Construction Contract, as specified in the applicable technical portion of each specification for "Operations and Maintenance Instruction Manuals" and "Record Drawings" requirements.
- B. Unless approved by the Department, training shall not be scheduled/conducted until Record Drawings, Operation and Maintenance Instruction Manuals, valve tag lists, equipment and piping system identification, and all software programming is complete.
- C. Provide full on-site training and instruction to designated Commonwealth personnel given by competent manufacturer's authorized personnel thoroughly familiar with all technical and operational aspects of the installed items. Instructions are to cover operation and maintenance of all systems, equipment components and other items as specified and furnished under this contract. Instructional digital video recordings may be used to augment required instructions and training but may not be substituted for the in person on-site training. All on-site training shall be digitally recorded by the Contractor. The digital video files are to be turned over to the Client Agency.
- D. Contractor shall provide an outline of the training and course content, which shall be submitted and accepted by the Professional and the Department prior to conducting training.
- E. Conduct instruction and training during regular working hours. For training on complicated systems, allow at least one-half of the training time to be at and/or with the system equipment.
- F. Provide additional training and instructions for all significant modifications and/or changes made under the terms and/or conditions of the manufacturer's and/or Contractor's warranty.
- G. The Contractor shall maintain and submit a sign-in list that clearly documents all personnel attending the training.
- H. No removed materials or equipment shall be reinstalled in the work, unless so noted on the Drawing or in these Specifications.

1.11 GENERAL

- A. All construction trailers, offices, equipment, and materials required to be on-site shall be located as shown on the Drawings, or at the direction of the Department.

1.12 WORKING HOURS

- A. Normal Working Hours:
  - 1. The Contractor's available working hours shall be from 7 A.M. to 3 P.M., Monday through Friday.
- B. Extended Working Hours: (Where indicated on the drawings)
  - 1. The Contractor's available working hours shall be from 7 A.M. to 7 P.M., Monday through Friday.
- C. Work during different hours, or work on Saturdays, Sundays, State and National Holidays or overtime work, must have the Regional Director's or his designee's prior written approval. Work on these days if approved shall be at no additional cost or time to the Contract.
- D. This shall not apply in those unforeseen isolated and/or emergency instances when a particular operation must be performed in a continuous sequence that extends the working day beyond the approved working hours. Coordinate with the Department in these instances.
- E. The Department's failure to approve different working hours, weekend or holiday working hours, or overtime hours is not cause for a claim against the Department for delay or any added costs or time to the Contract.
- F. Utility shut-downs required for tie-ins to existing systems shall be done in normal working hours to minimize the impact on the operations of the Client Agencies (and/ or surrounding buildings). Notify Architect/Engineer, DGS Bureau of Construction, Project Coordinator and Assistant Project Coordinator in writing 14 days prior to shut-downs. These costs shall be anticipated and included in the Contractor's bid. Shutdown shall be scheduled during daylight hours with a maximum outage duration of 8 hours total. The Contractor shall provide temporary power/generator power for any outage extending beyond 8 hours at no additional cost to the contract.

1.13 DELIVERY, STORAGE AND HANDLING

- A. Prefinished materials shall arrive at job site in their original unopened cartons or other protective packaging necessary to protect finishes. Materials shall be stored in such packages until time of application. Flat materials such as panels shall arrive and remain on adequate support to ensure flatness and prevent damage.
- B. Store all materials, equipment, and bulk items prior to installation in clean, dry, well ventilated locations away from uncured concrete, masonry, or damage of any kind. Waterproof tarpaulin or polyethylene sheeting must allow for air circulation under covering.
- C. Coordinate storage location with the Department.

- D. Each Prime Contractor shall provide and maintain, at its cost, a suitable storage container/conex box on the premises, at a location shown on the Lead Contractor's accepted staging plan. The Contractor shall provide and maintain heating facilities and supply fuel for same in cold weather and shall remove the storage container from the premises at completion of all work. Provide temporary utility services as required.
- E. Refer to each section for specific delivery, handling and storage instructions of items specified.

1.14 PARKING

- A. Parking shall be limited to areas indicated on the Site Plans. All parking is subject to prior approval of the Department and Client Agency.

1.15 TRAFFIC

- A. The Lead Contractor shall establish at the Initial Job Conference a construction staging and traffic plan for the project which minimizes the construction interference with the Client Agency's operation. This plan is subject to the Department's and the Client Agency's review and acceptance. This acceptance does not relieve the Contractors of their responsibilities regarding safety coordination, and adherence to all traffic laws and ordinances.

1.16 SUBSURFACE INFORMATION

- A. Sub-surface information is not available. Bidders shall therefore undertake to perform their own investigation of existing subsurface conditions. The Department will not be responsible in any way for the consequences of the Contractor's failure to conduct such an investigation. Excavation for the Project is "Unclassified" as fully described in the Earthwork Section.

1.17 ENVIRONMENTAL QUALITY CONTROL

- A. The Prime Contractor and its Subcontractors shall perform their work in a manner which shall minimize the possibility of air, water, land, and noise pollution, in accordance with the General Conditions of the Construction Contract.
- B. The name, address and telephone number of the Department of Environmental Protection Regional Office is furnished below. This office shall be contacted for waste disposal permits and for information concerning sites already approved for conducting waste disposal.

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>1. Northeast Regional Office</li> <li style="margin-left: 20px;">a. Public Square</li> <li style="margin-left: 20px;">Wilkes-Barre, Pa 18701-1915</li> <li style="margin-left: 20px;">(570) 826-2511</li> </ul> | <ul style="list-style-type: none"> <li>Counties: Carbon, Lackawanna, Lehigh,</li> <li style="margin-left: 20px;">Luzerne, Monroe, Northampton,</li> <li style="margin-left: 20px;">Pike, Schuylkill, Susquehanna,</li> <li style="margin-left: 20px;">Wayne, and Wyoming</li> </ul> |
|--|---|

1.18 OFFICE FOR CONTRACTOR

- A. Each Prime Contractor shall provide and maintain, at its cost, a suitable office on the premises, at a location shown on the Lead Contractor's accepted staging plan. The Contractor shall provide and maintain heating facilities and supply fuel for same in cold weather and shall



remove the office from the premises at completion of all work. Provide electrical, telephone and internet service.

#### 1.19 DGS CONSTRUCTION MANAGER OFFICE

- A. The Lead Contractor shall prepare a drawing of the DGS Office along with proposed arrangement of the Contractor's Office and construction staging area for the Department's approval. Four (4) copies of the sketch plan are to be submitted to the Department within 7 calendar days of Effective Date of Contract or issuance of Letter of Intent whichever occurs first.
- B. The Lead Contractor shall furnish, within five (5) days of the Department's approval of the Lead Contractor's drawing, a suitably finished mobile office of at least 600 square feet (12' x 50'), including the necessary extension of utilities and service lines required for its proper operation. The Lead Contractor shall clean this office at least bi-weekly, maintain and pay all utility bills, for the duration of the Project, through the completion of all punch list items (unless directed otherwise by the Department). The Lead Contractor shall remove the office from the premises when directed by the Department. The office shall be suitably partitioned as directed by the Department and shall include:
1. Heating and Air-Conditioning
  2. Screened and locking windows, on at least two (2) sides, provided with adequate window blinds
  3. Locking doors, complete with entrance steps and up to four (4) sets of keys
  4. Lighting and electrical receptacles of suitable number and capacity
  5. First quality mercury thermometer on outside which records the high and low temperature for the day
  6. The Lead contractor shall arrange for all electrical power hook-up/service, and shall be responsible for all cost necessary to provide these services to the field office (including monthly utility costs).
- C. Equipment: The Lead Contractor shall furnish, with the DGS job trailer, the following items in the quantity indicated and remove same from the premises when directed by the Department. The Lead Contractor shall maintain all items in good condition and furnish all supplies (i.e., toner, paper, bottled water, drinking cups, bathroom supplies) for the duration of the Contract. If any equipment fails, it shall be repaired or replaced by the Lead Contractor within twenty-four (24) hours of being notified by the Department. Specified IT hardware/peripherals shall be compatible with the HP Revolve 810 EliteBook and include all required battery chargers, data cables, software, ect. to provide a fully integrated and functioning system. The Lead Contractor shall confirm the IT equipment with the DGS PC and APC PRIOR TO purchasing.
1. (3) Desk(s) with swivel chair(s)
  2. (1) Plans table(s) with stools
  3. (4) Six (6) foot table(s)
  4. (12) Chair(s)
  5. (1) Clothes tree or closet with rod
  6. (1) All in one print/copy/scan machine capable of producing 35 pages per minute double sided on 8-1/2"x11" and 11"x17". Machine shall be wireless capable and network capable and print/copy/scan both in color and black and white (HP OfficeJet Pro 7740 or equivalent.)
  7. (1) Fire Extinguisher
  8. (1) First-Aid Kit

- 9. (1) Water cooler, with hot and cold taps
- 10. (2) Trash cans

IT Hardware/Peripherals:

- 11. 1 Computer monitor - basis of design - Hewlett Packard ProDisplay P232 - 23"
- 12. 1 Keyboard - basis of design - Hewlett Packard KU-1156
- 13. 1 Docking station with all associated cables for connection of all peripheral devices to support the Hewlett Packard Revolve 810 - Basis of design - HP 2013 UltraSlim Docking Station.
- 14. 1 Mouse - optical mouse with USB cord, dual button and scroll wheel - Basis of design - Hewlett Packard
- 15. 1 4'x3' white marker board with (2) sets of markers of standard colors.

- D. The Lead Contractor shall provide an Internet service and pay all connections/disconnection and monthly fees. The Lead Contractor shall provide a broadband Internet connection with Wi-Fi access utilizing WPA2 security. Options include cable modem, DSL or similar service (dial up is not acceptable). The Wi-Fi should be positioned to provide sufficient coverage in the DGS office space. The contractor shall provide usernames/passwords for authorized wireless users as determined by the DGS Construction Project Manager. It shall be the Lead Contractor's responsibility to ascertain the means in which the Internet source will be provided. Internet download and upload speeds of 100Mbps shall be provided at all times. The Internet source must be coordinated with the DGS Construction Project Manager to assure compatibility with the Department's hardware/software requirements. Wireless access point shall be made fully operational and maintained by the Contractor. It shall be noted, cable service is not readily available in the area. Telephone line service for DSL may be available. At the Departments' sole discretion, 4G LTE wireless hotspot internet service may be acceptable.

1.20 SANITARY FACILITIES The following conditions shall pertain:

- A. The existing facilities available for the Contractor's use will be assigned by the Department at the Initial Job Conference.
  - 1. The Lead Contractor shall, at its cost, provide and maintain in a clean and sanitary condition, adequate and approved sanitary facilities in accordance with O.S.H.A. requirements. All facilities shall be screened against insects. When directed by the Department, the Contractor shall dismantle and remove these facilities and disinfect as required. Portable chemical toilets approved by the Pennsylvania Department of Health are acceptable. Under temporary field conditions, provisions shall be made to assure not less than one toilet facility is available.

1.21 SMOKING POLICY

- A. Smoking and use of smokeless-tobacco, chewing tobacco, snuff, vape machines and similar paraphernalia are strictly prohibited in all buildings and on-site.

1.22 CONCRETE AND EARTHWORK

- A. All Contractors shall perform concrete work and earthwork required for their work, and shall comply with applicable Division 2, 3, 31, 32, and 33 sections. If any specification section

contains language conflicting with requirements of applicable Division 2, 3, 31, 32, and 33 sections, the most stringent requirements shall prevail.

#### 1.23 QUALITY CONTROL TESTING

- A. Structural-related testing and inspections required to be performed by the Contractor(s) are listed in Section 014000 - Quality Control Testing Services. If Quality Control testing or inspections required appear in Section 014000 and in a technical section, the most stringent requirements shall prevail. If Quality Control testing or inspections required appear in a technical section and not in Section 014000, they shall be required as if specified in Section 014000. Conditions pertaining to Quality Control testing and inspections may appear in the technical sections. All testing herein is to be by the Contractor. Testing by the Department, Quality Assurance Testing, is for the purpose of checking the results of the Contractor's Quality Control Testing. Testing is to be by the Contractor, unless specifically stated to be "by the Department" or required by Section 014010 - Quality Assurance Testing and Inspection Services.
- B. Non-structural testing is in the technical specifications.

#### 1.24 CADD FILE WAIVER

- A. The Professional will make graphic portions of the bid drawings available for use by the Contractor by uploading files to e-Builder.
- B. Electronic files shall be uploaded only after all construction contracts have been executed.
- C. The files are provided as a convenience to the Contractor, for use in preparing shop drawings and/or coordination drawings related to the construction of this Project only. These files and the information contained within are the property of the Department and may not be reproduced or used in any format except in conjunction with this Project.
- D. The Contractor acknowledges that the information provided in these files is not a substitution or replacement for the Contract Documents and does not become a Contract Document. The Contractor acknowledges that neither the Professional nor the Department warrant or make any representation that the information contained in these files reflect the Contract Documents in their entirety. The Contractor assumes full responsibility in the use of these files and acknowledges that all addenda, clarifications, and changes to the drawings executed as a part of the Contract Documents may or may not be incorporated in these electronic files.
- E. The Contractor acknowledges that the furnishing of these files in no way relieves the Contractor from the responsibility for the preparation of shop drawings or other schedules as set forth in the Contract between the Contractor and the Department.
- F. The electronic documents shall be stripped of the Professional's name and address, and any professional licenses and signatures indicated on the contract documents. Use of these electronic documents is solely at the Contractor's risk and shall in no way alter the Contractor's Contract for Construction.
- G. Disclaimer: The Professional and Department make no representation regarding fitness for any particular purpose, or suitability for use with any software or hardware, and shall not be responsible or liable for errors, defects, inexactitudes, or anomalies in the data, information, or documents (including drawings and specifications) caused by the Professional's or its Consultant's computer software or hardware defects or errors; the Professional's or its

Consultant's electronic or disk transmittal of data, information or documents; or the Professional's or its Consultant's reformatting or automated conversion of data, information or documents electronically or disk transmitted from the Professional's Consultants to the Professional.

- H. By the Contractor's or their subcontractor's use of the electronic files (e.g., AutoCAD files), the Contractor and their subcontractor waive all claims against the Department the Professional, its employees, officers, and Consultants for any and all damages, losses, or expenses the Contractor incurs from any defects or errors in the electronic documents. Furthermore, the Contractor shall indemnify, defend, and hold harmless the Department, the Professional, and its Consultants together with their respective employees and officers, from and against any claims, suits, demands, causes of action, losses, damages, or expenses (including all attorney's fees and litigation expenses) attributed to errors or defects in data, information, or documents, including drawings and specifications.

#### 1.25 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where design services or certifications by a design professional are specifically delegated to the Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated in the technical specification sections.

1. If criteria indicated in the technical sections are not sufficient to perform services or certification required, submit a written request for additional information to the Professional.

- B. Delegated Design Services Submittals: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional registered in the Commonwealth of Pennsylvania, for each product and system specifically assigned to the Contractor to be designed or certified by a design professional, indicating that the products and systems follow performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

#### 1.26 COORDINATION DRAWINGS

- A. Coordination of Work:

1. Each Prime Contractor shall clearly show, and coordinate with the other Prime Contractors, the following:
  - a. Arrange for pipe spaces, chases, slots, sleeves, and openings with general construction work, and arrange in building structure during progress of the Work, to allow for and facilitate distribution line and equipment installation.
  - b. Coordinate installation of required supporting devices for ductwork, piping, and conduit, as well as sleeves, and other structural components, as they are constructed.
  - c. Coordinate requirements for access panels and doors for HVAC, Plumbing and Electrical items requiring access where concealed behind finished surfaces.
  - d. Coordinate electrical connections to equipment provided by all Contractors.
  - e. Sequence, coordinate, and integrate installing materials and equipment for efficient flow of the Work. Coordinate installing large items of equipment requiring positioning before closing in the building.

2. Each Prime Contractor shall coordinate its construction operations with those of other Prime Contractors and entities to ensure efficient and orderly installation for each part of the Work. Each Prime Contractor shall coordinate its operations with other operations, included in different Sections that depend on each other for proper installations, connection, and operation. All Prime Contractors shall:
  - a. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - b. Coordinate installation of all components with other Prime Contractors to ensure adequate accessibility/clearance for required maintenance and service.
  - c. Make provisions to accommodate items scheduled for later installation.

#### 1.27 PERMIT CONDITIONS

- A. The design professional shall be responsible for submitting and obtaining permits from PA Labor and Industry and PA Department of Health.
- B. The design professional shall be responsible for submitting the Electrical Contractor (.4 Contract) prepared deferred fire alarm shop drawings to L&I.
  1. The contractor shall submit (4) hard-copies of final design professional approved shop drawings to design professional.

#### 1.28 INTENT OF AWARD

- A. Intent of award correspondence will be issued to the contractor during to procurement process to the contractor's required field investigation and associated fire protection system delegated design process.

#### 1.29 PRE-INSTALLATION CONFERENCES:

- A. Pre-installation meetings are required for many items and systems. The pre-installation meetings shall be held the same dates as the regularly scheduled bi-weekly job conferences. Each Prime Contractor shall coordinate with the Department any pre-installation meeting scheduling requirements in order to avoid delays in the installation of any items or systems requiring a pre-installation meeting. Each Prime Contractor requiring a pre-installation meeting to comply with the contractor documents, shall request the meeting a minimum of two weeks prior to the scheduled installation of the item or system. Failure to request a pre-installation meeting in the required time period will not relieve the contractors of their responsibility to comply with all contract documents including but not limited to the Project Schedule. No additional compensation or extension of time will be granted by the Department to the contractors for their failure to schedule or attend any of the required pre-installation meetings. Each contractor is responsible for administering pre-installation conferences as indicated in applicable technical specification sections.
  1. Each Prime Contractor shall:
    - a. Post meeting documentation through e-builder.
    - b. Provide agendas.
    - c. Run/Administer meetings.

- d. Provide meeting minutes.

1.30 PROJECT SIGN

- A. A project sign will not be required for this project. Refer to the General Conditions of the Construction Contract.

1.31 OPERATING SYSTEM LOGIC

- A. All subcontracts or purchase orders between the Contractor and manufacturers must:

1. Require all manufacturers contracted under the operating system logic provision to provide the Commonwealth with the source code and access to operating system logic with a complete, fully licensed programming development suite and final, tested copies of all programming to include source code, logic, documentation, configuration, data files and any other required files. Load all files on a new laptop computer, fully configured as a maintenance programming laptop and including all required communication devices and cables to connect to system components.

Provide a complete system backup of all software and files on a secured USB hard drive for offsite storage. Provide hard copies of all component lists, system configuration settings, passwords, and sources as part of O&M manual. Demonstrate the successful use and completeness of the programming laptop and the hard drive backup after all system startup and commissioning and to qualify for final system acceptance.

2. Authorize the Commonwealth and Agency to provide access to operating system logic to a Commonwealth or Agency third party that is under contract with the Commonwealth or Agency as determined necessary by the Commonwealth or Agency.

- B. A manufacturer may only retain access to the operating system logic if the manufacturer enters a Service or Maintenance Agreement with the Agency for its continued maintenance on the operating system. If a **manufacturer's** performance under the Service or Maintenance Agreement is deemed unsatisfactory by the Agency or is insufficient to meet the **Agency's** needs, the manufacturer shall no longer be permitted to retain access to the operating system logic. Upon termination of the Service or Maintenance Agreement, the manufacturer shall provide the Agency with access to the operating system logic and authorize the Agency to provide it to a third-party that is under contract with the Commonwealth or Agency.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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## SECTION 261100 - SECONDARY UNIT SUBSTATION

### PART 1 - GENERAL

#### 1.1 STIPULATIONS

- A. The specifications sections " General Conditions of the Construction Contract ", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

#### 1.2 SECTION INCLUDES

- A. Secondary unit substation consisting of incoming line section, transformer section, and secondary distribution section.

#### 1.3 RELATED SECTIONS AND WORK

- A. Refer to the Electrical Distribution Diagram and Electrical Schedules for size, rating, and configuration.

#### 1.4 REFERENCES

- A. ANSI/IEEE C12 - Code for Electricity Metering
- B. ANSI/IEEE C57.12 - Switchgear and Transformers - Enclosure Integrity
- C. ANSI/IEEE C57.13 - Requirements for Instrument Transformers
- D. FS W-C-375 - Circuit Breakers, Molded Case, Branch Circuit and Service
- E. IEEE 48 - Test Procedures and Requirements for High-Voltage Alternating-Current Cable Terminations 2.5 kV Through 765 kV
- F. NEMA AB 1 - Molded Case Circuit Breakers
- G. NETA ATS - Acceptable Testing Specifications for Electrical Power Distribution Equipment
- H. NEMA KS 1 - Enclosed Switches
- I. NEMA PB 2 - Dead Front Distribution Switchboards
- J. ANSI/IEEE C37.121- American National Standard for Switchgear - Unit Substations - Requirements

#### 1.5 SUBMITTALS

- A. Submit shop drawings under provisions of Section 260500.



- B. Submit shop drawings indicating front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, and ground; switchboard instrument details; instructions for handling and installation of switchboard; and electrical characteristics including voltage, frame size and trip ratings, withstand ratings, transformer impedance, and time-current curves of all equipment and components.
- C. Submit product data under provisions of Section 260500.
- D. Submit product data for each component and accessory specified.
- E. Submit manufacturer's installation instructions under provisions of Section 260500.
- F. Submit field reports indicating final adjustments and overcurrent protective device coordination curves.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 260500.
- B. Store and protect products under provisions of Section 260500.
- C. Accept products on site in factory shipping splits and verify damage.
- D. Protect products from moisture and debris by storing in a clean, dry heated space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units. Provide auxiliary heating in switchgear and transformer sections in accordance with manufacturer instructions.

#### 1.7 PROJECT RECORD DOCUMENTS

- A. Submit record documents under provisions of Section 260500.
- B. Accurately record actual locations of substations and circuit connections.

#### 1.8 OPERATION AND MAINTENANCE DATA

- A. Submit operation data under provisions of Section 260500.
- B. Include overcurrent protective device adjusting and testing instructions.
- C. Test Reports: Indicate procedures and results for specified factory and field testing and inspection.
- D. Submit maintenance data under provisions of Section 260500.
- E. Include bus tightening intervals and procedures and overcurrent protective device maintenance procedures.

## 1.9 QUALIFICATIONS

- A. Manufacturer and Contractor: Company specializing in manufacturing/installing the products specified in this Section with minimum ten years' experience, and with service facilities within 100 miles or 2 hours normal travel time.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Square "D" Company
  - 2. ABB
  - 3. Eaton
  - 4. Siemens ITE

### 2.2 SECONDARY UNIT SUBSTATION

- A. Description: Secondary unit substation manufactured to NEMA 210.
- B. Service Conditions:
  - 1. Maximum Temperature: 104°F (40°C).
  - 2. Altitude: 1000 feet.
  - 3. Construction: Indoor.
  - 4. Load Current Harmonic Factor: 0.05Insertper unit, maximum.
- C. Configuration: Loop type.

### 2.3 INCOMING SECTION EQUIPMENT

- A. Description: Primary 3-pole, fusible
- B. Configuration: Two incoming line(s).
- C. Nominal System Voltage:Insert 12470V, 3-phase, 60 Hz.
- D. Maximum Design Voltage: 15 KV.
- E. Basic Impulse Level: 95 KV BIL for 15 KV Max Design Voltage.
- F. Switch Continuous and Interrupting Current Rating: 600 amperes.
- G. Main Bus Ampacity: 600 amperes continuous.
- H. Short Circuit Rating, Switch without Fusing at Maximum Design Voltage:

MAX KV	BIL	Amperes Continuous and Interrupting	Momentary Switch Closed Asymmetrical Amperes	Fault Close Asymmetrical Amperes
15.0	95	600	40,000	61,000

- I. Provide spring charged stored energy operator.
- J. Fuses shall be current limiting. and as otherwise indicated on drawings.
- K. Lightning Arresters: Three distribution intermediate station type, connected to the incoming cable terminals. The minimum kV rating for Metal Oxide Surge Arresters for the nominal system line-to-line voltage shall be 15 kV or as otherwise indicated by the manufacturer for 12,470V, three phase, three wire, solidly grounded wye nominal distribution.

#### 2.4 TRANSFORMER SECTION EQUIPMENT

- A. Description: 3-Phase dry type ventilated vacuum pressure impregnated distribution transformer.
- B. Capacity: 2000 self-cooled or as otherwise indicated on the drawings.
- C. Voltage: 12,470Vprimary, secondary voltage 480/277 wye.
- D. Voltage Taps: Four 2-1/2% voltage taps, above and below nominal.
- E. Insulation Class: 220°C insulation class.
- F. Temperature Rise: 150°C rise over 40°C ambient.
- G. High Voltage Basic Impulse Level: 95 KV for 15 KV Class.
- H. Impedance: 5.75 nominal. The impedance tolerance shall be plus or minus 7.5 percent.

#### 2.5 OUTGOING DISTRIBUTION SECTION

- A. Substation supplier shall provide transition section enclosure, bus bar, flexible bus, wiring, bus bar connector links, throat connections, etc. from transformer secondary to secondary equipment.
- B. Description:
  - 1. Switchboard - refer to Section 262413

#### 2.6 INSTRUMENTS AND SENSORS

- A. Current Transformers: ANSI C57.13; 5-ampere secondary, bushing bar or window type, with single secondary winding and secondary shorting device, primary/secondary ratio as required, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.

- B. Potential Transformers: ANSI C57.13; 120-volt single secondary, disconnecting type with integral fuse mountings, primary/secondary ratio as required, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.
- C. Ammeters: ANSI C39.1; indicating ammeter with 4.5-inch square recessed case and 250 degree scale, white dial with black figures and pointer, 5-ampere, 60 Hertz movement, one percent accuracy.
- D. Voltmeters: ANSI C39.1; indicating voltmeter with 4.5-inch square recessed case and 250 degree scale, white dial with black figures and pointer, 120-volt, 60 Hertz movement, one percent accuracy. Voltmeter to read primary voltage.

## 2.7 FABRICATION

- A. Conform to requirements of ANSI C57.12.28.
- B. Provide a 1 x 1-1/4 inch minimum or as otherwise provided by manufacturer copper ground bus through the length of the switchboard.
- C. Align sections at rear only.
- D. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.
- E. Future Provisions: Fully equip spaces indicated for future devices with bussing and bus connections.
- F. Maximum Dimensions: as noted on the drawings.

## 2.8 ACCESSORIES

- A. IEEE C57.12.01 standard accessories and dial type thermometer.
- B. Tap Changer: Externally operated type.
- C. Transformer Disconnect Lockable Hasp: Provide circuit breakers, fused switches, and disconnects serving transformers with a lockable padlock hasp capable of being locked in the open/closed position.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Verify field measurements are as shown on the drawings.
- C. Verify that required utilities are available, in proper location, and ready for use.
- D. Beginning of installation means installer accepts conditions.

### 3.2 PREPARATION

- A. Provide 4 inch high concrete pad 4 inches wider and longer than substation, at a minimum or as otherwise indicated on the drawings under the provisions of Section 260527.

### 3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

### 3.4 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 260500 and as indicated in NETA ATS..
- B. Provide factory tests to IEEE C57.12.91. Include routine tests as defined in IEEE C57.12.01 and the following other tests:
  - 1. Impedance voltage and load loss.
  - 2. Dielectric tests.
  - 3. Audible sound level.
  - 4. Short circuit capability.
  - 5. Telephone influence factor (TIF).
- C. Allow witnessing of factory inspections and tests at manufacturer's test facility. Notify Owner at least 7 days before inspections and tests are scheduled and only proceed after prior approval from the Owner.
- D. Test to NEMA 210.

### 3.5 ADJUSTING

- A. Adjust transformer taps to provide acceptable voltage at utilization equipment connected to substation.
- B. Adjust trip units to provide adequate overcurrent protection and selective tripping with downstream protective devices.

### 3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain unit substation components.
- B. All on-site training shall be digitally recorded by the Contractor. The digital video files are to be turned over to the Client Agency.

END OF SECTION

## SECTION 261335 - PARALLELING & DISTRIBUTION SWITCHGEAR MEDIUM VOLTAGE 15KV

### PART 1 - GENERAL

#### 1.1 STIPULATIONS

- A. The specifications sections " General Conditions of the Construction Contract ", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

#### 1.2 SECTION INCLUDES

- A. Generator Paralleling Sections.
- B. Circuit Breaker Switchgear

#### 1.3 RELATED WORK

- A. Refer to the One-Line Diagram for size, rating, and configuration.
- B. Section 263213.13 - Diesel Engine Driven Generator Sets

#### 1.4 QUALITY CONTROL AND SYSTEM COORDINATION

- A. The generator manufacturer shall supply the paralleling distribution equipment to provide a single coordinated source of responsibility for the entire system. Thus, the generator manufacturer shall provide a fully operational and tested turnkey system. The system shall include the generators, parallel distribution equipment, automatic transfer switches, and related control equipment.
- B. Provide factory trained technicians to oversee the final installation, programming, testing, witness testing, and commissioning of the complete system. The complete system shall include the paralleling distribution equipment, generators, and automatic transfer switches.
- C. Functional (Witness) Testing: Provide functional testing per this specification section.
- D. Commissioning: Provide factory trained technicians for commissioning the installed system. The system commissioning shall include at least one full day to test the system. Additional commissioning days may be required if the system fails to pass the commissioning test. A commissioning report that defines the criteria for a satisfactory test will be provided by the Generator Vendor prior to the commissioning date for review/comment/approval by the Owner. The date of the commissioning testing shall be coordinated between the Owner, Architect/Engineer, and manufacturer.

#### 1.5 REFERENCE

- A. ANSI/IEEE C37.20.2 - Standard for Metal-Clad Switchgear

- B. ANSI/IEEE C37.04 and .06 - Standard ratings and preferred ratings for Indoor AC Medium-Voltage Circuit Breakers used in Metal-Clad Switchgear
- C. ANSI/IEEE C37.11 - Requirements for electrical control for AC High-Voltage Circuit Breakers rated on a symmetrical current basis or a total current basis
- D. ANSI/IEEE C37.09 - Standard Design and Production Testing
- E. ANSI/IEC C12 - Code for Electricity Metering
- F. ANSI/IEC C39.1 - Requirements for Electrical Analog Indicating Instruments
- G. ANSI/IEC C57.13 - Requirements for Instrument Transformers
- H. ANSI/IEC 1000.4.4 - Fast Transients Immunity
- I. ANSI/IEC 1000.4.2 - Electrostatic Discharge Immunity
- J. ANSI/IEC 1000.4.3 - Radiated Field Immunity
- K. ANSI/IEC 1000.4.6 Conducted Field Immunity
- L. ANSI/IEC 1000.4.11 Voltage Dip Immunity
- M. NEMA SG4 - Alternating Current High Voltage Circuit Breakers
- N. NEMA SG5 - Power Switchgear Assemblies
- O. NFPA 70 - National Electrical Code (NEC)
- P. NFPA 99 - Standard for Health Care Facilities
- Q. NFPA110 - Emergency and Standby Power Systems
- R. IEEE446 - Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- S. UL891 - Switchboards and Control Equipment

#### 1.6 SUBMITTALS

- A. Submit product data under provisions of Division 1.
- B. Include front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; switchboard instrument details; instructions for handling and installation of switchboard; and electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time-current curves of all equipment and components; diagram; completed nameplate schedule.
- C. Submit AC One-Line and Three-line schematic diagram with individual components referenced or identified for power, protection, and control systems.
- D. Submit DC schematic diagrams with all components referenced or identified.

- E. Include equipment access information. Clearly indicate which locations require access during installation and which locations require access for maintenance, testing, and repair.
- F. Certification Letter: The manufacturer shall provide a letter certifying compliance with all the requirements of this specification. Any exceptions to the specification shall be listed.
- G. Submit complete control and operation sequence which outlines system operation.
- H. Submit manufacturer's installation instructions under provisions of Section 260500.
- I. Include documentation of conformance with the qualifications section of this section.

#### 1.7 CRITICAL COMPONENTS

- A. Keys: Furnish four each to the Owner.
- B. Control Fuses: Furnish (3) additional fuses of each type and rating installed to the Owner
- C. Circuit-Breaker: Provide (1) additional vacuum circuit breaker sized to match largest circuit breaker being provided.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 260000.
- B. Store and protect products under provisions of Section 260000.
- C. Deliver in 48" maximum width shipping splits, unless approved otherwise by both the Contractor and Owner's Representative, individually wrapped for protection, and mounted on shipping skids with adequate bracing, support and protection.
- D. 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.
- E. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only with lifting lugs. Handle carefully to avoid damage.

#### 1.9 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 260500.
- B. Include instructions for operating equipment based on the control sequences.
- C. Include instructions for operating equipment under emergency conditions when engine generator is running.
- D. Include additional parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.
- E. List special tools, maintenance materials, and replacement parts.



## 1.10 QUALIFICATIONS

- A. Manufacturer: Company specializing in paralleling equipment with minimum five (5) years documented experience.
- B. Supplier: Authorized distributor of paralleling equipment with service facilities within 100 miles of the project site.

## 1.11 WARRANTY AND SERVICE

- A. The manufacturer shall warrant the equipment to be free from defects in material and workmanship for 5 years from the date of shipment.
- B. Manufacturer shall have an established network of service centers capable of servicing the specified equipment.
- C. Service center and manufacturer's personnel shall be on call 24 hours a day, 365 days a year. Personnel shall be factory trained and certified in the maintenance and repair of the specified equipment.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS - PARALLELING AND DISTRIBUTION SWITCHGEAR

- A. ***Manufacturers: Subject to compliance with requirements, provide products by one of the following:***
  - 1. Enercon
  - 2. Zenith
  - 3. Asco
  - 4. Kohler
  - 5. Russelectric
  - 6. Cummins Power Generation
  - 7. Schenider Electric
  - 8. Eaton
  - 9. Caterpillar
  - 10. ***Siemens Industry., Energy Management Division***
  - 11. Or Approved Equal.

### 2.2 RATINGS

- A. Definitions:
  - 1. Fully rated equipment shall be defined as equipment where all devices in that equipment shall carry a minimum of the AIC rating that is specified. All equipment, devices, components, etc. shall be fully-integrated, series ratings are not acceptable.
- B. The paralleling and distribution switchboards for this project shall be fully rated unless otherwise specifically noted in the Drawings or Specifications.

AMP RATING: as indicated on the drawings.

Contractor to calculate and verify.

Calculate utilizing DGS approved software program such as Power Tools for Windows (PTW) or Electrical Transient Analyzer Program (ETAP) or approved equal.

MVA RATING:

5-15KV

95 KV

C. Short Circuit Ratings for paralleling and distribution circuit breaker switchgear:

1. Short-Circuit Rating: 63 kAIC symmetric at rated maximum voltage.
2. BIL (Basic Impulse Level): Insert 95 KV.
3. Contractor to calculate and verify utilizing DGS approved software program such as Power Tools for Windows (PTW), Electrical Transient Analyzer Program (ETAP) or approved equal.

2.3 PARALLELING AND DISTRIBUTION CIRCUIT BREAKER SWITCHGEAR

A. Switchgear Enclosure:

1. Metal clad type construction shall be used in the formation of the housing to provide a rigid self-supporting and self-contained freestanding assembly. Major components of the primary circuits, breakers, buses, and voltage transformers, are completely enclosed by grounded metal barriers, that have no intentional openings between compartments.
2. All doors shall be pan type and be provided with sufficient hinges and stiffeners to support the door and components for an absolute minimum deflection and wobbling when opening or closing. Doors must operate more than 90 degrees.
3. The primary switching devices (vacuum circuit breakers) are of the removable (drawout) type, arranged with a mechanism for moving it physically between connected, test, and disconnected positions, equipped with self-aligning and self-coupling primary disconnects.
4. All vacuum circuit breaker housings shall be equipped with automatic shutters that cover primary circuit elements when the vacuum circuit breaker is in the disconnected, test, and removed position.
5. Primary bus conductors shall be fully insulated and removable insulation boots shall be provided for all bolted joints.
6. Instrument compartments and all low voltage wire ways will be isolated from all primary circuit elements by grounded metal barriers.
7. All removable access covers that expose primary elements when removed, shall be marked with "DANGER HIGH VOLTAGE" warning labels.
8. A continuous copper ground bus shall extend the entire length of the switchgear with each individual section grounded by bolted connection. The copper ground bus shall be a minimum of 1/4 X 2-in. size with provisions for cable connections at each end of the switchgear assembly or as otherwise provided by the manufacturer.
9. All circuit breaker ground pads shall be connected directly to the ground bus with bus bar of equivalent size.
10. Primary termination compartments shall be suitable for top or bottom cable entry as requested by field conditions as the installation necessitates, with adequate space for stress cones and shielded cable ground lead terminations.
11. Where a two-high vacuum circuit breaker configuration is provided in a common sections, the termination compartments shall be isolated by grounded metal barriers and cable duct to isolate incoming cables from each cable compartment. Each cable compartment

shall have a separate access cover to avoid exposing primary elements of the adjacent compartment. The bottom circuit breaker shall be roll-on-the-floor type when installed in bottom-most cubicle against the floor.

12. Provide silver plated copper bus with bolted joints for all phases, fully rated neutral, and ground bus that extends through each section. All vertical and horizontal distribution bussing shall be fully rated.
13. Install fuses in safety fuse blocks with visible fuse blown indicators.
14. Provide insulated barriers between circuit breakers and the bus structure
15. Provide insulated barriers between the bussing and cable compartments.
16. Provide insulated compartments and barriers for instrumentation and control equipment. Circuit breakers shall be installed in separate compartments with insulating barriers between the control equipment compartments and the circuit breaker compartments
17. Each section shall contain one or more individual circuit breaker compartments or instrumentation compartments with a rear compartment for the buses and outgoing cable terminations. An insulated barrier instrumentation compartment shall be provided when additional instruments or controls are provided in the switchboard section of a circuit breaker compartment. Provide dedicated conduit entry for control cabling separate from power cabling entry locations.
18. Locks: Front doors shall be supplied with a lockable handle. All door locks shall be keyed alike to operate from a single key, and one key shall be supplied for each lock. Full height doors shall latch at three (3) points to secure the door firmly.
19. Provide adequate wire bending space for circuit breakers and associated bus connections. Refer to the plans for wire size; allow for 750 KCM minimum.
20. Sheet Metal Finish: Prime painted with a rust-inhibiting primer and finished with two coats of satin finish ANSI 61 gray enamel.
21. All interconnections between shipping sections shall use locking pull-apart terminal blocks.

B. System Wiring:

1. Switchgear wiring shall be composed of UL listed, 105 degree C rated material, with all wiring labeled at each end and terminal block.
2. Use solderless compression type connectors for terminating all wires to devices requiring lugs. Devices designed for lugless connections will not use lugs at those connection points. Other circuits shall be locking spade type applied with the proper tool.
3. Provisions shall be made for wires to pass between vertical sections. Wireways or holes between sections will be provided. Any opening that control wiring will pass through that might abrade wire will have a grommet.
4. Wiring shall not be spliced and shall be free of abrasions and tool marks. The wires shall be neatly bundled and shall be supported to prevent sagging or breakage from weight or vibration. Wiring bundles shall be contained in covered metal or plastic gutters.
5. All wiring to hinged doors shall be run through door plugs. Terminal blocks shall be provided for all external connections and they shall be readily accessible in an area not exposed to primary bus or cables.

2.4 MANUFACTURER - POWER CIRCUIT BREAKERS

A. ***Manufacturers: Subject to compliance with requirements, provide products by one of the following:***

1. Square D
2. S & C
3. G & W
4. Eaton
5. ***Siemens Industry, Inc.***

## 2.5 CIRCUIT BREAKERS

- A. Circuit Breaker: Vacuum circuit breaker, amp rating per drawings, electrically and manually operated, draw out type construction, with auxiliary contacts. The breaker shall be operated by a motor charged spring stored energy mechanism. The stored energy mechanism shall be assessable and will be charged normally by an electric motor but, in an emergency, may be charged by a manual handle. Provide the following as required and indicated on teh drawings.
  - 1. Device 50/51, three phase over current relay, utility grade.
  - 2. Device 51N, residual phase ground over current relay, utility grade.
- B. Feeder Breaker Metering/Instrumentation
  - 1. Current and Potential transformers, as required and indicated on the drawings
  - 2. Circuit breaker control switch with two position indicating lights
  - 3. Device 86, lockout relay, Lock out relay
  - 4. Any other control devices, interlocks, protective features or indications necessary to make the system perform as required shall be included.
- C. Rated Maximum Voltage: 15,000 volt.
- D. Fully rated regardless of mounting location within the switchboard. Rated for 10,000 operations without maintenance for a 4,000 amp or less rating.
- E. Rated Frequency: 60 Hertz.
- F. Rated Permissible Tripping Delay: 2 seconds.
- G. Each circuit breaker shall contain three vacuum interrupters/bottles separately mounted. An integral contact wear gap indicator for each vacuum interrupter shall be visible. The breaker shall be removable from the switchgear for ease of inspection and maintenance.
- H. Main Section Devices: Individually mounted and compartmented, draw out construction.
- I. Distribution Section Devices: Individually mounted and compartmented, draw out construction.
- J. Operation Endurance Capability: ANSI/IEEE C37.16.
- K. Circuit Breaker Control Voltage: 24-volt DC.
- L. Miscellaneous Control Voltage: 120-volt, single phase.
- M. All circuit breakers shall be UL listed for compliance with ANSI/IEC C37.54.
- N. Provide circuit breakers with padlock hasp.
- O. Each circuit breaker compartment shall be provided with an integral motorized racking device accessory, equal to Eaton VC-W MR2, with the following features:
  - 1. Allow moving the breaker between the connect, test and disconnect positions from a distance of up to 30 feet via a hand held pendant, with the breaker compartment door closed.
  - 2. Breaker position shall be indicated on the pendant by LED lights. A blinking light indicates that the circuit breaker is in the motion through the selected position. A solid (non-blinking) light indicates that the circuit breaker has reached and stopped in the

- selected position. In case normal operation fails, the appropriate error code is displayed on the pendant in a separate 2 character LED display window.
3. The system shall be designed such that it allows manual racking of the circuit breaker using the levering crank accessory. Manual racking operation shall disable the motorized racking accessory.
  4. It shall be possible to enable/disable operation of the motorized racking accessory via purchaser's external interlocking/permissive contacts.
  5. 120 V AC power for the motorized racking accessory shall be derived from a control power transformer mounted in the switchgear.
  6. The hand held pendant shall also include "Open" and "Close" pushbuttons to allow for remote operation of the circuit breaker.
  7. Provide a discrete I/O interface module mounted in each circuit breaker control compartment for control of the motorized racking accessory via external hard-wired dry contacts, for example, via push buttons located at a remote control panel. The I/O interface module to provide output terminals for connections of remote 24 V LEDs for indication of breaker position status at the remote panel. With this I/O interface, the circuit breaker can be moved from disconnect to connect or from connect to disconnect positions from a remote control panel. Whenever the hand held pendant is in use, the pendant becomes the master and will override the customer's remote control signals.

## 2.6 MASTER CONTROLLER

- A. Provide a system master control to monitor and control the operation of the entire paralleling system, including the generator set controls. The master control panel shall contain the components and functions described in this section and as required to accomplish the operation specified herein and indicated on the drawings.
  1. Electronic isochronous kW load sharing control to operate the engine governors during synchronizing and to provide isochronous load sharing when paralleled. The control system shall allow sharing of real kW load between all generator sets in the system to within 1% of equal levels, without introduction of frequency droop into the system. The control system shall include all equipment required for kW load sharing with an infinite bus. The infinite bus governing controls shall allow the generator set to synchronize to an infinite bus, parallel, and ramp up to a preset load level on the generator set. Additional controls shall be provided to cause the generator set to ramp up to a kW load level signaled by the system master control PLC. The isochronous load sharing module and engine governor shall be a coordinated system of a single manufacturer and compatible with generators, switchgear and all parts of system
  2. Electronic kVAR load sharing control to operate the alternator excitation system while the generator set is paralleled. The control system shall allow sharing of reactive load between all generator sets in the system to within 1% of equal levels, without introduction of voltage droop into the system. The control system shall include all equipment required for VAR load sharing with an infinite bus in either a constant VAR or constant power factor mode for future application flexibility. (Mode and adjustments selectable by the operator).
  3. Load demand governing controls shall be provided to cause the generator set to ramp down to zero load when signaled to shut down in a load demand mode. On a signal to re-start, the load demand governing controls shall cause the generator set to synchronize to the system bus, close, and ramp up to its proportional share of the total bus load. The ramp rate of the generator set shall be operator-adjustable.
  4. Equipment shall be provided to monitor the generator set as it is starting, and verify that it has reached at least 90% of nominal voltage and frequency before closing to the bus. The equipment provided shall positively prevent out-of-phase paralleling if two or more engine generator sets reach operating conditions simultaneously by providing a lockout signal to disable breaker closure for generator set(s) in the system which have not been

selected to be the first unit to close to the bus. Controls to recognize the failure of the first breaker signaled to close, and allow system operation to proceed despite this failure shall also be provided (breaker failure alarm). Systems using dead bus relay schemes without a disable signal to positively prevent out-of-phase paralleling shall not be acceptable under this specification. System shall include an independent backup to automatically operate if the primary system fails. System shall utilize back-up/redundant control/auxiliary power systems if the primaries fail.

5. Synchronizer to electronically adjust the engine governor to match the voltage, frequency and phase angle of the bus. Synchronizer shall maintain the engine-generator voltage within 1% of bus voltage and phase angle within 20 electrical degrees of the bus for 0.5 seconds before circuit breaker closing. Each unit shall have its own synchronizer; systems using a switching scheme to use a single system synchronizer will not be acceptable. Synchronizers and systems which utilize a motor driven pot for control of AC voltage during the synchronizing process will not be acceptable. The system shall be provided with a fail to synchronize time delay that is adjustable from 10-120 seconds. Control logic for fail to synchronize function shall allow field adjustment of function for either alarm or shutdown of the generator set on failure condition. Synchronizer shall be a product of the generator set governor manufacturer for guaranteed compatibility and performance. System shall include provisions for manual initiations of synchronizing each generator with associated relays and protective features and lockouts.
6. Controls shall include a permissive relay function to assure that the generator set does not attempt to close out of phase with the bus, due to errant operation of the synchronizer.
7. Controls shall include a permissive (sync check) function, to be used with "generator synchronized" indicator during manual paralleling, to prevent accidental closure of the breaker with the generator set out of phase with the bus. Provisions to allow manual closure of the first generator set to a de-energized bus shall be included.
8. Control equipment shall contain a system of diagnostic LED's to assist in analyzing proper system function, as well as a graphical diagram of the power distribution having all control, safety, and alarm points on an HMI screen in the front door of an auxiliary section cubicle,.
9. Controls shall include three phase sensing reverse power equipment, to prevent sustained reverse power flow into the generator set. When the reverse power condition exceeds 10% of the generator set kW for 3 seconds, the paralleling circuit breaker shall be tripped open and the generator shut down.
10. Controls shall be provided to verify generator set and bus phase rotation match prior to closing the paralleling breaker.
11. Microprocessor-based alternator overcurrent
12. alarm and shutdown protection. This protection is required in addition to the overcurrent trip on the paralleling breaker, and shall sense current flow at the generator set output terminals. The overcurrent alarm shall be indicated when the load current on the generator set is more than 110% of rated current for more than 60 seconds. The overcurrent shutdown shall be matched to the thermal damage curve of the generator set, and shall not have an instantaneous function.
13. Microprocessor-based alternator short circuit protection. This protection is in addition to the overcurrent trip on the paralleling breaker. The short circuit shall occur when the load current on the generator set is more than 175% of rated current and an aggregate time/current calculation indicates that the system is approaching the thermal damage point of the alternator. The equipment used shall not have an instantaneous function
14. Provide overcurrent and short circuit protection for the feeder connecting the generator set to the paralleling switchgear. This protection may be integrated with alternator protection but must be positively coordinated to prevent tripping of the paralleling breaker prior to the operation of the alternator protective equipment.
15. Controls shall be provided to sense loss of excitation of the alternator while paralleled to the system bus.
16. Generator set start contacts rated 10 amps at 32 VDC. A redundant network-based

starting system shall also be provided.

17. The control system shall monitor the paralleling breaker auxiliary contacts, and initiate a fault signal if the breaker fails to close within an adjustable time delay period after the control has signaled it to close (0.5-15 seconds). Breaker failure alarm shall cause the paralleling breaker to trip open, and lock out until manually reset.
18. Controls shall be provided to initiate an alarm condition when generator set is at 90% of rated frequency for more than 10 seconds.
19. Controls shall be provided to shut down generator set and initiate alarm when the generator set is at less than 85% of nominal voltage for more than 10 seconds, more than 110% of nominal voltage for more than 10 seconds, or more than 130% of nominal.
20. All trip conditions shall result in opening of the respective circuit breaker(s) and require manual reset from a hard lockout (86 device).

- B. Provide a redundant master controller. The redundant controller will automatically take over all functions if the primaries controller fail.
- C. BacNet and ModBus TCT/IP communications protocols for annunciation of all control, alarm, metering and monitoring points.

## 2.7 PROTECTIVE RELAYS, SYNCHRONIZING RELAYS, INSTRUMENTS, AND CONTROLLERS

### A. Repetitive Accuracies:

1. Repetitive accuracies for solid state protective relays, devices, controls and monitors shall be compatible with respective devices and not exceed stated values for AC powered devices over a voltage range of 70-110% of nominal, and for DC powered devices, over a voltage range of 20 to 40-volt DC.
  - a. Voltage:  $\pm 2\%$  of setpoint over a frequency range of 40-70 Hz.
  - b. Current:  $\pm 3\%$  of setpoint over a frequency range of 40-70 Hz.
  - c. Frequency:  $\pm 0.2$  Hz.
  - d. Power:  $\pm 3\%$  of setpoint over a frequency range of 40-70 Hz., across a power factor range of 0.2 to unity, leading or lagging.
  - e. Voltage Difference:  $\pm 1.0$  volt over a frequency range of 40-70 Hz.
  - f. Frequency Difference:  $\pm 0.05$  Hz.
  - g. Relative Phase Angle:  $\pm 1.0^\circ$  at 50 60 Hz.
2. Environmental Conditions: Solid state circuitry, controls, relays, timers, monitors, etc. shall meet the following environmental conditions.
  - a. Temperate range:  $0^\circ\text{C}$  to  $+ 55^\circ\text{C}$ . Protective Relays: Provide utility grade (minimum Class 100) relaying instruments for each circuit breaker and system level controls. Protective relay package (Generator Protection Package) shall be utility grade with multiple integrated circuit protective relays combined into a single protection package device. Package shall include the following protective relay functions.
    1. Directional Power Relay: Provide directional power protection to open the circuit breaker in the event of a power reversal in the generator supply circuit.
    2. Voltage/Frequency Stabilization Relay: Provide voltage/frequency stabilization protection to prevent synchronizing operation of the circuit breaker unless voltage and frequency of the generator are within settable limits for a selected period of time.
    3. Overcurrent Ground Relay: Provide overcurrent ground protection to provide audible and visual display by means of a local and remote annunciator in the event of a ground fault.
    4. Locking-Out Relay: Provide locking-out relays to prevent circuit breaker closing in the

- event of other protection device operations.
5. Synchronizing Relay: Provide synchronizing relays to allow the closing of the circuit breaker upon either manual or logic commands. Provide with dead bus option.
  6. Synchronizing Control: Provide engine governor control to control engine speed for a paralleling sequence and for load pick-up. Control furnished to match the engine-generator supplier's requirements. Synchronizing controller to provide breaker close signal output.
  7. Bus Under Frequency Relay: Provide under frequency relay for input to control PLC to indicate system overload.
  8. Synchroscope: ANSI C39.1; rotary synchroscope with 4.5-inch square recessed case and divided scale indicating SLOW/FAST, white dial with black figures and pointer, 2-degree accuracy.
  9. Synchronizing Lights: Two LED lamps, lamps dark mode.
  10. Frequency Meter: 4.5-inch square recessed case, pointer type, frequency span - 55/65 Hertz.
  11. Current Transformers: ANSI C57.13; Five ampere secondary, bar or window type, with single secondary winding and secondary shorting device, primary/secondary ratio as required, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.
  12. Potential Transformers: ANSI C57.13; 120-volt single secondary, disconnecting type with integral primary and secondary fuses, primary/secondary ratio as required, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.
  13. AC control circuit shall be protected with line and load side fused which are installed in safety type fuse blocks. Provide visible blown indication for each fuse.
  14. Synchronizing Selector Switch: Rotary multi-stage snap-action type with silver plated contacts, engraved escutcheon plate, oval type handle, and three positions including OFF-MANUAL-AUTOMATIC.
  15. Governor Speed Setting Potentiometer: Rotary, oval handle, momentary contact type with silver plated contacts, engraved escutcheon plate, three position RAISE-OFF-LOWER control.
  16. Circuit Breaker Control Switch: Rotary, oval handle, momentary contact type with silver plated contacts, engraved escutcheon plate, two position ON-OFF control.
  17. System PLC: Programmable logic controller with interface keypad and LCD screen, complete with com port for software changes. Provide programming for all necessary inputs and outputs for system operation.

C. Digital Power Metering:

1. Provide a multifunction digital meter at each generator circuit breaker and control section for generator metering. Each meter shall include a communication module to permit information to be sent to a central monitoring computer for display, analysis, and logging and BacNET and ModBus TCP/IP communications protocols.
2. System programming and setup shall be stored in non-volatile memory and retained in the event of a power interruption.
3. Digital meters shall be equipped with the following I/O: eight (8) solid state status inputs, four (4) relay output contacts minimum.
4. Include LCD back-light display, installed semi-flush in the front of the paralleling distribution equipment. Values shall be displayed using menu scroll buttons. The following metered readings shall be displayed and communicated.
  - a. Current, per phase RMS and neutral.
  - b. Current unbalance %.
  - c. Voltage, phase to phase and phase to neutral.
  - d. Voltage unbalance %.
  - e. Real power (KW), per phase and 3-phase total.
  - f. Apparent power (KVA), per phase and 3-phase total.



- g. Reactive power (KVAR), per phase and 3-phase total.
- h. Power factor, 3-phase total and per phase.
- i. Frequency.
- j. Accumulated energy (MWH, MVAH and MVARH) - Reset of accumulated energy parameters shall be allowed from the front of the Data Monitor.

## 2.8 SYSTEM CONTROL POWER

- A. Control power for the paralleling and distribution equipment shall be derived from the generator starting batteries; 24 Volt DC, and supplemented with addition or dedicated batteries/systems where load necessitates.
- B. The control logic shall be powered through a suitable means which shall permit continuity of power until the last battery is no longer available. The controls shall be powered from any battery or combination of batteries and prevent feedback to a failing battery. The transition of control logic power from any battery combination to any other battery combination shall be accomplished without disruption in the power flow. Primary and backup systems capable of individually accommodating full connected load shall be provided,
- C. Provide a solid state, no break "best battery" selector system. The system shall automatically select the alternative battery string for control voltage if the primary battery string has failed. The battery banks of each individual generator system shall be isolated to prevent the failure of any one battery from disabling the entire system.
- D. Control power shall be backed up by a stand-alone Uninterruptable Power Supply (UPS) mounted remotely within the control cabinet of the switchgear. The UPS shall be sized to power all control systems. The UPS shall be networked into the existing building automation system for alarms and outages. UPS shall be GE LP11 series unit 10kVA or approved equal.

## 2.9 INDICATION

- A. Operating and safety indications, protective devices, alarms, basic system controls, engine gauges, and transfer switch statuses shall be grouped in a common control and monitoring panel mounted on front face of the paralleling distribution equipment. The indications components shall be displayed from the master control system HMI graphical display..
- B. Provide a lamp test push button. The test button shall cause all indication lamps on the paralleling and switchboard equipment to be simultaneously tested.
- C. Provide a master audible alarm. The alarm horn shall be the DC vibration type. Provide with an alarm horn silence button.
- D. Provide indication in compliance with NFPA 110 for a Level 1 system. Include the listed pre-alarm and alarm points, audible alarm, alarm silencing means, repetitive alarm circuitry, and lamp test switch in main control section of the paralleling distribution equipment as required and needed. Provide all interconnecting wiring in conduit per manufacturer's requirements by the Electrical Contractor. The remotely reported alarms shall include the following generator and paralleling equipment indications.
  - 1. LAMP ALARM
  - 2. FUNCTION COLORHORN
  - 3. Overcrank Red Yes
  - 4. Low water (engine) temperature Red Yes

5. High engine temperature pre-alarm Amber
6. High engine temperature Red Yes
7. Low lube oil pressure pre-alarm Amber
8. Low lube oil pressure Red Yes
9. Overspeed Red Yes
10. Under frequency Red Yes
11. Under voltage Red Yes
12. Over voltage Red Yes
13. High battery voltage Amber Yes
14. Low battery voltage Amber Yes
15. Battery charger failure (includes AC failure) Amber Yes
16. Loss of excitation Red Yes
17. Low fuel main tank Amber Yes
18. Low fuel daytank Amber Yes
19. Rupture basin alarm Red Yes
20. Reverse Power Red Yes
21. Phase rotation Red Yes
22. Failure to sync generators Amber Yes
23. Ground fault Amber Yes
24. Over current alarm Red Yes
25. Generator breaker failure Red Yes
26. Generator breaker trip Red Yes
27. Breaker open (generator) Green
28. Breaker closed (generator) Red
29. Timer for generator start and transfer Green
30. Timer for generator shutdown. Green
31. Generator running Green
32. Normal utility power Green
33. Emergency Power Supply (EPS) supplying load Green
34. Not in auto Red Yes
35. Emergency stop Red Yes
36. Emergency Power Off Switch activated (EPO) Red Yes
37. Manual Paralleling available Green
38. Load Shed Circuit Activated (one for each priority) Amber Yes
39. Load Shed Bypass (one for each priority) Amber
40. Generator Locked out (one for each generator) Red Yes
41. System PLC Stopped Red Yes
42. PLC Power Source Failure Red Yes
43. Emergency Bus Optimization Active Amber
44. Load Demand Active Amber
45. Bus loaded to Capacity Red Yes
46. Bus Optimization Stopped Adding Red Yes
47. Indicator Lamps: High intensity LED type liquid crystal display LCD type.
48. Door-mounted control components shall be industrial oil-tight type devices.
49. Alarm Horn: Provide an alarm horn silence button labeled alarm silence in the front face of the paralleling distribution equipment.

E. Five Position Engine Control Switch Operation:

1. Provide a five-position engine control switch for each generator.
2. Provide labels with 1/2" letters for each switch position.
3. Stop/Reset: In this position, the engine shall not be capable of starting and/or running. If the engine was shut down due to the operation of a protective device, the shutdown malfunction shall be reset when the switch is moved to this position for hard lockout requiring manual reset. If the engine is running when the switch is moved to this position, it shall be immediately shutdown.

4. Off/Cool down: In this position, the engine shall shutdown after a cooldown period.
5. Automatic: In this position, the engine control shall be in readiness for fully automatic operation upon receipt of a start signal.
6. Test Off-Line: When placed in this position, the engine shall start and run as if a start signal were received except it shall not be connected to the bus unless a start signal is received. When returned to the automatic position, the engine will shut down.
7. Test On-Line: When placed in this position, the engine shall start, run and connect to the bus as if a start signal were received. When returned to the "Automatic" position, the circuit breaker will open and the engine will run for its cool down period before shutting down.

F. Operator Panel: Provide an operator panel for each generator set and automatic transfer switch. The generator operator panel shall provide the following information.

1. Provide the following instrumentation information for each generator and automatic transfer switch: Amps, voltage L-L and L-N, frequency, watts, volt-amps, KWH, power factor, with a digital display.
2. Generator set mode indicating: manual operation, emergency, cooldown, stop, lockout, or auto.
3. Other generator and automatic transfer switch information: warnings, alarms, demand as a percentage of unit capacity.
4. Screen to display control, data, performance, present run time, total run time, and all indications/alarm reported at the generator control panel.
5. Engine cool down time: Adjustable 0-600 seconds. The control panel shall indicate the time remaining in the time delay period for each generator when the generator is timing for shutdown.
6. Generator start time delay: Adjustable 0-60 seconds. The control panel shall indicate the time remaining in the time delay period when the generator is timing to start.
7. Provide a visual indication of the status and position of each transfer switch at the main control panel of the paralleling distribution equipment.
8. Provide red LED for normal and emergency position.

G. Provide SCADA diagram indicating generator set and automatic transfer switch status and position on LCD monitor on HMI display.

## 2.10 MASTER CONTROLLER STATION DISPLAY

- A. Provide a system master control to monitor and control the operation of the entire paralleling distribution system and generator set controls, including automatic transfer switch.
- B. The master control station interface shall be displayed through a liquid crystal display LCD screen. LCD display shall be full color, high resolution, human machine interface (HMI). The screen shall be sized appropriately for the amount of system information, minimum 14-inch screen.
- C. Provide a redundant master control station display. The redundant screen will display all the same information as the primary screen.
- D. Components displayed on the HMI display shall be designated as indicated on the plans. The display shall include the following screens/functions.
  1. Main Menu Screen: Provide a main menu for ease of navigation through the various screens. The display shall turn return to the main screen and the display shall turn off after 10 minutes without human input.

2. One Line Diagram Screen: Provide a one-line diagram screen showing the system status of the following components by a combination of animation, changing color indicators, text messages, and pop up indicators.
  - a. Generators:
  - b. Paralleling distribution equipment
  - c. Automatic transfer switches including position:and status indications
  - d. Generator circuit breaker with status indications.
  - e. Main tie main circuit breakers with status indication.
  - f. Paralleling circuit breaker with status indication.
  
3. Generator Set Screen: Provide a generator set screen for each unit. Screen to display control, data, performance, present run time, total run time, and all indications/alarm reported at the generator control panel.
  - a. Provide the following instrumentation information for each generator: engine rpm, oil pressure, coolant temperature, DC voltage, engine hours, genset KW hours, number of starts, generator and bus line to line voltage on all phases, generator and busline to neutral voltage on all phases, generator and bus frequency, generator and load current, power factor, kVAR and kw, and power factor.
  
4. Load Control Screen: Provide a load control screen to display the following information and allow the following operations.
  - a. Display the paralleling bus capacity in KW, KVA, and Amps
  - b. Display the total load in KW, KVA, and amps.
  - c. Display loads served by priority level. Refer to drawings and operations systems operation portion of this section for complete list of priorities. In general, the priorities will be categorized as indicated on drawingst.
  - d. Operation: Allow user to manually shed or restore loads from the display screen.
  
5. History and alarms screen: Provide a history and alarm screen which provides a history of all historical operations and alarms with time stamp. Provide capability of storing 100 events. New events shall override the oldest stored information after the log is full. The historical events screen shall not be allowed to be cleared or erased. Each event shall be logged by date, time, alarm description, and time of alarm acknowledgement.
6. The following functions may be provided on separate screens or included on the above screens as a subcategory.
  - a. Allow the operator to enable or disable load demand operation.
  - b. Initiate test (with or without load).
  - c. Control the shutdown sequence for the generator sets in the load demand mode.
  - d. Set the load demand time delays.
  - e. Set the load demand operation setpoints.
  - f. Display and modify the automatic load add and shed sequence.
  - g. Manually start and stop each generator.
  - h. Generator set mode indicating: manual operation, emergency, cooldown, stop, lockout, or auto.
  - i. Other generator information: warnings, alarms, demand as a percentage of unit capacity.
  - j. Trending information: Display KW, KVA, and frequency for each generator and the total load for the system.
  - k. Engine cool down time: Adjustable 0-600 seconds. The control panel shall indicate the time remaining in the time delay period for each generator when the generator is timing for shutdown.
  - l. Generator start time delay: Adjustable 0-60 seconds. The control panel shall

indicate the time remaining in the time delay period when the generator is timing to start.

7. Security Log-in: Provide provisions for a security log-in function to prevent unauthorized use of the system. Provide three levels of access.

- a. Security Levels:

- 1) Monitor only: Access to all status screens, history, and alarm logs. No access to set points, engine controls, circuit breaker controls, or system status functions.
- 2) Monitor and Control: Access to system controls, functions, and basic system adjustable set points.
- 3) Administrative Technician: Access to all set points including factory established set points and calibration.

## 2.11 MANUAL SYNCHRONIZING CONTROLS

- A. Provide manual synchronizing controls for each generator. The manual synch controls shall be provided separately from the LCD human machine interface via manual selector switches in the vicinity of sync-check indicators/protective features.
- B. Provide a synch scope for each generator. The synch scope shall be a digital display, mechanical display in the face of the switchboard.
- C. Provide protective provisions so that the manual synch provisions will not allow a user to manually synch the generators in a dangerous situation which may damage the generators or paralleling equipment due to frequency, voltage, phase and speed imbalances/abnormalities.
- D. Provide a separate LED indication in the switchboard for each generator to indicate successful synchronization.

## 2.12 NEUTRAL GROUNDING RESISTORS

- A. One neutral grounding resistor shall be provided for each engine/generator system. The Neutral grounding resistor shall be rated 14,400 V line-to-neutral, 200A, 10 sec (or as recommended by manufacturer). Each resistor shall be provided with an appropriate current transformer for ground fault sensing. The neutral grounding resistor shall be provided in a steel enclosure suitable for outdoor installations with a solid top and screened or louvered side panel.

## 2.13 SYSTEM OPERATION

- A. **See specification section 010400-1.3 for Operating System Logic requirements.**
- B. Normal Condition:
  1. Operate as a paralleling standby system as indicated on the drawings..
  2. Under normal conditions, all generator breakers will be open, and the packaged engine generators will not be running.
  3. The utility source will be supplying the entire load through the normal distribution system.
  4. The automatic paralleling engine starting controls are placed in their automatic position

and the engine generators are in a state of standby.

C. Automatic Mode:

1. Start signal from any transfer switch shall automatically start all engine generators which have not been locked out.
2. The first generator to reach 90% of rated voltage and frequency is connected to the emergency bus through its associated paralleling circuit breaker.
3. Electronic interlocks permit the connection of only one generator.
4. The transfer switches sense available emergency power.
5. Loads shall close to the emergency bus.
6. Loads shall be fully operational within 10 seconds or less after losing utility power.
7. The paralleling equipment shall have provisions to maintain "transfer inhibit" output contact to inhibit other priority loads from transferring to the emergency bus until all generators are paralleled on the emergency bus.
8. The synchronizers shall automatically adjust the frequency of the other generator to achieve synchronism with the emergency bus. When within acceptable limits of synchronizing the on-coming generator shall close to the emergency bus through its associated paralleling circuit breaker.
9. When the generators are paralleled their governors shall be connected for load sharing operation.
10. Generators which have been locked out for maintenance or other reasons shall not inhibit the system from continuing past this step of the sequence.
11. Utility (Normal) Power Returns:
  - a. The transfer switches shall automatically transfer to the normal utility power source after utility power returns after an adjustable delay of ten minutes of continuous normal power is sensed. If normal power is lost during this delay, the times shall restart when normal power is restored.
  - b. When all loads have been transferred to the normal utility and all start signals have been removed from the generator sets, the circuit breakers in the paralleling equipment for each generator set shall open. The generators shall operate at no load for a cool down period of 15 minutes. The cool down period shall be adjustable from 10-30 minutes.
  - c. The generators shall shut down after the cool down period.
  - d. If a system start signal is received during the cool down period the automatic operation sequence shall be initiated again.
12. Special Conditions:
  - a. Bus under frequency relay shall initiate for bus frequency below 58 Hz. System PLC shall initiate "Load Shed" contact when bus under frequency condition is maintained for continuous 5 seconds. "Load Shed" contact shall initiate disconnecting from emergency source. Load shed operation shall require manual reset to restore shed transfer switches to emergency source.
  - b. Should an engine generator set fail to start, fail to automatically parallel or develop a critical running monitored fault, the control system shall cause the engine to automatically shut down with its circuit breaker automatically tripped open. The paralleling system would then load shed.
  - c. If the facility experiences a partial normal power outage, only those automatic transfer switches shall detect a power failure. This action shall prompt the system to automatically add load, to the bus. If subsequent normal power failures occur at other transfer switches the system shall automatically maintain the connected load accordingly as the generator capacity permits.
  - d. If the engine fails to start after 4 adjustable cranking attempts (factory set at 10 seconds on, 10 seconds off, adjustable from 5 to 30 seconds) or if any protective

device should operate while the engine is running, the engine shall be disconnected from service and immediately stopped. The engine control logic shall lock the failed set out of service and require a manual reset. The engine control logic shall include a provision for conversion to single cycle cranking, adjustable from 35 to 210 seconds.

D. Manual Operation:

1. System in manual shall require manual initiating of engine/generators. Initiation from system PLC shall start and synchronize both generators. Initiation from each engine generator shall require manual synchronizing and paralleling.
2. Relay interlocks shall inhibit the manual paralleling of generators in an unsafe condition.
3. System in manual shall disable system "Transfer Inhibit" and "Load Shed" functions.

E. Test Mode:

1. The system shall allow the generators to be tested by transfer of the system loads to the generator sets from the transfer switches. Loads shall be transferred to the emergency power supply system similar to the automatic operation control sequence.

F. Generator Set Exercise (Test Without Load Mode):

1. The system shall allow testing of the generator sets at no load. In this operation mode the generator sets will start, build up to rated speed and voltage, synchronize and close to the generator bus, but system loads shall not automatically transfer to the generator system. If a power failure occurs during a test period, loads shall immediately close into the system on a priority basis.

G. Load Demand:

1. After all generator sets have been paralleled to the bus and all loads connected, a stabilization time delay (0-15 minutes) factory set at 15 minutes will be initiated. At the expiration of the time delay period, the system will operate in a load demand mode. The load demand control logic and its associated controls both generating sets on the bus, and load-share accordingly.
2. Upon sensing that the connected load has decreased the reserve capacity to 10% or less, a 10-second time delay is initiated. This time delay will be field adjustable from 0-300 seconds. If the reserve capacity stays below 10% for the duration of the time delay, the controls will initiate an alarm. If, during the time delay period, the reserve capacity decreases to 0 or less (signifying bus overload), the time delay will be bypassed and an alarm will be immediately generated.
3. Should the load exceed the full rated capacity of a single generator set, an alarm shall be immediately generated, but all loads shall remain connected. Loads shall only drop/be disconnected as a last resort from generator protective devices.

2.14 ACCESSORIES

A. DC Control Power: Diode power supply for best battery arrangement connection to both engine battery systems.

B. Auxiliary Contacts:

1. Provide 4 N.O., 4 N.C. spare independent auxiliary contacts, 120 volt, 10 amp, which

change state when each diesel generator is to start. Reverse state when units are to stop. Provide separate contacts in paralleling equipment for each unit.

- C. Emergency Power Off Switch (EPO): The emergency stop switch shall be red, mushroom head switch, with protective Lexan cover, mounted in the face of the main control panel of the paralleling distribution equipment , at each generator, outside of each room housing generators, each automatic transfer switch, and each remote annunciator panel.
- D. Paralleling Switchgear Remote Annunciator Panel:
  - 1. Remote HMI and indicator annunciator to duplicate all status and points as specified in generator control section. Remote annunciator shall be powered from the paralleling distribution equipment.
  - 2. Located as shown on drawings. Provide (2) panels and associated interconnecting wiring.
- E. A mimic bus shall be provided on the front of all equipment to diagrammatically show the internal bus structure of the lineup. Mimic bus material shall be adhesive vinyl strips OR 1/16-inch minimum thick 1/2" minimum high/wide melamine plastic laminate, attached to the equipment using mechanical fasteners or screws. The mimic bus color shall match the system colors specified in the Electrical Identification Specification 26 05 53.
- F. Accessory Set: Furnish tools and miscellaneous items required for circuit-breaker and switchgear test, inspection, maintenance, and operation.
  - 1. Racking handle to manually move circuit breaker between connected and disconnected positions.
  - 2. Maintenance tool for manually charging the breaker closing spring and manually opening the shutter.
  - 3. Test jumper for electrically operating the breaker while out of its compartment.
  - 4. Breaker lifting yoke used for attachment to breaker for lifting breaker on or off compartment rails.
  - 5. Set of rail extensions and rail clamps.
  - 6. Portable test set for testing all functions of circuit-breaker, solid state trip devices without removal from switchgear.
  - 7. Meter test plugs suitable for testing switchgear meters.
- G. Circuit breaker Removal Apparatus: Overhead circuit-breaker lifting device, track mounted at top front of switchgear and complete with hoist and lifting yokes matching each size of drawout circuit breaker installed. Mounting and location coordinated with entry locations to prevent conflict and interference with utilities, systems, services, and other connections.
- H. Circuit-Breaker transport Dolly/Cart: Provide portable hoist for removing, installing, and transporting circuit breakers.
- I. Storage for Manual: Include a rack or holder within auxiliary compartments for copies of operation and maintenance manuals.



## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install distribution paralleling equipment in accordance with manufacturer's written guidelines and instructions.
- B. Installation of equipment shall include all interconnecting wiring between equipment provided for the emergency power supply system. The contractor shall also provide interconnecting wiring between equipment section when required, under the supervision of the equipment supplier.
- C. Verify adequate clearance to paralleling and distribution switchboard equipment prior to installation.
- D. Install paralleling and distribution switchboard on concrete housekeeping pads. Inspect concrete pads for level prior to installation.
- E. Tighten accessible bus connections and mechanical fasteners after placing switchboard.
- F. Install fuses.

### 3.2 INSTALLATION OF CONTROLS FURNISHED BY ENGINE-GENERATOR SUPPLIER

- A. Switchgear manufacturer shall mount and wire all electronic and electric controls associated with the engine-generator set governor, automatic transfer switches, and voltage regulator as described in the engine-generator set specifications. Controls may include, but not be limited to:
  - 1. Electronic control portion of governor.
  - 2. Frequency adjust potentiometer.
  - 3. Cross current compensation transformer.

### 3.3 FIELD QUALITY CONTROL

- A. Inspect completed installation for physical damage, proper alignment, anchorage and grounding.
- B. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each. Test voltage shall be 1000 volts, and a minimum acceptable value for insulation resistance is 2 megohms.
- C. Check tightness of accessible bolted bus joints using a calibrated torque wrench. Tightness shall be in accordance with manufacturer's recommended values.
- D. Physically test key and mechanical/electrical interlock systems and sequence of operations, including all safety, as well as protective features to verify proper functionality.
- E. The Factory Technician shall perform the following series onsite, as well as those indicated in NETA ATS.:
  - 1. Verify contractor connections, control power availability, visually inspect relay settings,

- verify megger test of the generator cables and the main bus.
2. With the engine generator supplier's technical representative controlling the engine, verify that the switchgear and control equipment are fully operational and perform per the sequence of operation specified. Equipment or services required for load or performance testing of the engines shall be provided by the engine generator set supplier.
  3. With the engine generator supplier's technical representative controlling the engine, demonstrate all functions of the control system, both automatic and manual.
  4. Provide documentation in the form of function checklists and recorded data for each section to the approving Architect/Engineer.

#### 3.4 ADJUSTING AND CLEANING

- A. Provide field services as required in conjunction with manufacturer for system start-up and testing as described in Section 233213.
- B. Verify proper phase rotation between the individual generators of the emergency power system and the utility source.
- C. Adjust all operating mechanisms for free mechanical movement.
- D. Touch up scratched or marred surfaces to match original finish.
- E. Adjust trip and time delay settings to values as determined by equipment manufacturer's/vendors and in accordance with the results of overcurrent protective device coordination studies, or as instructed by the Architect/Engineer.
- F. Make necessary adjustment and debugging at terminal locations to obtain correct data and access for revising set points for operation.

#### 3.5 RELAY COORDINATION

- A. The switchboard supplier and contractor shall be responsible for relay coordination of generator protection package as required for reliable system operation and equipment protection. All documentation and settings shall be submitted to the Architect/Engineer for review prior to start-up in accordance with the results of the overcurrent protective device coordination studies.

#### 3.6 SYSTEM COMMISSIONING (ON-SITE ACCEPTANCE TESTING)

- A. The complete installation shall be tested for compliance with the specification following completion of all the complete emergency power supply system.
- B. The date and times for the system commissioning shall be coordinated to allow representatives from the following groups to attend: Owner representatives, Architect/Engineer, appropriate contractors, factory representatives. The contractor and factory representatives shall actually conduct the tests as outlined in the commissioning report.
- C. The requirements associated with the emergency power supply system commissioning report shall be provided by the Generator vendor prior to the test. The detailed requirements of the test have not been included in this section. In general, the requirements will include the following items:
  1. Explanation of emergency power supply system for owner's representatives.

2. Cold start test of the generators.
3. Simulated utility power outage.
4. 4-hour full load test; contractor shall provide load banks if required.
5. One step rated load pickup test in accordance with NFPA 110.
6. Simulate power outage at each transfer switch.
7. Verify successful automatic restart of all mechanical, electrical, other systems which are connected to the emergency power system after a simulated power outage. Example: motors shall be tested for proper phase rotation, VFDs programming shall be tested for automatic restart.

### 3.7 FUNCTIONAL TESTING

- A. Paralleling gear manufacturer shall coordinate with generator manufacturer for conducting a fully functioning test of the gear and the generator sets at the factory.
- B. The equipment shall be factory tested to simulate a complete and integrated system. The circuit breakers supplied shall be installed in their actual positions and electrically and mechanically tested. A narrative of the system operation shall be provided and shall be used when testing the equipment. Copies of the test reports shall be submitted to the Architect/Engineer.
- C. Functional test shall simulate field installed conditions including transfer switch controls, load shedding, load sense demand and fault conditions. Testing shall include, not limited to, the following:
  1. Connect genset to fuel source in testing area.
  2. Connect to resistive load banks and any applicable test cell devices.
  3. Connect to switch-gear for full function testing.
  4. Perform test comprised of:
    - a. 1/4-hour warmup period.
    - b. 1 hour @ 25% load.
    - c. 1 hour @ 50% load.
    - d. 1 hour @ 75% load.
    - e. 1 hours @ 100% load.
    - f. 1/4-hour cooldown period.
  5. Computer generate a record of time, kW, voltage, amperage, RPM, water temperature, plus any additional engine instruments at 15-minute intervals plus certified strip chart recording during load step changes and transient periods of test. Two (2) copies of standard certified test reports to be supplied immediately upon completion of test. All testing to be performed at system rated power factor.
  6. Witness of test shall be at engine dealer discretion; however; any transportation, lodging, or meals for these personnel shall be the responsibility of the Contractor.
  7. Disconnect after test.
  8. Touch up paint and prepare for shipment.
- D. The following tests shall be documented during the witness test:
  1. Dielectric Test (Per ANSI C37.20.2, 5.3.1).
  2. Mechanical Test (Per ANSI C37.20.2, 5.3.2).
  3. Grounding of Instrument Transformer Case Test (Per ANSI C37.20.2, 5.3.3).
  4. Electrical Operation and Control Wiring Test (Per ANSI C37.20.2, 5.3.4.1).
  5. Polarity Test (Per ANSI C37.20.2, 5.3.4.3).
  6. Sequence Test (Per ANSI C37.20.2, 5.3.4.4).

- E. All additional circuit-breakers shall be field tested as noted above and returned to its crate for storage.
- F. A report of all testing and results shall be submitted to the Owner for record.

### 3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the distribution switchgear.
- B. All on-site training shall be digitally recorded by the Contractor. The digital video files are to be turned over to the Client Agency.

END OF SECTION

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## SECTION 263213.13 - DIESEL-ENGINE-DRIVEN GENERATOR SETS

### PART 1 - GENERAL

#### 1.1 STIPULATIONS

- A. The specifications sections " General Conditions of the Construction Contract ", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

#### 1.2 SUMMARY

- A. Section Includes:

1. Diesel engine.
2. Diesel fuel-oil system.
3. Control and monitoring.
4. Generator overcurrent and fault protection.
5. Generator, exciter, and voltage regulator.
6. Load bank.
7. Vibration isolation devices.

- B. Related Requirements:

1. Section 261335 "Distribution Switchgear Medium Voltage 15kv" for controls and paralleling equipment for large or multiple parallel engine generators.
2. Section 263343 "Battery Chargers" for remote engine battery chargers.

#### 1.3 DEFINITIONS

- A. EPS: Emergency power supply.
- B. EPSS: Emergency power supply system.
- C. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Include thermal damage curve for generator.
3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.

5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
6. Include airflow requirements for cooling and combustion air in cubic feet per minute at 0.8 power factor, with air-supply temperature of 95, 80, 70, and 50 deg F. Provide Drawings indicating requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.
8. Include control diagrams and sequence of operations for paralleled generator controls. Controls shall be coordinated with Paralleling Distribution Switchgear submittals.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for engine generators and functional relationship between all electrical components.

## 1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for engine generator, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight, skid-mounted load bank, and each piece of equipment not integral to the engine generator, and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Source Quality-Control Reports: Including, but not limited to, the following:

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
5. Report of sound generation.
6. Report of exhaust emissions showing compliance with applicable regulations.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

C. Field quality-control reports.

## 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.
  - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
    - b. Operating instructions laminated and mounted adjacent to generator location.
    - c. Training plan.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
  - 2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
  - 3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
  - 4. Belts: One set of each type and size.
  - 5. Tools: Each tool listed by part number in operations and maintenance manual.

## 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Testing Agency Qualifications: Accredited by NETA.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

## 1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 2 years from date of Substantial Completion.

## 1.10 Generator Controls

- A. All aspects related to generator control system (programming elements and password access) shall be open source to permit facilities team to gain access to controls and make adjustments as necessary. Proprietary systems are not permitted. See specification section 010400-1.3 for Operating System Logic requirements.



## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include the following:
  - 1. Caterpillar, Inc.; Electric Power Division.
- B. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Engine generator housing, day tank, engine generator, batteries, battery racks, silencers, load banks (as Base Bid #2 and 3), sound attenuating equipment, accessories, and components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
  - 2. Shake-table testing shall comply with ICC-ES AC156. Testing shall be performed with all fluids at worst-case normal levels. Water shall be substituted for diesel fuel in fuel tank during test.
  - 3. Component Importance Factor: 1.5.
- B. B11 Compliance: Comply with B11.19.
- C. NFPA Compliance:
  - 1. Comply with NFPA 37.
  - 2. Comply with NFPA 70.
  - 3. Comply with NFPA 99.
  - 4. Comply with NFPA 110 requirements for Level 1 EPSS.
- D. Engine Exhaust Emissions: Comply with EPA Tier 2 (Base Bid #3, Tier 4) requirements and applicable state and local government requirements.
- E. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
- F. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
  - 1. Ambient Temperature: 41 to 104 deg F
  - 2. Relative Humidity: Zero to 95 percent.
  - 3. Altitude: Sea level to 1000 feet .

G. Unusual Service Conditions: Engine generator equipment and installation are required to operate under the following conditions:

1. High salt-dust content in the air due to sea-spray evaporation.

## 2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Power Rating: Prime Industrial Standby.

D. Overload Capacity: 110 percent of service load for 1 hour in 12 consecutive hours.

E. EPSS Class: Engine generator shall be classified as a Class

F. Service Load: 2500 kVA/2000kW.

G. Power Factor: 0.8, lagging.

H. Frequency: 60 Hz.

I. Voltage: 12470-V ac.

J. Phase: Three-phase, three wire, wye delta.

K. Induction Method: Naturally aspirated Turbocharged.

L. Governor: Adjustable isochronous, with speed sensing.

M. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and engine generator center of gravity.

N. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries, with capacity as required to operate as a unit as evidenced by records of prototype testing.
2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

O. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.

2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time:
  - a. Comply with NFPA 110, Type 10 system requirements.
  - b. 10 seconds.

P. Engine Generator Performance for Sensitive Loads:

1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.
  - a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.
2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
8. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.
  - a. Provide permanent magnet excitation for power source to voltage regulator.

10. Start Time:
  - a. Comply with NFPA 110, Type 10 system requirements.
  - b. 10 seconds.

Q. Parallel Engine Generators:

1. Automatic reactive output power control and load sharing between engine generators operated in parallel.
2. Automatic regulation, automatic connection to a common bus, and automatic synchronization, with manual controls and instruments to monitor and control paralleling functions.
3. Protective relays required for equipment and personnel safety.
4. Paralleling suppressors to protect excitation systems.
5. Reverse power protection.
6. Loss of field protection.

## 2.4 DIESEL ENGINE

A. Fuel: ASTM D975, diesel fuel oil, Grade 2-D S15.

B. Rated Engine Speed: 1800 rpm.

C. Lubrication System: Engine or skid-mounted.

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499 and with NFPA 110 requirements for Level 1 equipment for heater capacity.

E. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator set mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.

- a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and non-collapsible under vacuum.
  - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
  
- F. Muffler/Silencer:
  - 1. Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
    - a. Minimum sound attenuation of 25 dB at 500 Hz.
    - b. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be 78 number dBA or less.
  
- G. Air-Intake Filter: Standard Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
  
- H. Starting System: 24-V electric, with negative ground.
  - 1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
  - 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
  - 3. Cranking Cycle: As required by NFPA 110 for system level specified 60 seconds.
  - 4. Battery: Calcium lead alloy (4)x12V 1500CCA, 210Amp Hr. Coordinate "Battery Cable" Subparagraph below with Drawings.
  - 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
  - 6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
  - 7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
  - 8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
  - 9. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for lead-acid nickel-cadmium batteries. Unit shall comply with UL 1236 and include the following features:
    - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 to 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.
    - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    - d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.

- e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
- f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

## 2.5 DIESEL FUEL-OIL SYSTEM

- A. Comply with NFPA 37.
- B. Piping: Fuel-oil piping shall be Schedule 40 black steel, complying with requirements in Section 231113 "Facility Fuel-Oil Piping." Cast iron, aluminum, copper, and galvanized steel shall not be used in the fuel-oil system.
- C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.
- D. Fuel Filtering: Remove water and contaminants larger than 1 micron.
- E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
- F. Day Tank: Comply with UL 142, freestanding, factory-fabricated fuel tank assembly, with integral, float-controlled transfer pumps and the following features:
  - 1. Containment: Integral rupture basin with a capacity of 150 percent of nominal capacity of day tank.
    - a. Leak Detector: Locate in rupture basin and connect to provide audible and visual alarm in the event of day-tank leak.
  - 2. Tank Capacity: 275 gallons
  - 3. Pumps:
    - a. Provide pump package for fuel supply and return to main tank.
    - b. Pump Capacity: Exceeds maximum flow of fuel drawn by engine-mounted fuel supply pump at 110 percent of rated capacity, including fuel returned from engine.
  - 4. Low-Level Alarm Sensor: Liquid-level device operates alarm contacts at 25 percent of normal fuel level.
  - 5. High-Level Alarm Sensor: Liquid-level device operates alarm and redundant fuel shutoff contacts at midpoint between overflow level and 100 percent of normal fuel level.
  - 6. Piping Connections: Factory-installed fuel supply and return lines from tank to engine; local fuel fill, vent line, overflow line; and tank drain line with shutoff valve.
  - 7. Redundant High-Level Fuel Shutoff: Actuated by high-level alarm sensor in day tank to operate a separate motor-control device that disconnects day-tank pump motor. Sensor shall signal solenoid valve, located in fuel suction line between fuel storage tank and day tank, to close. Both actions shall remain in shutoff state until manually reset. Shutoff action shall initiate an alarm signal to control panel but shall not shut down engine generator.
  - 8. Tank shall be provided and installed by a qualified Tank Installer approved by PA DEP.

## 2.6 CONTROL AND MONITORING

- A. See specification section 010400-1.3 for Operating System Logic requirements.
- B. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- C. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts engine generator. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- D. Provide minimum run time control set for 10 minutes with override only by operation of a remote emergency-stop switch.
- E. Comply with UL 508A.
- F. Configuration:
  - 1. Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel shall be powered from the engine generator battery.
- G. Control and Monitoring Panel:
  - 1. Digital engine generator controller with integrated LCD display, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
  - 2. Analog control panel with dedicated gages and indicator lights for the instruments and alarms indicated below.
  - 3. Instruments: Located on the control and monitoring panel and viewable during operation.
    - a. Engine lubricating-oil pressure gage.
    - b. Engine-coolant temperature gage.
    - c. DC voltmeter (alternator battery charging).
    - d. Running-time meter.
    - e. AC voltmeter, for each phase connected to a phase selector switch.
    - f. AC ammeter, for each phase connected to a phase selector switch.
    - g. AC frequency meter.
    - h. Generator-voltage adjusting rheostat.
  - 4. Controls and Protective Devices: Controls, shutdown devices, and common alarm indication, including the following:
    - a. Cranking control equipment.
    - b. Run-Off-Auto switch.
    - c. Control switch not in automatic position alarm.

- d. Overcrank alarm.
- e. Overcrank shutdown device.
- f. Low-water temperature alarm.
- g. High engine temperature prealarm.
- h. High engine temperature.
- i. High engine temperature shutdown device.
- j. Overspeed alarm.
- k. Overspeed shutdown device.
- l. Low fuel main tank.

1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for duration required [for the indicated EPSS class] [in "Fuel Tank Capacity" Subparagraph in "Diesel Fuel-Oil System" Article].

- m. Coolant low-level alarm.
- n. Coolant low-level shutdown device.
- o. Coolant high-temperature prealarm.
- p. Coolant high-temperature alarm.
- q. Coolant low-temperature alarm.
- r. Coolant high-temperature shutdown device.
- s. EPS load indicator.
- t. Battery high-voltage alarm.
- u. Low cranking voltage alarm.
- v. Battery-charger malfunction alarm.
- w. Battery low-voltage alarm.
- x. Lamp test.
- y. Contacts for local and remote common alarm.
- z. Low-starting air pressure alarm.
- aa. Low-starting hydraulic pressure alarm.
- bb. Remote manual stop shutdown device.
- cc. Air shutdown damper alarm when used.
- dd. Air shutdown damper shutdown device when used.
- ee. Generator overcurrent-protective-device not-closed alarm.
- ff. Hours of operation.
- gg. Engine generator metering, including voltage, current, hertz, kilowatt, kilovolt ampere, and power factor.

H. Engine Generator Metering: Comply with Section 260913 "Electrical Power Monitoring and Control." Section 262713 "Electricity Metering." Section 260913 "Electrical Power Monitoring and Control" and Section 262713 "Electricity Metering."

I. Connection to Datalink:

- 1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.
- 2. Provide connections for datalink transmission of indications to remote data terminals via ModBus or Ethernet.

J. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.

K. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect



so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
2. Low water-temperature alarm.
3. High engine temperature pre-alarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel main tank alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Contacts for local and remote common alarm.
11. Audible-alarm silencing switch.
12. Air shutdown damper when used.
13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Lamp test.
18. Low-cranking voltage alarm.
19. Generator overcurrent-protective-device not-closed alarm.

- L. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator unless otherwise indicated.
- M. Remote Emergency-Stop Switch: Flush; wall mounted unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

## 2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.
  1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
  2. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.
- B. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other engine generator protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:
  1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other engine generator malfunction alarms. Contacts shall be available for load shed functions.

2. Under single- or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
  3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.
  4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.
- C. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.
1. Indicate ground fault with other engine generator alarm indications.
  2. Trip generator protective device on ground fault.

## 2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class F.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six 12-lead alternator.
- E. Range: Provide limited broad extended range of output voltage by adjusting the excitation level.
- F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- G. Enclosure: Drip proof.
- H. Instrument Transformers: Mounted within generator enclosure.
- I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.
1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
  2. Maintain voltage within 20 percent on one step, full load.
  3. Provide anti-hunt provision to stabilize voltage.
  4. Maintain frequency within 10 percent and stabilize at rated frequency within 2 5 seconds.
- J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
- K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- L. Sub-transient Reactance: 12 percent, maximum.

## 2.9 LOAD BANK (Base Bid #2 and 3)

### A. Description:

1. Permanent, outdoor, weatherproof, remote-controlled, forced-air-cooled, resistive unit capable of providing a balanced three-phase, delta-connected load to engine generator at 100 percent rated-system capacity, at 80 percent power factor, lagging. Unit shall be capable of selective control of load in 25 percent steps and with minimum step changes of approximately 5 and 10 percent available.

B. Resistive Load Elements: Corrosion-resistant chromium alloy with ceramic and stainless-steel supports. Elements shall be double insulated and designed for repetitive on-off cycling. Elements shall be mounted in removable aluminized-steel heater cases. Galvanized steel is prohibited. Element's maximum resistance shall be between 100 and 105 percent of rated resistance.

C. Load-Bank Heat Dissipation: Integral fan with totally enclosed motor shall provide uniform cooling airflow through load elements. Airflow and coil operating current shall be such that, at maximum load, with ambient temperature at the upper end of specified range, load-bank elements operate at not more than 50 percent of maximum continuous temperature rating of resistance elements.

D. Load-Element Switching: Remote-controlled contactors switch groups of load elements. Contactor coils are rated 120 V. Contactors shall be located in a separate NEMA 250, Type 3R enclosure within load-bank enclosure, accessible from exterior through hinged doors with tumbler locks.

E. Contactor Enclosures: Heated by thermostatically controlled strip heaters to prevent condensation.

F. Load-Bank Enclosures: NEMA 250, Type 3R, aluminized steel complying with NEMA ICS 6. Louvers at cooling-air intake and discharge openings shall prevent entry of rain and snow. Openings for airflow shall be screened with 1/2-inch- square, galvanized-steel mesh. Reactive load bank shall include automatic shutters at air intake and discharge. Components other than resistive elements shall receive exterior epoxy coating with compatible primer. Comply with requirements in Section 099600 "High-Performance Coatings."

G. Protective Devices: Power input circuits to load banks shall be fused, and fuses shall be selected to coordinate with generator circuit breaker. Fuse blocks shall be located in contactor enclosure. Cooling airflow and overtemperature sensors shall automatically shut down and lock out load bank until manually reset. Safety interlocks on access panels and doors shall disconnect load power, control, and heater circuits. Fan motor shall be separately protected by overload and short-circuit devices. Short-circuit devices shall be noninterchangeable fuses with 200,000-A interrupting capacity.

H. Load-Bank Remote-Control Panel: Separate from load bank in NEMA 250, Type 1 enclosure with a control power switch and pilot light, and switches controlling groups of load elements.

I. Control Sequence: Control panel may be preset for adjustable single-step loading of generator during automatic exercising.

## 2.10 VIBRATION ISOLATION DEVICES

- A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
  - 1. Material: Standard neoprene Natural rubber Bridge-bearing neoprene, complying with AASHTO M 251 separated by steel shims.
  - 2. Shore A Scale Durometer Rating: 50.
  - 3. Number of Layers: Three.
  - 4. Minimum Deflection: 1 inch.
- B. 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.
  - 6. Minimum Deflection: 1 inch.
- C. Comply with requirements in Section 232116 "Hydronic Piping Specialties" for vibration isolation and flexible connector materials for steel piping.
- D. Comply with requirements in Section 233113 "Metal Ducts" for vibration isolation and flexible connector materials for exhaust shroud and ductwork.
- E. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

## 2.11 FINISHES

- A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

## 2.12 SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
  - 1. Tests: Comply with IEEE 115 and with NFPA 110, Level 1 Energy Converters.
- B. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
  - 1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
  - 2. Test generator, exciter, and voltage regulator as a unit.

3. Full load run.
4. Maximum power.
5. Voltage regulation.
6. Transient and steady-state governing.
7. Single-step load pickup.
8. Safety shutdown.
9. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
10. Report factory test results within 10 days of completion of test.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.
- B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
  1. Notify Architect/Engineer, DGS Construction Manager, and Owner no fewer than 21 working days in advance of proposed interruption of electrical service.
  2. Do not proceed with interruption of electrical service without Owner's written permission.

### 3.3 INSTALLATION

- A. Comply with NECA 1 and NECA 404.
- B. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.
- C. Equipment Mounting:
  1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
  2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
  3. Install packaged engine generator with elastomeric isolator pads restrained spring isolators having a minimum deflection of 1 inch static deflection on 4-inch- high concrete

base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Section 260548.16 "Seismic Controls for Electrical Systems."

- D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- E. Cooling System: Install Schedule 40 black steel piping with welded joints for cooling water piping between engine generator.
  - 1. Install isolating thimbles where exhaust piping penetrates combustibles. Provide a minimum of 9 inches of clearance from combustibles.
  - 2. Insulate cooling-system piping and components as per manufacturer instructions.
- F. Exhaust System: Install Schedule 40 black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.
  - 1. Piping materials and installation requirements are specified in Section 232113 "Hydronic Piping."
  - 2. Install flexible connectors and steel piping materials according to requirements in Section 232116 "Hydronic Piping Specialties."
  - 3. Insulate muffler/silencer and exhaust system components according to requirements in Section 230719 "HVAC Piping Insulation."
  - 4. Install isolating thimbles where exhaust piping penetrates combustibles with a minimum of 9 inches of clearance from combustibles.
- G. Drain Piping: Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40 black steel pipe with welded joints.
  - 1. Piping materials and installation requirements are specified in Section 232113 "Hydronic Piping."
  - 2. Drain piping valves, connectors, and installation requirements are specified in Section 232116 "Hydronic Piping Specialties."
- H. Fuel Piping:
  - 1. Diesel storage tanks, tank accessories, piping, valves, and specialties for fuel systems are specified in Section 231113 "Facility Fuel-Oil Piping."
  - 2. Copper and galvanized steel shall not be used in the fuel-oil piping system.
- I. Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

### 3.4 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.
- B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow space for service and maintenance.
- C. Connect cooling-system water piping to engine generator and heat exchanger with flexible connectors.

- D. Connect engine exhaust pipe to engine with flexible connector.
- E. Connect fuel piping to engines with a gate valve and union and flexible connector.
- F. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- G. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.
- H. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

### 3.5 IDENTIFICATION

- A. Identify system components according to Section 230553 "Identification for HVAC Piping and Equipment" and Section 260553 "Identification for Electrical Systems."
- B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency:
  - 1. Engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
  - 1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below, as specified in NETA ATS. Certify compliance with test parameters.
    - a. Visual and Mechanical Inspection:
      - 1) Compare equipment nameplate data with Drawings and the Specifications.
      - 2) Inspect physical and mechanical condition.
      - 3) Inspect anchorage, alignment, and grounding.
      - 4) Verify that the unit is clean.
    - b. Electrical and Mechanical Tests:
      - 1) Perform insulation-resistance tests according to IEEE 43.
        - a) Machines Larger Than 200 hp: Test duration shall be 10 minutes. Calculate polarization index.
        - b) Machines 200 hp or Less: Test duration shall be one minute. Calculate the dielectric-absorption ratio.
      - 2) Test protective relay devices.

- 3) Verify phase rotation, phasing, and synchronized operation as required by the application.
  - 4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
  - 5) Perform vibration test for each main bearing cap.
  - 6) Verify correct functioning of the governor and regulator.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
  3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
    - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
    - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
    - c. Verify acceptance of charge for each element of the battery after discharge.
    - d. Verify that measurements are within manufacturer's specifications.
  4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
  5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
  6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
  7. Exhaust Emissions Test: Comply with applicable government test criteria.
  8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
  9. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 and 100 percent of rated linear load. Verify that harmonic content is within specified limits.
  10. Noise Level Tests: Measure A-weighted level of noise emanating from engine generator installation, including engine exhaust and cooling-air intake and discharge, at four locations.
- C. Coordinate tests with tests for transfer switches and run them concurrently.
  - D. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.
  - E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.
  - F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
  - G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - H. Remove and replace malfunctioning units and retest as specified above.



- I. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.
- J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- K. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels so terminations and connections are accessible to portable scanner.
  - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
  - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - 3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.7 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's authorized service representative. Include quarterly preventive maintenance and exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Parts shall be manufacturer's authorized replacement parts and supplies.

### 3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.
- B. All on-site training shall be digitally recorded by the Contractor. The digital video files are to be turned over to the Client Agency.

END OF SECTION