

VBE-2
VBE PARTICIPATION SUBMITTAL

Bidder/Offerer: I.B. Abel, Inc. **Solicitation # :** DGS C-0948-0090 P3.4

Solicitation Title: Capitol Complex Central Plant - Building Reno. Chiller System Rep

Discipline: .4 Electrical (.1 GC, .2 HVAC, .3 Plumbing, or .4 Electrical)

Base Bid: 1.00 (identify the corresponding Base Bid for this VBE Participation Submittal)

CHECK ONE, AND ONLY ONE, BOX. FAILURE TO COMPLY WILL RESULT IN REJECTION OF YOUR BID/PROPOSAL.

Click on bold titles to navigate to that specific page.

☐ **I agree to meet the VBE participation goal in full.**
I have completed and am submitting with my bid or proposal a **VBE Utilization Schedule (VBE-3)**, which is required in order to be considered for award.

☐ **I am requesting a partial waiver of the VBE participation goal.**
After making good faith outreach efforts as more fully described in the **Guidance for Documenting Good Faith Efforts to Meet the VBE Participation Goal**, I am unable to achieve the total VBE participation goal for this solicitation and am requesting a partial waiver of the VBE 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. a **VBE Utilization Schedule (VBE-3)** for that portion of the VBE participation goal that I will meet; AND
2. a **Good Faith Efforts Waiver Request** for the portion of the VBE participation goals that I am unable to meet.

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

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

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

VBE-3
VBE UTILIZATION SCHEDULE

Bidder/Offeror: I.B. Abel, Inc.

Solicitation # : DGS C-0948-0090 P3.4 **Solicitation Title:** Capitol Complex Central Plant - Building Reno. Chiller &

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

VBE Name SAP Vendor Number (6-digit number provided by VBE) VBE Verification Number (located on DGS VBE verification)	Type of VBE (check all that apply)	Description of Work to be Performed (Statement of Work/Specification reference)	% Commitment (or % of work to be self-performed by VBE bidder/offeror)	Dollar Value of Commitment (after applying any calculation per VBE-1, Section IV, Calculating VBE participation)
Name: <u>Veterans R Us</u> SAP Vendor Number: <u>123456</u> VBE Verification Number: <u>123456-2023-VBE</u>	VBE	staffing resources	%	\$
Name: <u>Schneider</u> SAP Vendor Number: VBE Verification Number:	☒ VBE ☐ SDVBE		%	
Name: <u>Perry County</u> SAP Vendor Number: VBE Verification Number:	☐ VBE ☐ SDVBE		%	
Name: <u>Manna Supply</u> SAP Vendor Number: VBE Verification Number:	☐ VBE ☐ SDVBE		%	
Name: SAP Vendor Number: VBE Verification Number:	☐ VBE ☐ SDVBE		%	
Attach additional sheets if necessary			Total % VBE commitment: <u>0</u>	Total \$ amount: <u>0</u>

VBE-3.1
LETTER OF COMMITMENT

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

Solicitation #: _____ Solicitation Title: _____

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

Services/Supplies and Time Frame. If Bidder/Offeror is the successful vendor, the VBE 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 VBE will provide:	
Specific Time Frame the VBE 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 VBE-3
	(c)	(d)	(c) x (d) = (e)
VBE Subcontractor - performs at least 50% of the value of the subcontract with its own forces		100%	
VBE Manufacturer - produces on premise material, supplies, articles, or equipment required for contract.		100%	
VBE Stocking Suppliers - maintains materials on premises that are bought and stored and required for the contract.		60%	
VBE Non-stocking Supplier - Service Fee Only - Does not carry inventory.		100%	

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

Sincerely,

Acknowledged

Printed name

Printed name

Bidder/Offeror Point of Contact Signature

VBE Point of Contact Signature

** The work performed by a firm that is dually verified as both an SDB and 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. See SDB-1 Instructions, Section II, Paragraph 4 for example of how work performed by a firm that is dually verified is credited.*

VBE-5

GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF VBE PARTICIPATION GOAL

Project Description:	Capitol Complex Central Plant - Building Reno. Chiller System Replacement and Electrical System Upgrades
Commonwealth Agency Name:	DGS
Solicitation #:	DGS C-0948-0090 P3.4
Solicitation Due Date and Time:	1/20/26 2:00 pm

Bidder/Offeror Company Name:	I.B. Abel, Inc.
Bidder/Offeror Contact Name:	Mat Robinson
Bidder/Offeror Contact Email:	mrobinson@ib-abel.com
Bidder/Offeror Contact Phone Number:	(717) 451-6179

Part 1 – Identified Items of Work Offeror Made Available to VBEs

Identify those items of contract work that the Offeror made available to VBEs. This includes, where appropriate, those items the Offeror identified and subdivided into economically feasible units to facilitate the VBE participation. For each item listed, show the anticipated percentage of the total contract cost. Offeror must demonstrate that enough work to meet the VBE participation goal was made available to VBEs, and the total percentage of the items of work identified for VBE participation met or exceeded the VBE 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 VBE Firms? If not, explain why.
Excavating, Rigging, Testing, Equipment	☒ yes ☐ no	☐ yes ☐ no	☒ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no

Attach additional sheets if necessary.

VBE-5

GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF VBE PARTICIPATION GOAL

Part 2 – Identified VBEs and Record of Solicitations

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

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

Name of Identified VBE 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
VBE Name: NCE Testing ☒ VBE ☐ SDVBE	Electrical Testing	Date: 12/8/25 ☐ mail ☒ email ☐ fax	Date: 12/17/25 ☐ mail ☒ email ☐ fax	Date and Time of Call: 1/8/26 11:48 am Spoke with: Robert Maceenia Left Message:	☐ yes ☐ no	☐ yes ☐ no	☐ Used other VBE ☐ Used non-VBE ☐ Self performing
VBE Name: Keystone ☒ VBE ☐ SDVBE	Equipment	Date: 12/8/25 ☐ mail ☒ email ☐ fax	Date: 12/11/25 ☐ mail ☒ email ☐ fax	Date and Time of Call: 12/11/25 11:59 am Spoke with: Rob Stern Left Message:	☒ yes ☐ no	☐ yes ☐ no	☐ Used other VBE ☐ Used non-VBE ☐ Self performing

Attach additional sheets as necessary.

VBE-5
GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF
VBE PARTICIPATION GOAL

Part 3 – VBE Outreach Compliance Statement

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

•Stocking supplies for fire alarm parts and smarts
•Stocking supplies for electrical materials
•Stocking supplies for electrical equipment
•Excavation
•Rigging

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

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

Emails, phone calls

4. Bonding Requirements (Please Check One):

☒

This project does not involve bonding requirements.

☐

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

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

☒

Offeror did attend the pre-Bid/Proposal conference or Supplier Forum

☐

No pre-Bid/Proposal conference or Supplier Forum was held

☐

Offeror did not attend the pre-Bid/Proposal conference or Supplier Forum

VBE-5

GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF VBE PARTICIPATION GOAL

Part 4 – Additional Information Regarding Rejected VBE Quotes

This form must be completed if Part 2 indicates that a VBE quote was rejected because the Offeror is using a non-VBE or is self-performing the Identified Items of Work. List the Identified Items of Work, state whether the work will be self-performed or performed by a non-VBE, and if applicable, state the name of the non-VBE firm. Also include the names of all VBEs and non-VBE firms that provided a quote and the amount of each quote.

Describe Identified Items of Work not being performed by VBEs (include specific section from bid or proposal)	Self-performing or using non-VBE (provide name of non-VBE if applicable)	Amount of non-VBE quote \$	Name of other firms that provided quotes and whether they are VBE	Amount quoted \$	Reason why VBE quote was rejected along with brief explanation
Electrical Testing	☐ self-performing ☐ using Non-VBE Name: Qualas	\$ 86,625	☐ VBE ☐ Non-VBE Name: Tactical Testing	\$ 184,900	☐ price ☐ capabilities ☐ other Qualas was lower than Tactical Testing. No VBE quotes were received to compare pricing
Security	☐ self-performing ☐ using Non-VBE Name: Schneider	\$ 9,100	☐ VBE ☐ Non-VBE Name: n/a	\$ 0	☐ price ☐ capabilities ☐ other Proprietary as per RFP documents
Fire Alarm	☐ self-performing ☐ using Non-VBE Name: Siemens	\$ 9,850	☐ VBE ☐ Non-VBE Name: n/a	\$ 0	☐ price ☐ capabilities ☐ other Proprietary as per RFP documents
Excavating	☐ self-performing ☐ using Non-VBE Name: Perry County	\$ 79,250	☐ VBE ☐ Non-VBE Name: n/a	\$ 0	☐ price ☐ capabilities ☐ other Received no quotes from VBE excavating
Equipment	☐ self-performing ☐ using Non-VBE Name: Manna Supply	\$ 2,676,240	☒ VBE ☐ Non-VBE Name: Keystone	\$ 8,995,964	☒ price ☐ capabilities ☐ other Price was lower from a different supplier

Attach additional sheets as necessary.

VBE-5
GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF
VBE PARTICIPATION GOAL

Part 5 – VBE Subcontractor Unavailability Certificate

1. It is hereby certified that the firm of _____
(Name of VBE)

located at _____
(Number) (Street)

(City) (State) (Zip)

was offered an opportunity to bid on Solicitation No. _____

by _____
(Name of Bidder/Offeror's Firm)

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

(Signature of VBE's Representative) (Title) (Date)

(DGS VBE Certification #) (Telephone #)

***** 3.

If the VBE does not complete this form, the bidder.offeror must complete the following:

To the best of my knowledge and belief, the above-listed VBE is either unavailable for the work/service for this project, is unable to prepare a Proposal, or did not respond to a request for a price Proposal and has not completed the above portion of this submittal.

(Signature of Bidder/Offeror) (Title) (Date)

Arijana Cooper

From: Arijana Cooper
Sent: Monday, December 8, 2025 9:35 AM
Cc: Mathew Robinson; Jason Vansickle
Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

I.B. Abel, Inc. is currently seeking SBD/VBE participation for applicable UNSPSC codes related to the P3.4 scope of electrical work for the DGS C-0948-0090 P3.4 Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

This includes:

- Stocking supplies for fire alarm parts and smarts
- Stocking suppliers for electrical materials
- Stocking suppliers for electrical equipment
- Excavation
- Rigging
- Project Management

Please review the project information provided below, along with the link to the project documents:

<https://ib-abel.sharefile.com/public/share/web-sbd01e338ab6747b3b907b7e83f5b63bc>

Kindly confirm your intent to participate or decline this opportunity by **Friday, December 19, 2025**.

Should you have any questions or require additional information, please don't hesitate to reach out. Mat Robinson is the lead estimator and his contact information is:

MRobinson@ib-abel.com

717-451-6179

Thank you for your time and consideration.

Project: Project No. the **DGS C-0948-0090 P3.4** Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Harrisburg, PA 17110

Bid Opening Date and Time: 12/29/2025

Brief Description: The project consists of upgrades, relocations and replacement of various building, HVAC and electrical systems and components associated with the existing 8,600 ton Central Chiller Plant serving the PA State Capitol Complex. To support the electrical equipment replacement and reconfiguration an underground electrical vault will be constructed and connected to the existing chiller plant, via an underground tunnel.

Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

AC

Arijana Cooper

To

Cc

Bcc

Mathew Robinson; Jason Vansickle

'tmarenco@battagassoc.com'; 'jennifer.moses@zitomedia.com'; 'mljordan@zoominternet.net'; 'pcep@pa.net'; 'gundyexca@yahoo.com'; Brion Martin - Manna Supply, Inc. (brion.martin@mannasupply.com); Janell Butorac - J Sterling Solutions LLC (janell@sterlingdistr.com); 'amy@allaccessrigging.com'; Kenneth Dupree - Unique Harmony Consultants LLC (kdupree@uniqueharmonyconsultantsllc.com)

Reply

Reply All

Forward

Mon 12/8/2025 9:35 AM

Arijana Cooper

From: Arijana Cooper
Sent: Friday, December 12, 2025 7:31 AM
Cc: Mathew Robinson; Jason Vansickle
Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Good morning,

Please note the bid due date has been extended. Addendum 3 and 4 have been added to the project share folder.

I.B. Abel, Inc. is currently seeking SBD/VBE participation for applicable UNSPSC codes related to the P3.4 scope of electrical work for the DGS C-0948-0090 P3.4 Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

This includes:

- Stocking supplies for fire alarm parts and smarts
- Stocking suppliers for electrical materials
- Stocking suppliers for electrical equipment
- Excavation
- Rigging
- Project Management

Please review the project information provided below, along with the link to the project documents:

<https://ib-abel.sharefile.com/public/share/web-sbd01e338ab6747b3b907b7e83f5b63bc>

Kindly confirm your intent to participate or decline this opportunity by **Friday, December 19, 2025**.

Should you have any questions or require additional information, please don't hesitate to reach out. Mat Robinson is the lead estimator and his contact information is:

MRobinson@ib-abel.com

717-451-6179

Thank you for your time and consideration.

Project: Project No. the **DGS C-0948-0090 P3.4** Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Harrisburg, PA 17110

Bid Opening Date and Time: 01/12/2026

Brief Description: The project consists of upgrades, relocations and replacement of various building, HVAC and electrical systems and components associated with the existing 8,600 ton Central Chiller Plant serving the PA State Capitol Complex. To support the electrical equipment replacement and reconfiguration an underground electrical vault will be constructed and connected to the existing chiller plant, via an underground tunnel.

Arijana Cooper

From: Microsoft Outlook
To: robstern7@aol.com; jennifer.moses@zitomedia.com; mljordan@zoominternet.net; pcep@pa.net; gundyexca@yahoo.com; brion.martin@mannasupply.com; janell@sterlingdistr.com; amy@allaccessrigging.com; kdupree@uniqueharmonyconsultantsllc.com; jgormley@ncetest.com; bjmessina@ncetest.com
Sent: Friday, December 12, 2025 7:32 AM
Subject: Relayed: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

robstern7@aol.com

jennifer.moses@zitomedia.com

mljordan@zoominternet.net

pcep@pa.net

gundyexca@yahoo.com

brion.martin@mannasupply.com

janell@sterlingdistr.com

amy@allaccessrigging.com

kdupree@uniqueharmonyconsultantsllc.com

jgormley@ncetest.com

bjmessina@ncetest.com

Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Arijana Cooper

From: Microsoft Outlook
To: tmarenco@battagassoc.com
Sent: Friday, December 12, 2025 7:31 AM
Subject: Relayed: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

tmarenco@battagassoc.com

Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Arijana Cooper

From: Mathew Robinson
Sent: Friday, January 9, 2026 1:04 PM
To: pcep@pa.net
Cc: Arijana Cooper
Subject: Re: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
Addendum 11 has been uploaded. Our bid is now due on the 20th. Please verify but I see no changes to the project other than due date pertaining to addendums 9-11. Please send your pricing by EOB the 14th.

<https://ib-abel.sharefile.com/public/share/web-s39c36c308ba94e1492b09558f0848215>

Thank you,
Mat

Mathew Robinson
Senior Estimator
Mobile: 717-451-6179
www.ib-abel.com

 **24/7 Service & Support 717-845-1639**

From: Mathew Robinson <mrobinson@ib-abel.com>
Sent: Thursday, January 08, 2026 11:39 AM
To: pcep@pa.net <pcep@pa.net>
Cc: Arijana Cooper <arijana.cooper@ib-abel.com>
Subject: Re: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
Addendum 8 has been uploaded. Our bid is still due on the 13th. Please send your pricing to us as soon as you can.

<https://ib-abel.sharefile.com/public/share/web-s59e439513e364d9982fdbec9f38d6e52>

Thank you,
Mat

Mathew Robinson
Senior Estimator
Mobile: 717-451-6179
www.ib-abel.com

24/7 Service & Support 717-845-1639

From: Mathew Robinson <mrobinson@ib-abel.com>
Sent: Tuesday, December 30, 2025 6:32 AM
To: pcep@pa.net <pcep@pa.net>
Cc: Arijana Cooper <arijana.cooper@ib-abel.com>
Subject: Re: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
Addendum 6 and 7 have been uploaded to the sharefile. Let me know if you plan to attend the additional walk through.

<https://ib-abel.sharefile.com/public/share/web-sb015c2e830bb4b8aa778671c76f83b15>

Thank you,
Mat

Mathew Robinson
Senior Estimator
Mobile: 717-451-6179
www.ib-abel.com

24/7 Service & Support 717-845-1639

From: Mathew Robinson <mrobinson@ib-abel.com>
Sent: Thursday, December 18, 2025 2:15 PM
To: pcep@pa.net <pcep@pa.net>
Cc: Arijana Cooper <arijana.cooper@ib-abel.com>
Subject: Fw: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
We are currently bidding the above referenced project in Harrisburg, PA. We would like to get a quote for the Excavation from you. The attached drawings are for your use. The link below contains the spec's and all bidding information pertaining to the project. This information is for your use. Our pricing is due 1/13/26. We would like your quote by EOB 1/09/26. With the Holidays and company schedules please confirm timing of this quote.

Notes:

Prevailing wage determination is located in the project manual of the link provided.
We will probably build the duct bank as an assembly and lower into the excavation. Including the rebar.
Please provide concrete for the duct bank and reinstalled exterior light poles.
~~Plan to form and pour the light pole bases.~~
Test bores, soil composition, and other information are contained in the project manual and specs through the link below.
Highlighted routing and footages are approx.
The grounding triads scale out to be about 4'6" per side however please plan on 10' per side of excavation.

<https://ib-abel.sharefile.com/public/share/web-sfc805706b3604cf9878bf5c74cb93974>

If you have any questions please contact me directly.

Thank you,

Mat

Mathew Robinson

Senior Estimator

Mobile:717-451-6179

www.ib-abel.com



 **24/7 Service & Support 717-845-1639**



January 5, 2026

I B Abel Inc.
2745 Black Ridge Road
York, PA 17406-7920

Attention: Mathew Robinson

Subject: 2508324 I.B. Abel - DGS Central Plant Proposal

Reference:

Dear Mathew,

Qualus Services, LLC appreciates this opportunity to be of service to I B Abel Inc. After careful review, it is our pleasure to submit this proposal for your consideration. The execution strategy described in this proposal has been prepared to define the scope of work and overall approach that Qualus intends to follow throughout the execution of this project.

Staffed with experienced engineers, field service technicians, operational professionals, and outfitted with the most up-to-date software and equipment, Qualus prides itself on being at the forefront in terms of industry standards, testing and design capabilities, and quality assurance processes. Our proven business philosophy is to invest in building long-term relationships with our clients based on our strong client-centric culture emphasizing safety, quality, and project execution track record.

We appreciate the opportunity to work with you on this project. If you have any questions or concerns, please contact me at 410-344-0300 or by email at JP.Shoop@QualusCorp.com

Sincerely,

JP Shoop
Account Manager

TABLE OF CONTENTS

PROJECT SUMMARY.....3

HSSE & HUMAN PERFORMANCE.....3

ABOUT QUALUS.....3

EQUIPMENT SCOPE.....4

WORK SCOPE.....6

CLARIFICATIONS 13

CUSTOMER RESPONSIBILITIES 14

PROJECT SCHEDULE 14

PROJECT PRICING 14

PROPOSAL ACCEPTANCE.....15

TERMS & CONDITIONS.....15

PROJECT SUMMARY

NETA Acceptance Testing at Capitol Complex - Central Chiller Plant. 7th Street / Soldier's Grove. Dauphin County. City of Harrisburg.

HSSE & HUMAN PERFORMANCE

Safety First, We All Own It is a core value and a top priority for all projects. Qualus operates with a strict zero-tolerance policy when it comes to non-compliance of safety protocols. In addition to our Corporate Safety Manual and our Life Saving Rules, a site-specific safety plan will be created, tailored, and distributed to meet the specific needs and challenges of the project. Our teams also utilize Job Task Hazard Analyses and HP utilization checklists to ensure that we maintain our heightened state of awareness when it comes to your infrastructure. Any elements of your programs not covered in our standards will be included as a requirement in the working conditions.

ABOUT QUALUS

Qualus is a leading pure-play power services firm and innovator at the forefront of the energy transition and transformation, with differentiated capabilities across grid modernization, resiliency, security, and sustainability. The firm partners with utilities, commercial, industrial, data center, and government clients, and renewable and energy storage developers, offering comprehensive solutions through boutique and integrated advisory, planning, engineering, digital solutions, program management, and specialized field services. Qualus also provides software and technology enabled services and develops breakthrough solutions for critical power industry challenges such as distributed and variable resource integration, emergency management, and secure data exchange. The firm has nearly 1,600 professionals, with offices throughout the U.S. and Canada.

EQUIPMENT SCOPE

Relocated Existing 10MVA Unit Substations (x2)

Relays:

51,51G 2

51 2

81,47,27,59 2

Instrument Transformers

CT 6

PT 2

Meters (Schneider Electric PM8000) 2

MDS15' - 1200A 15KV Switchgear 1

Vacuum Circuit Breakers 7

CT 22

PT 4

Lightning Arresters 2

Relays:

50/51,50G 4

51 2

51,50G 2

87B 2

25 1

81,47,27,59 2

Meters (Schneider Electric ION 9000T) 2

Meters (Schneider Electric PM8000) 4

MDS5' - 2000A 5KV Switchgear 1

5KV Main Disconnects 2

5KV Fused Disconnects 5

Lightning Arresters 2

CT 5

Meters (Schneider Electric PM8000) 5

12.47KV:480/277V Unit Substation XFMR	2
3500kVA 12.47KV-480Y/277V XFMR	2
480V Draw-Out Circuit Breakers	3
Meters (Schneider Electric PM8000)	3
MTM2' 5000A 480V Switchgear	1
480V Draw-Out Circuit Breakers	9
Meters (Schneider Electric PM8000)	8
MTM1' 3200A 480V Switchgear	1
480V Draw-Out Circuit Breakers	5
Meters (Schneider Electric PM8000)	4
CT	2
Cables / Busway	
15KV Cable Set	8
5KV Cable Set	4
2000A 4.16KV Busway	2
LV Cable Sets #3 AWG & Larger	24
LV Busway	4
LV Panels	14
Small Transformers	1
600A Circuit Breaker in 'MDS2'	1
LV Disconnects	4
LV CB > 225 Amp (MDP-NE, PP, LR)	3
Grounding System	1

NOTE: UPS, VFD, Existing and Relocated equipment is not included in this proposal.

WORK SCOPE

Qualus Services (Qualus) will provide the required technical labor, supervision, basic equipment, consumable materials, and engineering services to perform the following scope of work:

CABLES, MEDIUM AND HIGH VOLTAGE CABLE

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage, where visible and safely accessible.
2. Verify tightness of bolted electrical connections with a calibrated torque wrench, where possible.
3. Inspect compression applied connectors for correct cable match and indentation, where visible.
4. Inspect shield grounding, cable supports and terminations. (See note below)
5. Where applicable, verify that visible cable bends meet or exceed ICEA and manufacturer's bending radius, where visible (See note below)
6. If cables are terminated through window type current transformers, inspect to verify that neutral and ground conductors are correctly placed and that shields are correctly terminated for operation of protective devices, where visible.
7. Inspect for correct identification and arrangements, where visible. (See note below)
8. Inspect cable jacket insulation and condition, where visible. (See note below)

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Insulation resistance test on each conductor with all other conductors and shield grounded.
3. Shield continuity test on each cable.
4. Perform very low frequency (VLF) dielectric withstand voltage test.
 - All cables must be outside of manholes for testing. Qualus Services will not enter manholes with energized conductors. Electrical contractors are responsible for disconnecting and re-connection of cables.

CABLES, LOW VOLTAGE, 600-VOLT MAXIMUM (#3AWG and larger)

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Verify tightness of bolted electrical connections with a calibrated torque wrench (where possible).
3. Inspect compression applied connectors for correct cable match and indentation, where visible.
4. Inspect for correct identification and arrangements, where visible.
5. Inspect cable jacket insulation and condition, where visible.

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Insulation resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable for 1 minute.
3. Continuity tests to ensure correct cable connection.
 - Electrical contractor is responsible for disconnecting and re-connection of cables.

DRY TYPE TRANSFORMERS (500KVA and greater)

A. Perform the following mechanical inspections

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment and grounding.
3. Verify that resilient mounts are free and that any shipping brackets have been removed.
4. Verify tightness of bolted electrical connections with a calibrated torque wrench.
5. Verify that as-left tap connections are as specified.
6. Verify that cooling fans operate and that fan motors have correct overcurrent protection.
7. Verify the presence of surge protection.

B. Perform the following electrical testing

1. Resistance measurements through bolted electrical connections.
2. Insulation resistance tests winding to winding and each winding to ground (where possible).
3. Calculate the polarization index.
4. Turns ratio and winding resistance test on all tap positions.
5. Test surge arresters.

MEDIUM VOLTAGE, METAL ENCLOSED AIR SWITCHES

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Inspect anchorage, alignment, grounding, and required clearances.
3. Verify correct blade alignment, blade penetration, travel stops and mechanical operation.
4. Verify that fuses sizes and types are in accordance with drawings, and all engineered studies.
5. Verify that expulsion limiting devices are in place on all holders having expulsion type elements.
6. Verify that each fuse has adequate mechanical support and contact integrity.
7. Verify tightness of bolted electrical connections with a calibrated torque wrench.
8. Verify operation and sequencing of interlocking systems.
9. Verify correct barrier installation.
10. Verify correct operation of all indicating and control devices.
11. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.
12. Verify operation of heaters when safely possible.

B. Perform the following electrical testing

1. Resistance measurements through bolted connections.
2. Measure contact resistance across each switchblade and fuse holders.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. Dielectric withstand voltage test.
5. Measure fuse resistance.

MEDIUM VOLTAGE VACUUM CIRCUIT BREAKERS

A. Perform the following mechanical inspections

1. Visually inspect for signs of physical damage.
2. Inspect anchorage, alignment and grounding.
3. Mechanical operator test in accordance with manufacturer's published data, if applicable.
4. Measure critical distances such as contact gap on the operating mechanism in accordance with
5. manufacturer's published data.
6. Verify tightness of bolted electrical connections with a calibrated torque wrench.
7. Verify cell fit and element alignment.
8. Verify racking mechanism operation.
9. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.
10. Verify operation of heaters.
11. Record as-left operation counter readings.

B. Perform the following electrical testing

1. Resistance measurements through bolted connections.
2. Contact/pole resistance test.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. Minimum pickup voltage tests on trip and close coils.
5. Verify operation of electrical close and trip operations, trip-free and antipump function.
6. Trip breaker via protective relays.
7. Vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the contacts in the open position.
8. Dielectric withstand voltage test.

PANELBOARDS

A. Visual and Mechanical Inspection

1. Inspect and note general condition of each section and document equipment nameplate information.
2. Inspect physical and mechanical condition.
3. Inspect anchorage, alignment, grounding, and required area clearances.

B. Electrical Tests

1. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground.

MICROPROCESSOR BASED RELAYS

A. Perform the following mechanical inspections.

1. Verify operation of light-emitting diodes, display and targets.
2. Record passwords for all access levels.
3. Clean the front panel and remove foreign material from the case.
4. Check tightness of connections.
5. Verify that the frame is grounded in accordance with manufacturer's instructions.
6. Set the relay in accordance with the coordination study.
7. Download settings from the relay. Print a copy of the settings for the report and compare the settings to those of the coordination study.

B. Perform the following electrical testing.

1. Insulation resistance test on each circuit to frame. Procedures for performing this test on solid state relays shall be determined from the manufacturer's published data.
2. Apply voltage or current to all analog inputs and verify correct registration of the relay meter function.
3. Check functional operation of each element used in the protection scheme.
4. Control verification:
 - Check operation of all active digital inputs.
 - Check all output contacts or SCRs, preferably by operating the controlled device such as circuit breaker, auxiliary relay or alarm.
 - Check all internal logic functional used in protection scheme.
 - For pilot schemes, perform a loop-back test to check the receive and transmit communications circuits.
 - For pilot schemes, perform satellite synchronized end to end tests.
 - For pilot schemes with direct transfer trip (DTT), perform communications statistics, fault counters, sequence of events recorder and all event records.
 - Upon completion of testing, reset all min/max recorders, communications statistics, fault counters, sequence of events recorders and all event records.

METERING DEVICE

Visual and Mechanical Inspection

1. Document equipment nameplate data.
2. Inspect physical and mechanical condition.
3. Verify freedom of movement, end play, and alignment of rotating disks.

Electrical Tests

1. Verify accuracy of meters at all cardinal points.
2. Calibrate meters according to manufacturer's recommendations.
3. Verify all instrument multipliers.
4. Verify that current transformer and voltage transformer secondary circuits are intact.

SWITCHGEAR AND SWITCHBOARDS ASSEMBLIES

A. Perform the following mechanical inspections.

1. Inspect switchboard for damage and overall condition.
2. Inspect anchorage, alignment, grounding, and required area clearances.
3. Verify that the unit is clean and that all shipping bracing, loose parts, and documentation shipped inside cubicle have been removed.
4. Verify that fuse and circuit breaker sizes and types correspond to drawings and coordination study (**customer provided**).
5. Verify that current and voltage transformers ratios correspond to drawings.
6. Verify tightness of bolted electrical connections with a calibrated torque wrench.
7. Confirm correct operation and sequencing of electrical and mechanical interlocks.
8. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.
9. Inspect insulators for evidence of damage or contaminated surfaces.
10. Verify barrier and shutter installation and operation.
11. Exercise all active components.
12. Inspect mechanical indicating devices for correct operations.
13. Verify that filters are in place and vents are clear, if applicable.
14. Verify cubicle heater operation, when safely possible.
15. Perform visual and mechanical inspection of instrument transformers.
16. Inspect control power transformers.
17. Inspect for physical damage, cracked insulation, broken leads, tightness of connections and defective wiring.
18. Verify that primary and secondary fuse and circuit breaker ratings match drawings.

B. Perform the following electrical testing.

1. Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.1.A.8.1.
2. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1.
3. Perform a dielectric withstand voltage test on each bus section, each phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If the manufacturer has no recommendation for this test, it shall be in accordance with Table 100.2. The test voltage shall be applied for one minute.
4. Perform current-injection tests on the entire current circuit in each section of switchgear per manufacturers specifications.
5. Control power transformers:
 - a) Insulation resistance test.
 - b) Turns ratio test on all taps.
6. Voltage transformers:
 - a) Verify correct secondary voltage.
 - b) Turns Ratio Test
 - c) Insulation Resistance Test
7. Current transformers:
 - a) Turns Ratio Test
 - b) Insulation Resistance Test

CIRCUIT BREAKERS, AIR, INSULATED-CASE/MOLDED-CASE (LOW VOLTAGE)

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Inspect anchorage and alignment.
3. Operate breaker.
4. Verify tightness of bolted electrical connections with a calibrated torque wrench.
5. Inspect operating mechanism, contacts and arc chutes in unsealed units.
6. Verify operation of charging mechanism where applicable.
7. Perform adjustments for final protective device settings. We have included one (1) input of settings. Additional setting changes would result in additional costs.

B. Perform the following electrical testing

1. Resistance measurements through bolted connections.
2. Contact/pole resistance test.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. High current injection test. (Secondary Injection on temporarily equipment)
 - Electrical testing will be performed only on breakers rated over 225 Amp.
 - Customer must provide 480V, 1P, 100A for our primary injection test set.
 - Customer will remove and reinstall any fixed mounted breakers that require primary injection testing.

TRANSFORMERS, DRY TYPE, AIR COOLED, LOW VOLTAGE, SMALL (<500KVA).

A. Perform the following mechanical inspections.

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment, and grounding.
3. Verify that resilient mounts are free and that any shipping brackets have been removed.
4. Verify tightness of bolted electrical connections with a calibrated torque wrench.
5. Verify that as-left tap connections are as specified.

B. Perform the following electrical testing.

1. Resistance measurements through bolted electrical connections.
2. Insulation resistance tests winding to winding and each winding to ground (where possible). Calculate the polarization index.
3. Perform Turns Ratio on the as found tap.

GROUNDING SYSTEMS

A. Perform the following mechanical inspections.

1. Inspect physical and mechanical condition.
2. Verify tightness of bolted electrical connections with a calibrated torque wrench.
3. Inspect anchorage.

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Fall of potential or alternative test in accordance with ANSI/IEEE 81 on the main grounding electrode or system (if applicable).
3. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and derived neutral points.

LOW VOLTAGE AIR SWITCHES

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Inspect anchorage, alignment, grounding, and required clearances.
3. Verify correct blade alignment, blade penetration, travel stops and mechanical operation.
4. Verify that fuses sizes and types are in accordance with drawings, and all engineered studies.
5. Verify that each fuse has adequate mechanical support and contact integrity.
6. Verify tightness of bolted electrical connections with a calibrated torque wrench.
7. Verify operation and sequencing of interlocking systems.
8. Verify correct barrier installation.
9. Verify correct operation of all indicating and control devices.
10. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Measure contact resistance across each switchblade and fuseholders.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. Measure fuse resistance.
5. Perform ground fault test (if applicable).

INFRARED SCANNING (New equipment only)

In addition to the outlined services, we will perform an infrared survey of the equipment listed in accordance with NETA and project specifications and bid specifications.

Customer will provide a person to assist with removal and reinstallation of panel covers. This person is required to be:

- Qualified as defined under provisions statement in NFPA-70E.
- Must have the appropriate shock and arc flash PPE.

CLARIFICATIONS

1. Qualus is committed to a safe work environment for our personnel and in maintaining our industry leading safety record. In support of this effort, Qualus will “Move at the Speed of Safety”. If site conditions are less than ideal, requiring additional time and effort to meet typical safety standards, Qualus reserves the right to pass on any delay costs to the customer.
2. Testing and/or abatement of hazardous materials including but not limited to PCBs, asbestos, and lead paint, are not included in this proposal.
3. Utility switching fees and/or wiring permit fees, if any, are not included in this proposal and will be additional to the base contract price.
4. This proposal does not include any permitting or inspection fees.
5. Standby time is not included in this proposal. Any non-Qualus caused delays in accessing the required workspace and/or equipment once on site, such as inclement weather, de-energizing/energizing equipment for an outage, equipment malfunction, coordination between trade(s), etc. may be subject to additional charges.
6. Notice of delays or change orders will be brought to your attention before costs are incurred. The customer must provide written authorization to proceed with any additional work.
7. A charge will apply if work is cancelled within 48 hours of the scheduled date.
8. Qualus pricing does not include any work outside the substation yard.
9. Qualus to mobilize to site once all apparatus is set. Any requirement to mobilize early without all equipment in the final position will incur additional costs via Change Order.
10. Qualus pricing does not include any purchasing or transporting of SF6 gas.
11. A written purchase order or signed copy of the Work Authorization/Proposal is required before materials can be ordered and/or before site work can be performed.
12. Certain NETA testing may not be feasible and will not be performed.
13. Pricing is based on performing the scope of work listed in this quotation only. Any equipment or test procedures not explicitly listed will require a change order. Testing will be performed once on all equipment unless otherwise specified. Re-testing failed equipment will be addressed as a change order.
14. Excludes time and cost for badging, safety training, drug testing, or COVID testing.
15. Excludes load testing of any kind unless otherwise specified.
16. No retainage is agreed to or accepted for this project.
17. Ground rods must be made accessible prior to final concealment and or connection.

CUSTOMER RESPONSIBILITIES

- 1. Provide any available existing drawings of the existing switchgear.
- 2. Provide the existing Short Circuit, Coordination, and Arc Flash Study model for incorporation of the new circuit breakers and relays. If an existing study and model is not available, additional charges will apply.
- 3. Perform Isolation and LO/TO activities, witnessed and verified by Qualus personnel.
- 4. Clear and free access to the work location and parking for required vehicles.
- 5. Provide adequate site conditions clear from mud, snow, and ice, as required. This includes removal of debris, snow, or other obstructions for clear and safe access.
- 6. Provide offloading, storage, and site handling of all material delivered from Qualus.
- 7. Provide a safe, secure laydown area for Qualus supplied equipment, and materials.
- 8. Equipment must be deenergized and ready for testing prior to Qualus arriving onsite. Any deviation may require a change order.
- 9. Provide 480V, 100A, 1PH for our test set.

PROJECT SCHEDULE

- 1. The pricing is based on work being performed during normal working hours, Monday through Friday, 7:00AM-3:30PM. Work after normal working hours, Saturdays, Sundays, and Holidays is not included.
- 2. Any specific schedule or time frame offered for accomplishing the scope of work in this proposal is subject to prior sale and the availability of Qualus resources. The schedule for performance of this work scope must be confirmed with Qualus at the time of order placement.

PROJECT PRICING

Qualus proposes completing the Work Scope listed above for the following amounts:

BASE WORK SCOPE:

▪ NETA ATS (New Equipment)	\$65,750.00 Fixed
▪ NETA ATS (Temp. Equipment):	\$11,275.00 Fixed
▪ Infrared Scan (1 Tech X 1 Day X 2 Times):	\$4,900.00 Fixed
▪ Commissioning Support (1 Tech X 2 Days):	\$4,700.00 Fixed

Note:

- 1. Prices quoted are exclusive of any present or future federal or state taxes or local sales, use or excise taxes, or tariffs. If any such present or future sales, use or excise taxes, or tariffs apply, then they shall be added to the invoice as a separate item unless Purchaser has furnished an acceptable tax exemption certificate from such tax prior to shipment.

PROPOSAL ACCEPTANCE

Upon acceptance of this proposal, please send a contract/purchase order to:

Qualus Services LLC

Attn: JP Shoop

11620 Crossroads Circle

Middle River MD 21220

Fax: 410-335-4389

Email: JP.Shoop@QualusCorp.com

This proposal is considered proprietary in nature, intended for the sole use of the entity addressed above, and as such is not intended for general public distribution.

TERMS & CONDITIONS

Qualus Terms & Conditions Apply

AIA Monthly Progress Billing, Net 30 Day Terms

Freight: Prepay and Add

FOB: Factory

This proposal is valid for 45 days.

QUALUS Standard Terms & Conditions

Unless a separate agreement on terms and conditions exist between the Company and the Purchaser, the following terms and conditions shall apply to all sales by Qualus Corp. and its affiliates, including Qualus, LLC, Qualus Services, LLC, Qualus Consulting, LLC, Qualus Solutions, LLC, and Qualus Solutions of FL, LLC (collectively, hereinafter the "Company").

1. Terms of Payment – Payment terms are due thirty (30) days from the date of invoice. Company shall invoice Purchaser monthly. If payment is not made within thirty (30) days of the invoice date, a late payment charge of one and one half percent (1 1/2%) per month shall be imposed on the unpaid balance. With respect to goods purchased, pro rata payments shall become due as partial shipments are made. When shipments are delayed by the Purchaser, payment shall become due from the date the Company is prepared to make shipment. Goods which at Purchaser's request (i) are held for delayed shipment or (ii) are placed in off-site storage, will be invoiced as if shipped when originally scheduled and will be held and stored at the risk and expense of the Purchaser.

2. Payment - If, in the sole opinion of the Company, the financial condition of the Purchaser at the time the equipment is ready for shipment does not justify the terms of payment specified, then as a condition of shipment, Company may require (i) that the Purchaser provide adequate assurances of payment or (ii) payment terms satisfactory to the Company, in its sole discretion.

3. Quotations -

3.1 Quotations are void unless accepted within thirty (30) days from the date thereof, unless otherwise stated and, in the meantime, are subject to change or withdrawal upon notice. Orders made thereon are not binding until and unless accepted by the Company. Shipping dates are approximate and based upon prompt receipt of all necessary information and approved drawings whenever required. Stenographic and clerical errors are subject to correction.

3.2 Unless otherwise specified in writing, all quotes are on a straight time basis, excluding work on Saturdays, Sundays and Holidays.

4. Changes, Deletions and Extra Work – Purchaser, without invalidating the Contract, may order extra work scope and make changes in addition to or deducting from the work, and the Contract sum shall be adjusted accordingly. All such work shall be executed under the conditions of this Contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.

The value of any such extra work or change shall be determined in one or more of the following ways:

- (a) by estimate and acceptance of lump sum.
- (b) by unit prices named in the Contract or subsequently agreed upon.
- (c) by cost and percentage of cost or by cost and a fixed fee.

5. Minimum Billing Charge - The minimum billing charge shall be \$100.00.

6. Delivery - Unless otherwise specified, all products are delivered f.o.b. point of shipment regardless of transportation costs being "allowed", "pre-paid", or "collect".

7. Shipment Delays - The Company shall not be liable for delays in starting work or in shipment or non-shipment due to causes beyond its reasonable control or due to acts of God, acts of the

Purchaser, fires, strikes, labor disturbances, floods, pandemics, epidemics, quarantine restrictions, war, insurrections or riot, civil or military authority, compliance with priority orders or preference ratings issued by the Government, freight embargo's, car shortages, wrecks or delays in transportation, unusually severe weather, or inability to obtain necessary labor, materials or manufacturing facilities due to such causes or any of them. In the event of any such delay, the date of shipment will be extended, at the minimum, for a period equal to the period of the delay. The contract of sale will in no event be subject to cancellation by the Purchaser, whether due to delay in delivery or to any other cause, except by mutual agreement of the parties, nor shall the Company be liable under any circumstances for special or consequential damages on any account of delay.

8. Suspension/Cancellation – In the event Purchaser requests a suspension of work under this Contract, Purchaser shall, in writing, notify Company reasonably in advance of the suspension date; this notification will indicate the anticipated suspension period. Company shall advise Purchaser of the price adjustment resulting from the planned suspension of the work. The price adjustment will be based on Company's ability to reasonably relocate manpower, and any materials, and equipment during the suspension period. Remobilization costs will be priced on the same basis.

Purchaser may cancel this contract upon thirty (30) days written notice to the Company, and upon payment to Company of reasonable and proper cancellation charges; including but not limited to charges for engineering, testing, repair, upgrade and installation work completed, and for materials on order / in manufacture / in storage and lost profits ("Cancellation Charges").

If the financial condition of Purchaser at any time does not, in the judgment of Company, justify continuance of the work to be performed hereunder on the terms of payment agreed upon, Company may require full or partial payment in advance or shall be entitled to cancel the Contract and shall receive reimbursement for its reasonable and proper Cancellation Charges. In the event of bankruptcy or insolvency of Purchaser or in the event any proceeding is brought against the Purchaser, voluntarily or involuntarily, under the bankruptcy or any insolvency laws, Company shall be entitled to cancel the Contract at any time during the period allowed for filing claims against the estate and shall receive reimbursement for its reasonable and proper cancellation charges. Company's rights under this paragraph are in addition to all rights available to it at law or in equity.

9. Limitation of Liability - The Company shall not accept any penalty or liquidated damage clauses of any kind, or any liability arising from such clauses, unless specifically approved in writing by a duly authorized representative of the Company. The Company shall not be liable for any indirect, special, consequential, or punitive damages (including lost profits, loss of use, business interruption, lost productivity, loss of communications) arising out of or relating to this purchase (whether for breach of contract, breach of warranty, tort, negligence, or other form of action) and irrespective of whether Company has been advised of the possibility of any such damage. In no event shall the Company's liability exceed the price the Purchaser paid to the Company for the specific Goods or Services provided by the Company giving rise to the claim or cause of action.

10. Damage and Loss Claims – The Company shall not be responsible for loss, shortage, or damage after receipt of "in good order" receipts from the transportation company. The Company's

responsibility for loss, shortage, or damage ceases with the delivery to a common carrier, at which time title and risk of loss pass to the purchaser, and all claims for loss, shortage, damage, or delay must be made to the carrier by the Purchaser. Concealed damage claims must be reported to the carrier within fifteen (15) days from the date of delivery. The Company will reasonably assist the Purchaser in securing satisfactory adjustment of any claims.

11. Warranty –

11.1 The Company warrants that the (i) goods shall be as provided by the specifications provided by Purchaser and new (unless otherwise directed or permitted), and if new, without apparent damage or defect, (ii) services will be performed in accordance with the specifications provided by Purchaser and performed in a workmanlike manner. In the event Purchaser notifies Company of defective materials or workmanship within the lesser of eighteen (18) calendar months from shipment of materials or completion of the work, or twelve (12) calendar months from installation of the goods, the Company will, (i) at its option either repair or replace defective new materials, and correct the defective workmanship free of charge. Repairs or warranty work shall be performed f.o.b. factory or at a Purchaser's site, at the Company's option.

11.2 Whenever work is performed at Purchaser's site, it will be performed during a normal eight-hour straight-time day. If the Purchaser requests that product warranty work be performed during any other time period, Purchaser will be invoiced for the premium portion of the work; i.e. the difference between the applicable rate and the overtime rate for the services performed.

11.3 This warranty does not apply to, nor is any expense or other damages or liability assumed for, any goods which are used, which have been improperly stored, or installed, or from any accidental or intentional attempts to operate the goods in excess of their rating, or in any abnormal atmosphere or environments, or to which unauthorized repairs have been made whether or not such goods are defective or in accord with the specifications. Any such repairs or modifications must be authorized by the Company in writing.

11.4 This warranty does not apply to, nor is any expense or other damages or liability assumed for work performed on serviced equipment that has been subsequently serviced by another firm without authorization by the Company in writing.

12. Equipment and Materials of Others - The Company's responsibility does not extend to equipment not manufactured by the Company. The Company will reasonably assist Purchaser in making claims under any warranty provided by the supplier or manufacturer of such equipment.

12.1 The Company's responsibility does not extend to used equipment supplied in any other than "fully reconditioned" state.

12.2 THE FORGOING WARRANTY IS EXCLUSIVE AND EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES (EXCEPT TITLE), WHETHER EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE FORGOING REMEDIES OF REPAIR OR REPLACEMENT SHALL CONSTITUTE THE SOLE REMEDY OF THE PURCHASER AND SOLE LIABILITY OF THE COMPANY FOR ANY BREACH OF WARRANTY.

13. Nuclear Insurance – Indemnity - For applications in nuclear projects, the Purchaser/Owner shall have a complete and proper insurance protection against liability and

property damage resulting from a nuclear incident and shall indemnify the Company, its suppliers and subcontractors against all claims resulting from a nuclear incident.

14. Returned Goods – No goods shall be returned without the Purchaser having secured approval and terms of return from the Company. The return of all goods including, but not limited to, returnable shipping materials such as cable reels, end plates or covers, oil drums, gas bottles, etc. will not be permitted under any condition without the Company's properly executed Returned Goods Authorization Form. Goods returned without complete identification in accordance with the Company's instructions or without charges prepaid shall not be accepted. The Company reserves the right to refuse any goods returned for credit.

15. Termination - After acceptance by the Company, an order shall not be terminated, in whole or part by the Purchaser except by agreement in writing from the Company and such agreement shall be contingent upon payment of reasonable Cancellation Charges based upon expenses already incurred and commitments made by the Company plus a charge of 10% of the contract price to compensate the Company for indirect costs resulting from the termination.

16. Rescheduling - Rescheduling of an order by the Purchaser shall require agreement in writing executed by the Company and renegotiation of the price and escalation terms to reasonably cover additional costs and commitments occasioned by the change. Delivery commitments made by the Company are based upon complete specifications and/or information supplied by the Purchaser with the order and upon prompt return of approval drawings (if required by the Purchaser) by the date requested by the Company. Rescheduling of any order by the Company as a result of the Purchaser's delay in returning approval drawings shall require renegotiation of price and escalation terms to reasonably cover additional costs and commitments occasioned by the delay.

17. Drawing Approval and Changes - If at drawing approval, the Company has failed to design the product in accordance with the Purchaser's specifications, the Company shall, at its expense, make appropriate changes. Where Purchaser's specifications are not definitive, the Company reserves the right to design the product in line with, in the Company's judgment, good engineering practice. If at drawing approval, the Purchaser makes changes outside the scope of the design as covered in Purchaser's specifications, the price and delivery terms shall be renegotiated to reasonably cover any additional cost and commitments occasioned by the change. Such change must be in writing executed by the Purchaser and Company. Changes made to an order by the Purchaser after engineering is completed or entry of the order into manufacturing shall result in substantially greater costs and delivery delays.

18. Taxes - Prices quoted are exclusive of any present or future federal or state taxes or local sales, use or excise taxes, or tariffs. If any such present or future sales, use or excise taxes, or tariffs apply, then they shall be added to the invoice as a separate item unless Purchaser has furnished an acceptable tax exemption certificate from such tax prior to shipment.

19. Indemnification – Purchaser shall fully indemnify, defend and hold harmless Company, its affiliates and all of its and their respective co-owners, partners, joint venturers, officers, directors, employees and agents (collectively the "Company Indemnified Parties") from and against all claims directly or indirectly arising out of or resulting from or relating to any of the following:

- (a) Personal injury or death of any person, or damage to the extent in any way directly or indirectly arising out of or related to the negligence (of any type) or willful misconduct of Purchaser or anyone directly or indirectly employed by them or anyone for whose acts they may be liable (other than any Contractor Indemnified Parties")
- (b) Personal injury to or death of any employees of Purchaser, regardless of the cause of such damages, losses, costs, and expenses, including the sole or joint negligence, breach of contract or other basis of liability of any Contractor Indemnified Parties.

20. Dispute Resolution – Any controversy or claim arising out of or relating to this Contract, or the breach thereof, shall be settled by arbitration by the American Arbitration Association under its Commercial Arbitration Rules, and judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof. The arbitration shall be conducted in accordance with the Federal Arbitration Act, 9 U.S.C. 1 *et seq*, and the venue for the arbitration shall be the Circuit Court of Seminole County, Florida.

20.1 Both Company and Purchaser hereby knowingly, voluntarily, and intentionally waive and forever relinquish any and all claims or rights that such party may have to any trial by jury on any issue arising out of any litigation or disputes or claims under this Contract or any order or in any way associated therewith. Both parties intend to waive and forever relinquish any right under the Seventh Amendment of the United States Constitution to trial by jury and any claims or rights to a trial by jury under the constitution of any state or any other constitutional, statutory, or otherwise applicable law providing for a right to trial by jury.

21. General –

21.1 Company shall not be responsible for the acts and workmanship of the employees, contractors, subcontractors or agents of the Purchaser. The Company reserves the right to subcontractor any of the work to one or more subcontractors.

21.2 The delegation or assignment by Purchaser of any or all of its duties or rights hereunder without Company's prior written consent shall be void.

21.3 The rights and obligations of the parties under this Contract shall be interpreted and governed in all respects by the laws of the state of Florida. If either party brings against the other party any proceeding arising out of this agreement, that party may bring that proceeding only in the United States District Court for the Middle District of Florida or, only if there is no federal subject matter jurisdiction, in Circuit Court of Seminole County, Florida.

21.4 Any information, suggestions or ideas transmitted by Purchaser to Company in connection with performance hereunder are not to be regarded as secret or submitted in confidence except as may be otherwise provided in a writing signed by a duly authorized representative of Purchaser.

21.5 Company shall comply with all state and federal safety and health laws, including but not limited to the Occupational Safety and Health Act of 1970 (OSHA) and all standards, rules, regulations and orders issued pursuant to such state and federal safety and health laws and laws related to non-segregated facilities and equal employment opportunity.

21.6 This Contract contains the complete agreement between the parties and no modification, amendment, revision, waiver or other change will be binding on Company unless assented to in writing by Company's authorized representative. Any oral or written

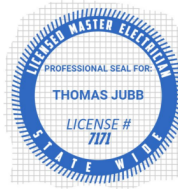
representation, warranty, course of dealing or trade usage not contained or referenced herein will not be binding on Company.

21.7 Purchaser shall obtain and pay for all necessary permits for the work to be done and shall hold company harmless from any liability for work done without said permits.

21.8 Should any term or provisions of this Contract be held invalid, illegal, or unenforceable, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby and such provision shall be ineffective only to the extent of such invalidity, illegality, or unenforceability.

INITIALS: COMPANY _____
PURCHASER _____

CL2:459754_v6
Revised February 2, 2025



A Member of the Professional Electrical Services and Management, L.L.C. (PESM) Team

Mathew Robinson

Senior Estimator

Mobile: 717-451-6179

www.ib-abel.com

Date: 12/3/25

Due Date-12/15/25

Proposal #: tjpesmprott dgs hb cap complex cup 12 3 25

Project: 25-2216 - DGS Central Plant Upgrades

Thank you for allowing us the opportunity to service you and your team. Our team has over 65 years of providing quality electrical related services to commercial, educational, institutional, mission critical data centers, and industrial buildings, in both the private and government sectors.

We will strive to insure that your electrical systems installation and maintenance, will meet the required specifications, electrical industry recommended and or required codes and standards, (such as NETA, NFPA70A, NFPA70B, NFPA70E, NFPA110, IEEE, NEMA, OSHA, ANSI, ASTM, BOCA, JACHO- as well as local jurisdictional and general insurance requirements). Our solutions are tailored to each specific client/facility. This will assist in minimizing the hazards to **life, property, and equipment for the final owners.**

Based on industry insurance reports, hundreds of millions of dollars are lost, as well as many lives lost and injuries reported, as a direct result of property owners, first-not having a properly tested new electrical system installation and second- owners not implementing a form of a recommended or required code/standard compliant Electrical Risk Management Program (ERMP) program in their facilities.

Please see below your supplied specifications and equipment drawings that reflect the 3rd party independent testing/engineering services that are required for this project. PESM has assembled a plan with multiple options for your review. Please contact us to discuss or if changes are needed. Areas **highlighted in yellow** are either comments from PESM or emphasized information. Items ~~crossed out~~ are to be completed by others.



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Were general testing or NETA type testing is noted in the specs, (unless otherwise noted) it was utilized as the bases for this testing plan. As the spec listed testing of devices that are not shown on the supplied drawings- they are excluded.

I) SPECIFICATIONS and information supplied by client: (as applicable)

SECTION 260513

MEDIUM-VOLTAGE CABLES

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.

b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.

2. Test results that comply with requirements.

3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

3.8 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal.

a. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of



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reducing natural ground resistance.

b. Perform tests by the fall-of-potential method according to IEEE 81.

4. Provide drawings locating each ground rod/plate and ground rod/plate assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods/plates driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

a. Equipment Rated 500 kVA and Less: 10 ohms.

b. Equipment Rated 500 to 1000 kVA: 5 ohms.

c. Equipment Rated More Than 1000 kVA: 3 ohms.

d. Equipment Rated More Than 600V/GND: 3 ohms.

SECTION 260543

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL AND TELECOMMUNICATION SYSTEMS

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

SECTION 261116

SECONDARY UNIT SUBSTATIONS WITH SWITCHGEAR SECONDARY

3.6 FIELD QUALITY CONTROL

A. General Field Testing Requirements:

1. Comply with provisions of NFPA 70B, "Testing and Test Methods" Chapter.

2. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

3. After installing secondary unit substation but before primary is energized, verify that grounding system at substation is tested at specified value or less.

4. After installing secondary unit substation and after electrical circuitry has been energized, test for compliance with requirements.

5. Visual and Mechanical Inspection:

a. Verify equipment nameplate data complies with Contract Documents.

b. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

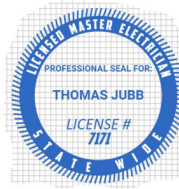
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

7. Prepare test and inspection reports. Record as-left set points of all adjustable devices.

B. Switchgear Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.



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- b. Inspect anchorage, alignment, grounding, and required area clearances.
- c. Verify unit is clean and shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.
- d. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study as well as to address of circuit breaker that is used to identify it in microprocessor-communication software.
- e. Verify that current and voltage-transformer ratios correspond to Drawings.
- f. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
 - 1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
 - 2) Make key exchange with devices operated in off-normal positions.
- g. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- h. Inspect insulators for evidence of physical damage or contaminated surfaces.
- i. Verify correct barrier and shutter installation and operation.
- j. Exercise all active components.
- k. Inspect mechanical indicating devices for correct operation.
- l. Verify that filters are in place and vents are clear.
- m. Inspect control power transformers as follows:
 - 1) Inspect for physical damage, cracked insulation, broken leads, connection tightness, defective wiring, and overall general condition.
 - 2) Verify that primary- and secondary-fuse or circuit-breaker ratings match Drawings and comply with manufacturer's recommendations.
 - 3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.
- 2. Electrical Tests:
 - a. Perform dc voltage insulation-resistance tests on each bus section, phase-to phase and phase-to-ground, for one minute. If temperature of bus is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.
 - 1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.
 - 2) Do not proceed to dielectric-withstand-voltage tests until insulation resistance levels are raised above minimum values.
 - b. Perform a dielectric-withstand-voltage test on each bus section, each phase-to ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.
 - 1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric-withstand-voltage test, test specimen is considered to have passed test.
 - c. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for



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600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's recommendation.

1) Minimum insulation-resistance values of control wiring must not be less than 2 megohms.

d. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at all devices.

2) Verify secondary voltages by energizing primary winding with system voltage.

e. Perform current-injection tests on entire current circuit in each section of switchgear.

1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 A flows in secondary circuit. Verify correct magnitude of current at each device in circuit.

2) Perform current tests by primary injection with magnitudes such that a minimum of 1.0 A flows in secondary circuit. Verify correct magnitude of current at each device in circuit.

f. Verify operation of space heaters.

g. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from each source.

C. Medium-Voltage Surge Arrester Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, grounding, and clearances.

c. Verify arresters are clean.

d. Verify that ground lead on each device is individually attached to a ground bus or ground electrode.

e. Verify that stroke counter is correctly mounted and electrically connected if applicable. Record stroke counter reading.

2. Electrical Test:

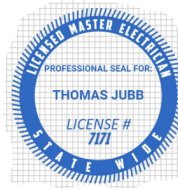
a. Perform an insulation-resistance test on each arrester, phase terminal-to-ground. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to meet recommended minimum insulation resistance listed in table.

b. Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.

3. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than this table or manufacturer's recommendations. Dielectric-withstand-voltage tests must not proceed until insulation-resistance levels are raised above minimum values.

b. Perform a contact/pole-resistance test. Compare bolted connection resistance



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values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of lowest value. Microhm or dc millivolt drop values must not exceed high levels of normal range as indicated in manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

c. Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.

d. Verify correct operation of any auxiliary features, such as electrical close and trip operation, trip-free operation, and anti-pump function. Auxiliary features must operate in accordance with manufacturer's published data.

e. Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators.

f. Perform power-factor or dissipation-factor tests on each pole with breaker open and each phase with breaker closed. Power-factor or dissipation-factor values must meet manufacturer's published data.

g. Perform vacuum bottle integrity (dielectric-withstand-voltage) test across each vacuum bottle, with contacts in "open" position in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by end of total time of voltage application during vacuum bottle integrity test, test specimen is considered to have passed test.

h. Perform a dielectric-withstand-voltage test in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric-withstand-voltage test, test specimen is considered to have passed test.

i. Verify operation of heaters.

D. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Verify correct connection of transformers with system requirements.

c. Verify that adequate clearances exist between primary and secondary circuit wiring.

d. Verify unit is clean.

e. Verify that required grounding and shorting connections provide contact.

f. Verify correct operation of transformer withdrawal mechanism and grounding operation.

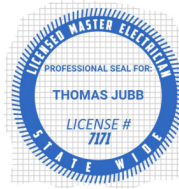
g. Verify correct primary- and secondary-fuse sizes for voltage transformers.

h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:

a. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, comply with manufacturer's recommendations. Insulation-resistance values of instrument transformers must not be less than values shown in NETA ATS, Table 100.5.

b. Perform a polarity test of each current transformer in accordance with



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IEEE C57.13.1. Polarity results must agree with transformer markings.

c. Perform a ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must comply with IEEE C57.13.

d. Perform an excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or must comply with IEEE C57.13.1.

e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. The measured burdens must match instrument transformer Accuracy Class rating.

f. Perform dielectric-withstand-voltage tests on primary winding with secondary grounded. Test voltages must comply with NETA ATS, Table 100.9. If no evidence of distress or insulation failure is observed by end of total time of voltage application, primary winding is considered to have passed test.

g. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with test equipment manufacturer's published data.

h. Verify that current-transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3.

3. Electrical Tests of Voltage and Potential Transformers:

a. Perform insulation-resistance tests winding-to-winding and each winding-toground. Apply test voltage for one minute in accordance with NETA ATS, Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's recommendations. Insulation-resistance values of instrument transformers must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.5.

b. Perform insulation-resistance tests winding-to-winding and each winding-toground. Test voltages must be applied for one minute in accordance with NETA ATS, Table 100.5. Insulation-resistance values of transformers must not be less than values shown in NETA ATS, Table 100.5.

c. Perform a polarity test on each transformer to verify polarity marks or H(1)-X(1) relationship. Polarity results must agree with transformer markings.

d. Perform a turns-ratio test on all tap positions. Ratio errors must not exceed tolerances specified in IEEE C57.13.

e. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to instrument transformer ratings. The measured burdens must match instrument transformer Accuracy Class rating.

f. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with test equipment manufacturer's published data.

g. Verify that voltage-transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3.

E. Dry-Type Transformer Section Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, and grounding.



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- c. Verify that resilient mounts are free and that any shipping brackets have been removed.
- d. Verify unit is clean.
- e. Verify that alarm, control, and trip settings on temperature and level indicators are set and operate within manufacturer's recommended settings.
- f. Verify that cooling fans operate and that fan motors have correct overcurrent protection.
- g. Perform specific inspections and mechanical tests recommended by manufacturer.
- h. Verify that as-left tap connections are as specified.
- i. Verify presence of surge arresters and that their ratings are as specified.
- 2. Electrical Tests:
 - a. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index; value of index must not be less than 1.0.
 - b. Perform power-factor or dissipation-factor tests on windings in accordance with test equipment manufacturer's published data. Investigate and correct power-factor values that exceed:
 - 1) 2.0 percent for power transformers.
 - 2) 5.0 percent for distribution transformers.
 - c. Measure core insulation resistance at 500 V(dc) if core is insulated and core ground strap is removable. Core insulation-resistance values must not be less than 1 megohm at 500 V(dc).
 - d. Perform a power-factor or dissipation-factor tip-up test on windings greater than 2.5 kV. Tip-up test result exceeding 1.0 percent must be investigated.
 - e. Perform turns-ratio tests at all tap positions. The test results must not deviate by more than one-half percent from either adjacent coils or calculated ratio. If test fails, replace transformer.
 - f. Perform an excitation-current test on each phase. The typical excitation-current test data pattern for a three-legged core transformer is two similar current readings and one lower current reading. Investigate and correct if test shows a different pattern.
 - g. Measure resistance of each winding at each tap connection.
 - h. Perform an applied-voltage test on all primary and secondary windings-to-ground. See IEEE C57.12.91, Sections 10.2 and 10.9. The ac dielectric-withstand-voltage test result must not exceed 75 percent of factory test voltage for one-minute duration. The dc dielectric-withstand-voltage test result must not exceed 100 percent of ac RMS test voltage specified in IEEE C57.12.91, Section 10.2, for one minute duration. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric-withstand-voltage test, test specimen is considered to have passed test.
 - i. Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.
- F. Low-Voltage Power Circuit-Breaker Field Tests:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, and grounding.
 - c. Verify that all maintenance devices are available for servicing and operating



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breaker.

d. Verify unit is clean.

e. Verify that arc chutes are intact.

f. Inspect moving and stationary contacts for condition and alignment.

g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.

h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.

i. Verify cell fit and element alignment.

j. Verify racking mechanism operation.

k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

l. Perform adjustments for final protective-device settings in accordance with coordination study provided by end user.

m. Record as-found and as-left operation counter readings.

2. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations must be investigated.

b. Measure contact resistance across each power contact of circuit breaker. Microhm or dc millivolt drop values must not exceed high levels of normal range as indicated in manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic must not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are not available, trip times must not exceed value shown in NETA ATS, Table 100.7.

d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic must not exceed manufacturer's published time-current tolerance band.

e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic must not exceed manufacturer's published time-current tolerance band.

f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.

g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.

h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and



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close coils must conform to manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.

i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.

j. Verify correct operation of any auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, anti-pump function, and trip unit battery condition. Reset trip logs and indicators.

Auxiliary features must operate in accordance with manufacturer's published data.

k. Verify operation of charging mechanism. The charging mechanism must operate in accordance with manufacturer's published data.

G. Metering Device Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

c. Verify unit is clean.

d. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.

b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.

c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specification

d. Verify that current-transformer and voltage-transformer secondary circuits are intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

H. Nonconforming Work:

1. Equipment will be considered defective if it does not pass tests and inspections.

2. Remove and replace defective units and retest.

I. Prepare test and inspection reports.

4. Report:

a. Prepare a written report covering monitoring performed and corrective action taken.

b. For each relay and adjustable circuit breaker, tag device with adjusting technician's initials and date of adjustment. Record settings and file with test records specified in "Field Quality Control" Article.

B. Infrared Inspection and Adjusting: Perform survey during periods of maximum possible loading. Remove all necessary covers prior to inspection.

1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of electrical power connections of unit substation.

2. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchgear 11 months after date of Substantial Completion.

3. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1.8 deg F (1 deg C) at 104 deg F (30 deg C).

4. Record of Infrared Inspection: Prepare a certified report that identifies testing technician and equipment used, and lists the following results:

a. Description of equipment to be tested.



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- b. Discrepancies.
- c. Temperature difference between area of concern and reference area.
- d. Probable cause of temperature difference.
- e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
- f. Identify load conditions at time of inspection.
- g. Provide photographs and thermograms of deficient area.
- 5. Act on inspection results in accordance with recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Client Agency's operations permit.

SECTION 261323

MEDIUM-VOLTAGE SWITCHGEAR

3.5 FIELD QUALITY CONTROL

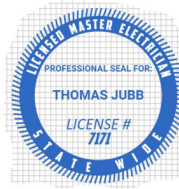
A. General Field Testing Requirements:

- 1. Comply with the provisions of NFPA 70B, "Testing and Test Methods."
- 2. After installing switchgear and after electrical circuitry has been energized, test for compliance with requirements.
- 3. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

B. Medium-Voltage Switchgear Assembly Field Tests:

1. Visual and Mechanical Inspection:

- a. Verify that fuse and switch sizes and types correspond to Drawings and coordination study, as well as to the switch's address in the control network.
- b. Verify that current and voltage transformer ratios correspond to Drawings.
- c. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
- d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
 - 1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
 - 2) Make key exchange with devices operated in off-normal positions.
- e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- f. Inspect insulators for evidence of physical damage or contaminated surfaces.
- g. Verify correct barrier and shutter installation and operation.
- h. Exercise active components.
- i. Inspect mechanical indicating devices for correct operation.
- j. Verify that filters are in place and vents are clear.
- k. Perform visual and mechanical inspection of instrument transformers in accordance with Article "Instrument Transformer Field Tests."
- l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or switch ratings match drawings.



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3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.

2. Electrical Tests:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Perform dc voltage insulation-resistance tests on each bus section, phase to phase and phase to ground, for one minute. If the temperature of the bus is other than plus or minus 20 deg C, adjust the resulting resistance as provided in NETA ATS, Table 100.11.

1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.

2) Do not proceed to the dielectric withstand voltage tests until insulation resistance levels are raised above minimum values.

c. Perform a dielectric withstand voltage test on each bus section, each phase to ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply the test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.

d. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate the applied voltage, follow the manufacturer's recommendation.

1) Minimum insulation-resistance values of control wiring must not be less than two megohms.

e. Control Power Transformers:

1) Perform insulation-resistance tests. Perform measurements from winding to winding and each winding to ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.

2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to a rated secondary voltage source. Verify correct potential at all devices.

3) Verify correct secondary voltage by energizing the primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected.

4) Verify correct function of control transfer relays located in the switchgear with multiple control power sources.



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f. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at all devices.

2) Verify secondary voltages by energizing the primary winding with system voltage.

g. Perform current-injection tests on the entire current circuit in each section of switchgear.

1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.

2) Perform current tests by primary injection with magnitudes such that a minimum of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.

h. Perform system function tests in accordance with "System Function Tests" Article.

i. Verify operation of space heaters.

j. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from each source.

3. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Insulation resistance values must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than this table or manufacturer's recommendations. Dielectric-withstand-voltage tests must not proceed until insulation-resistance levels are raised above minimum values.

b. Perform a contact/pole-resistance test. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value. Microhm or dc millivolt drop values must not exceed the high levels of the normal range in accordance with manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

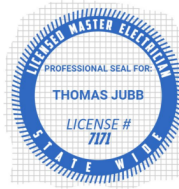
c. Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the trip and close coils must comply with manufacturer's published data. In the absence of the manufacturer's published data, comply with NETA ATS, Table 100.20.

d. Verify correct operation of any auxiliary features, such as electrical close and trip operation, trip-free operation, and anti-pump function. Auxiliary features must operate in accordance with manufacturer's published data.

e. Trip switch by operation of each protective device. Reset trip logs and indicators.

f. Perform power-factor or dissipation-factor tests on each pole with the switch open and each phase with the switch closed. Power-factor or dissipation-factor values must comply with manufacturer's published data.

g. Perform vacuum bottle integrity (dielectric-withstand-voltage) test across each vacuum bottle, with the contacts in the "open" position in accordance with manufacturer's published data. If no evidence of distress or insulation failure is



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observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.

h. Perform a dielectric-withstand-voltage test in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric-withstand-voltage test, the test specimen is considered to have passed the test.

i. Verify operation of heaters.

C. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.

b. Inspect physical and mechanical condition.

c. Verify correct connection of transformers with system requirements.

d. Verify that adequate clearances exist between primary and secondary circuit wiring.

e. Verify the unit is clean.

f. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.

Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

g. Verify that required grounding and shorting connections provide contact.

h. Verify correct operation of transformer withdrawal mechanism and grounding operation.

i. Verify correct primary and secondary fuse sizes for voltage transformers.

j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000 V(dc) for one minute. For units with solid state components that cannot tolerate the applied voltage, follow manufacturer's written recommendations. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.5.

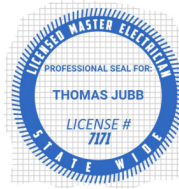
c. Perform a polarity test of each current transformer in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.

d. Perform a ratio-verification test using the voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.

e. Perform an excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match the curve supplied by the manufacturer or be in accordance with IEEE C57.13.1.

f. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared with and must match instrument transformer ratings.

g. Perform insulation-resistance tests on the primary winding with the secondary



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grounded. Test voltages must be in accordance with Table 100.5.

h. Perform dielectric withstand tests on the primary winding with the secondary grounded. Test voltages must be in accordance with Table 100.9.

i. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.

j. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by the engineer in the project drawings.

3. Electrical Tests of Voltage Transformers:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Perform insulation-resistance tests winding-to-winding and each winding to ground. Test voltages must be applied for one minute in accordance with Table 100.5. For units with solid-state components that cannot tolerate the applied voltage, follow manufacturer's recommendations. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.5.

c. Perform a polarity test on each transformer to verify the polarity marks or H1- X1 relationship as applicable. Polarity results must agree with transformer markings.

d. Perform a turns-ratio test on all tap positions. Ratio errors must be in accordance with IEEE C57.13.

e. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared with and must match instrument transformer ratings.

f. Perform a dielectric withstand test on the primary windings with the secondary windings connected to ground. The dielectric voltage must be in accordance with Table 100.9. The test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the primary windings are considered to have passed the test.

g. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use test equipment manufacturer's published data.

h. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that the circuits are grounded at only one point.

D. Ground Resistance Test:

1. Visual and Mechanical Inspection:

a. Verify ground system complies with the Contract Documents and NFPA 70 Article 250, "Grounding and Bonding."

b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.

c. Inspect bolted electrical connections using a calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.



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Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

d. Inspect anchorage.

2. Electrical Tests:

a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on the main grounding electrode or system. The resistance between the main grounding electrode and ground must be no more than 5 ohms.

b. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 ohms. Compare equipment nameplate data with Contract Documents.

c. Inspect physical and mechanical condition.

d. Inspect bolted electrical connections for high resistance using a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

E. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

d. Verify the unit is clean.

e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Verify accuracy of meters at all cardinal points. Meter accuracy must be in accordance with manufacturer's published data.

c. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.

d. Verify all instrument multipliers. Instrument multipliers must be in accordance with system design specifications.

e. Verify that current transformer and voltage transformer secondary circuits are intact. Test results must confirm the integrity of the secondary circuits of current and voltage transformers.

F. Medium-Voltage Surge Arrester Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.

b. Inspect physical and mechanical condition.

c. Inspect anchorage, alignment, grounding, and clearances.

d. Verify the arresters are clean.

e. Verify that the ground lead on each device is individually attached to a ground bus



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or ground electrode.

f. Verify that the stroke counter is correctly mounted and electrically connected if applicable. Record the stroke counter reading.

2. Electrical Test:

a. Perform an insulation-resistance test on each arrester, phase terminal to ground. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to meet recommended minimum insulation resistance listed in the table.

b. Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.

c. Test grounding connections. Resistance between the arrester ground terminal and the ground system must be less than 0.5 ohm.

G. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.

b. Verify operation of light-emitting diodes, display, and targets.

c. Record passwords for each access level.

d. Clean the front panel and remove foreign material from the case.

e. Check tightness of connections.

f. Verify that the frame is grounded in accordance with manufacturer's instructions.

g. Set the relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."

h. Download settings from the relay. Print a copy of the settings for the report and compare the settings to those specified in the coordination study.

2. Electrical Tests:

a. Perform insulation-resistance tests from each circuit to the grounded frame in accordance with manufacturer's published data.

b. Apply voltage or current to analog inputs, and verify correct registration of the relay meter functions.

c. Functional Operation: Check functional operation of each element used in the protection scheme as follows:

1) Timing Relay:

a) Determine time delay.

b) Verify operation of instantaneous contacts.

2) Volts/Hertz Relay:

a) Determine pickup frequency at rated voltage.

b) Determine pickup frequency at a second voltage level.

c) Determine time delay.

3) Sync Check Relay:

a) Determine closing zone at rated voltage.

b) Determine maximum voltage differential that permits closing at zero degrees.

c) Determine live line, live bus, dead line, and dead bus set points.

d) Determine time delay.

e) Verify dead bus/live line, dead line/live bus, and dead bus/dead line control functions.



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- 4) Undervoltage Relay:
 - a) Determine dropout voltage.
 - b) Determine time delay.
 - c) Determine time delay at a second point on the timing curve for inverse time relays.
- 5) Directional Power Relay:
 - a) Determine minimum pickup at maximum torque angle.
 - b) Determine closing zone.
 - c) Determine maximum torque angle.
 - d) Determine time delay.
 - e) Verify time delay at a second point on the timing curve for inverse time relays.
 - f) Plot the operating characteristic.
- 6) Current Balance Relay:
 - a) Determine pickup of each unit.
 - b) Determine percent slope.
 - c) Determine time delay.
- 7) Negative Sequence Current Relay:
 - a) Determine negative sequence alarm level.
 - b) Determine negative sequence minimum trip level.
 - c) Determine maximum time delay.
 - d) Verify two points on the I-two-squared-t curve.
- 8) Phase Sequence or Phase Balance Voltage Relay:
 - a) Determine positive sequence voltage to close the NO contact.
 - b) Determine positive sequence voltage to open the NC contact (undervoltage trip).
 - c) Verify negative sequence trip.
 - d) Determine time delay to close the NO contact with sudden application of 120 percent of pickup.
 - e) Determine time delay to close the NC contact upon removal of voltage when previously set to rated system voltage.
- 9) Instantaneous Overcurrent Relay:
 - a) Determine pickup.
 - b) Determine dropout.
 - c) Determine time delay.
- 10) Time Overcurrent:
 - a) Determine minimum pickup.
 - b) Determine time delay at two points on the time current curve.
- 11) Ground Detector Relay:
 - a) Determine maximum impedance to ground causing relay pickup.
- 12) Directional Overcurrent Relay:
 - a) Determine directional unit minimum pickup at maximum torque angle.
 - b) Determine closing zone.
 - c) Determine maximum torque angle.
 - d) Plot operating characteristics.
 - e) Determine overcurrent unit pickup.
 - f) Determine overcurrent unit time delay at two points on the time current curve.



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d. Control Verification:

1) Functional Tests:

- a) Check operation of all active digital inputs.
- b) Check output contacts or silicone-controlled rectifiers (SCRs), preferably by operating the controlled device, such as switch, auxiliary relay, or alarm.
- c) Check internal logic functions used in protection scheme.
- d) Upon completion of testing, reset min/max recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.

2) In-Service Monitoring: After the equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.

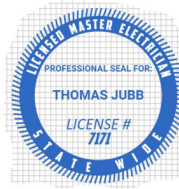
H. DC System VRLA Batteries Field Test:

1. Visual and Mechanical Inspection:

- a. Verify that batteries are adequately located.
- b. Verify that battery area ventilation system is operable.
- c. Verify existence of suitable eyewash equipment.
- d. Verify equipment nameplate data complies with Contract Documents.
- e. Inspect physical and mechanical condition.
- f. Verify adequacy of battery support racks, mounting, anchorage, alignment, grounding, and clearances.
- g. Verify the units are clean.
- h. Inspect spill containment installation.
- i. Verify application of an oxide inhibitor on battery terminal connections.

2. Electrical Tests:

- a. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended levels.
- b. Verify charger functions and that alarms comply with system manufacturer's recommendations.
- c. Measure negative post temperature. Negative post temperature must comply with manufacturer's published data or IEEE 1188.
- d. Measure charger float and equalizing voltage levels. Charger float and equalizing voltage levels must be in accordance with the battery manufacturer's published data.
- e. Measure each monoblock/cell voltage and total battery voltage with charger energized and in float mode of operation. Monoblock/cell voltages must be in accordance with manufacturer's published data.
- f. Measure intercell connection resistances.
- g. Perform internal ohmic measurement tests. Cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical cells that are in a fully charged state. Monoblock/cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical monoblocks/cells in a fully charged state.
- h. Perform a load test in accordance with manufacturer's published data or IEEE 1188. Replace units that fail to pass the test.
- i. Measure the battery system voltage from positive to ground and negative to ground. Voltage measured from positive to ground must be equal in magnitude to



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the voltage measured from negative to ground.

I. Nonconforming Work:

1. Switchgear will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.
- J. Prepare test and inspection reports. Record as-left set points of adjustable devices.

1. The contractor shall provide three (3) copies of the manufacturer's representative certification.
2. The contractor shall provide three (3) copies of the manufacturer's field startup report.
3. The contractor shall provide three (3) copies of factory test reports.

3.6 SYSTEM FUNCTION TESTS

A. System function tests must prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and all components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
3. Verify the correct operation of sensing devices, alarms, and indicating devices.

3.7 FOLLOW-UP SERVICE

A. Voltage Monitoring and Adjusting: After acceptance by the Department, but not more than six months after acceptance, if requested by the Department or Client Agency, perform the following voltage monitoring:

1. During a period of normal load cycles as evaluated by Client Agency, perform seven days of three-phase voltage recording at the outgoing section of each switchgear. Use voltmeters with calibration traceable to NIST standards and with a chart speed of not less than 1 inch (25 mm) per hour. Voltage unbalance greater than 1 percent between phases, or deviation of phase voltage from the nominal value by more than plus or minus 5 percent during the test period is unacceptable.
2. Corrective Action: If test results are unacceptable, perform the following corrective action, as appropriate:
 - a. Adjust switchgear taps.
 - b. Prepare written request for voltage adjustment by electric utility.
3. Retests: Repeat monitoring, after corrective action has been performed, until specified results are obtained.
4. Report:
 - a. Prepare a written report covering monitoring performed and corrective action taken.

B. Infrared Inspection: Perform the survey during periods of maximum possible loading. Remove covers prior to the inspection.

1. After acceptance by the Department, but not more than 60 days after acceptance, perform infrared inspection of the electrical power connections of the switchgear.
2. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1deg C at 86 deg F (30 deg C).
3. Record of Infrared Inspection: Prepare a certified report that identifies the testing technician and equipment used and lists the results as follows:
 - a. Description of equipment to be tested.
 - b. Discrepancies.



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- c. Temperature difference between the area of concern and the reference area.
- d. Probable cause of temperature difference.
- e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
- f. Identify load conditions at time of inspection.
- g. Provide photographs and thermograms of the deficient area.
- 4. Act on inspection results in accordance with the recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Client Agency's operations permit

SECTION 262200

LOW VOLTAGE TRANSFORMERS

3.3 FIELD QUALITY CONTROL

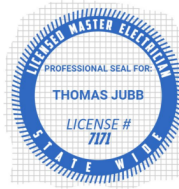
- A. Engage a qualified electrical testing and inspecting agency to administer and perform tests and inspections specified within this section, with the assistance of a factory authorized service representative.
- B. Test Objectives: To ensure transformer is operational within industry and manufacturer's tolerances, is installed according to the Contract Documents, and is suitable for energizing.
- C. Test Labeling: On satisfactory completion of tests for each transformer, attach a dated and signed "Satisfactory Test" label to tested component.
- D. Schedule tests and provide notification at least 7 days in advance of test commencement.
- E. Report: Submit a written report of observations and tests. Report defective materials and installation.
- F. Tests: Include the following minimum inspections and tests according to manufacturer's written instructions. Comply with IEEE C57.12.91 for test methods and data correction factors.
 - 1. Inspect accessible components for cleanliness, mechanical and electrical integrity, and damage or deterioration. Verify that temporary shipping bracing has been removed. Include internal inspection through access panels and covers.
 - 2. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, if not available, those specified in UL 486A and UL 486B.
 - 3. Insulation Resistance: Perform megohmmeter tests of primary and secondary winding to winding and winding to ground.
 - a. Minimum Test Voltage: 1000 V, dc.
 - b. Minimum Insulation Resistance: 500 megohms.
 - c. Duration of Each Test: 10 minutes.
 - d. Temperature Correction: Correct results for test temperature deviation from 20 deg C standard.

SECTION 262300

LOW-VOLTAGE SWITCHGEAR

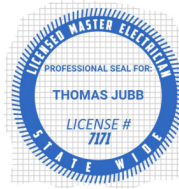
3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Comply with provisions of "Testing and Test Methods" Chapter in NFPA 70B and NETA ATS.
 - 2. After installing switchgear and after electrical circuitry has been energized, test for compliance with requirements.
 - 3. Perform visual and mechanical inspections and electrical tests stated in NETA ATS. Certify compliance with test parameters.
 - 4. Visual and Mechanical Inspection:



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- a. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study, as well as to circuit breakers address in control network.
- b. Verify that current and voltage transformer ratios correspond to Drawings.
- c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.
- d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
 - 1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
 - 2) Make key exchange with devices operated in off-normal positions.
- e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- f. Inspect insulators for evidence of physical damage or contaminated surfaces.
- g. Verify correct barrier and shutter installation and operation.
- h. Exercise active components.
- i. Inspect mechanical indicating devices for correct operation.
- j. Verify that filters are in place and that vents are clear.
- k. Perform visual and mechanical inspection of instrument transformers in accordance with "Instrument Transformer Field Tests" Paragraph.
- l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
 - 3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.
5. Electrical Tests:
 - a. Perform DC voltage insulation-resistance tests on bus sections, phase-to-phase and phase-to-ground, for one minute. If bus temperature is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.
 - 1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.
 - 2) Do not proceed to dielectric withstand voltage tests until insulation resistance levels are raised above minimum values.
 - b. Perform dielectric withstand voltage test on bus sections, phase-to-ground with phases not under test grounded, in accordance with manufacturer's published



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data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, test specimen is considered to have passed test.

c. Perform insulation-resistance tests on control wiring for ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's published instruction.

1) Minimum insulation-resistance values of control wiring may not be less than 2 MΩ.

d. Control Power Transformers:

1) Perform insulation-resistance tests. Perform measurements from winding-to winding and windings-to-ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.

2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to rated secondary voltage source. Verify correct potential at devices.

3) Verify correct secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with secondary wiring disconnected.

4) Verify correct function of control transfer relays located in switchgear with multiple control power sources.

e. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at devices.

2) Verify secondary voltages by energizing primary winding with system voltage.

f. Perform current-injection tests on entire current circuit in switchgear sections.

1) Perform current tests by secondary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.

2) Perform current tests by primary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.

g. Perform system function tests in accordance with "System Function Tests" Paragraph.

h. Verify operation of space heaters.

i. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from sources.

B. Circuit-Breaker Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, and grounding.

c. Verify that maintenance devices are available for servicing and operating breaker.

d. Verify unit is clean.



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- e. Verify that arc chutes are intact.
 - f. Inspect moving and stationary contacts for condition and alignment.
 - g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.
 - h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.
 - i. Verify cell fit and element alignment.
 - j. Verify racking mechanism operation.
 - k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - l. Perform adjustments for final protective-device settings in accordance with coordination study provided by Client Agency.
 - m. Record as-found and as-left operation counter readings.
2. Electrical Tests:
- a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across open poles. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than Table 100.1 or manufacturer's published instructions must be investigated.
 - b. Measure contact resistance across power contacts of circuit breakers. Drop values for $\mu\Omega$ or mV(dc) may not exceed high levels of normal range as indicated in manufacturer's published data. In absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
 - c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are unavailable, trip times may not exceed value shown in NETA ATS, Table 100.7.
 - d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
 - e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
 - f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.
 - g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.
 - h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.



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- i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
 - j. Verify correct operation of auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, ant pump function, and trip-unit battery condition. Reset trip logs and indicators. Auxiliary features must operate in accordance with manufacturer's published data.
 - k. Verify operation of charging mechanism. Charging mechanism must operate in accordance with manufacturer's published data.
- C. Instrument Transformer Field Tests:
- 1. Visual and Mechanical Inspection:
 - a. Verify that equipment nameplate data complies with Contract Documents.
 - b. Inspect physical and mechanical condition.
 - c. Verify correct connection of transformers with system requirements.
 - d. Verify that adequate clearances exist between primary and secondary circuit wiring.
 - e. Verify that unit is clean.
 - f. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.
 - g. Verify that required grounding and shorting connections provide contact.
 - h. Verify correct operation of transformer withdrawal mechanism and grounding operation.
 - i. Verify correct primary and secondary fuse sizes for voltage transformers.
 - j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - 2. Electrical Tests of Current Transformers:
 - a. Perform insulation-resistance test of current transformers and secondary wiring for ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
 - b. Perform polarity test on current transformers in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.
 - c. Perform ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.
 - d. Perform excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or be in accordance with IEEE C57.13.1.
 - e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared to, and must match, instrument transformer ratings.



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- f. Perform insulation-resistance tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.5.
 - g. Perform dielectric withstand tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.9.
 - h. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
 - i. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by Engineer in Project Drawings.
3. Electrical Tests of Voltage Transformers:
- a. Perform insulation-resistance tests, winding-to-winding and windings-to-ground. Test voltages must be applied for one minute in accordance with NETA ATS Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
 - b. Perform polarity test on transformers to verify polarity marks or H1-X1 relationship as applicable. Polarity results must agree with transformer markings.
 - c. Perform turns-ratio test on tap positions. Ratio errors must be in accordance with IEEE C57.13.
 - d. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to, and must match, instrument transformer ratings.
 - e. Perform dielectric withstand test on primary windings with secondary windings connected to ground. Dielectric voltage must be in accordance with NETA ATS, Table 100.9. Test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, primary windings are considered to have passed test.
 - f. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use test equipment manufacturer's published data.
 - g. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that circuits are grounded at only one point.
- D. Ground-Resistance Test:
- 1. Visual and Mechanical Inspection:
 - a. Verify that ground system complies with Contract Documents and with Article 250, "Grounding and Bonding," in NFPA 70.
 - b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.
 - c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or



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NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Inspect anchorage.

2. Electrical Tests:

a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on main grounding electrode or system. Resistance between main grounding electrode and ground must be no more than 5 Ω .

b. Perform point-to-point tests to determine resistance between main grounding system and major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 Ω . Compare equipment nameplate data with the Contract Documents.

c. Inspect physical and mechanical condition.

d. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

E. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

d. Verify that unit is clean.

e. Verify freedom of movement, end play, and alignment of rotating disk(s).

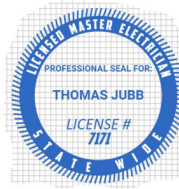
2. Electrical Tests:

a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.

b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.

c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specifications.

d. Verify that current transformer and voltage transformer secondary circuits are



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intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

F. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

- a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.
- b. Verify operation of LEDs, display, and targets.
- c. Record passwords for each access level.
- d. Clean front panel and remove foreign material from case.
- e. Check tightness of connections.
- f. Verify that frame is grounded in accordance with manufacturer's published instructions.
- g. Set relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."
- h. Download settings from relay. Print copy of settings for report and compare settings to those specified in coordination study.

2. Electrical Tests:

- a. Perform insulation-resistance tests from circuits to grounded frame in accordance with manufacturer's published data.
- b. Apply voltage or current to analog inputs, and verify correct registration of relay meter functions.
- c. Check functional operation of elements used in protection scheme as follows:
 - 1) ANSI No. 2/62, Timing Relay:
 - a) Determine time delay.
 - b) Verify operation of instantaneous contacts.
 - 2) ANSI No. 24, Volts/Hertz Relay:
 - a) Determine pickup frequency at rated voltage.
 - b) Determine pickup frequency at second voltage level.
 - c) Determine time delay.
 - 3) ANSI No. 25, Sync Check Relay:
 - a) Determine closing zone at rated voltage.
 - b) Determine maximum voltage differential that permits closing at zero degrees.
 - c) Determine set points of live line, live bus, dead line, and dead bus.
 - d) Determine time delay.
 - e) Verify control functions of dead bus/live line, dead line/live bus, and dead bus/dead line.
 - 4) ANSI No. 27, Undervoltage Relay:
 - a) Determine dropout voltage.
 - b) Determine time delay.
 - c) Determine time delay at second point on timing curve for inverse time relays.
 - 5) ANSI No. 32, Directional Power Relay:
 - a) Determine minimum pickup at maximum torque angle.
 - b) Determine closing zone.
 - c) Determine maximum torque angle.
 - d) Determine time delay.
 - e) Verify time delay at second point on timing curve for inverse time



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relays.

f) Plot operating characteristic.

6) ANSI No. 46, Current Balance Relay:

a) Determine pickup of unit.

b) Determine percent slope.

c) Determine time delay.

7) ANSI No. 46N, Negative Sequence Current Relay:

a) Determine negative sequence alarm level.

b) Determine negative sequence minimum trip level.

c) Determine maximum time delay.

d) Verify two points on I_2T curve.

8) ANSI No. 47, Phase Sequence or Phase Balance Voltage Relay:

a) Determine positive sequence voltage to close N.O. contact.

b) Determine positive sequence voltage to open N.C. contact (undervoltage trip).

c) Verify negative sequence trip.

d) Determine time delay to close N.O. contact with sudden application of 120 percent of pickup.

e) Determine time delay to close N.C. contact on removal of voltage when previously set to rated system voltage.

9) ANSI No. 50, Instantaneous Overcurrent Relay:

a) Determine pickup.

b) Determine dropout.

c) Determine time delay.

10) ANSI No. 51, Time Overcurrent:

a) Determine minimum pickup.

b) Determine time delay at two points on time current curve.

11) ANSI No. 64, Ground Detector Relay:

a) Determine maximum impedance to ground causing relay pickup.

12) ANSI No. 67, Directional Overcurrent Relay:

a) Determine directional unit minimum pickup at maximum torque angle.

b) Determine closing zone.

c) Determine maximum torque angle.

d) Plot operating characteristics.

e) Determine overcurrent unit pickup.

f) Determine overcurrent unit time delay at two points on time current curve.

13) ANSI No. 87, Differential Relay:

a) Determine operating unit pickup.

b) Determine operation of restraint unit.

c) Determine slope.

d) Determine harmonic restraint.

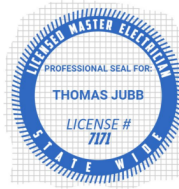
e) Determine instantaneous pickup.

d. Control Verification:

1) Functional Tests:

a) Check operation of active digital inputs.

b) Check output contacts or SCRs, preferably by operating controlled device, such as circuit breaker, auxiliary relay, or alarm.



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- c) Check internal logic functions used in protection scheme.
- d) On completion of testing, reset minimum/maximum recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.
- 2) In-Service Monitoring: After equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.
- G. Ground-Fault Protection Field Tests: Evaluate interconnected system in accordance with switchgear manufacturer's published instructions.
 - 1. Determine proper location of sensors around bus of circuit to be protected. This determination may be done visually, with knowledge of which bus is involved.
 - 2. Verify grounding points of system to determine that ground paths do not exist that would bypass sensors. Use high-voltage testers and resistance bridges.
 - 3. Test installed system for correct response by application of full-scale current into equipment to duplicate ground-fault condition, or by equivalent means such as by simulated fault current generated by the following:
 - a. A coil around sensors
 - b. A separate test winding in sensors.
 - 4. Record test results on test form provided with instructions provided by manufacturer.
- H. System Function Tests: Perform system function tests after other field quality-control tests have been completed and components have passed specified tests. Verify correct interaction of sensing, processing, and action devices.
 - 1. Develop test parameters and perform tests for purpose of evaluating performance of integral components and their functioning as complete unit within design requirements and manufacturer's published data.
 - 2. Verify correct operation of interlock safety devices for fail-safe functions in addition to design function.
 - 3. Verify correct operation of sensing devices, alarms, and indicating devices.

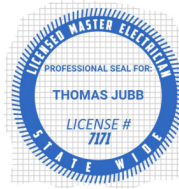
SECTION 262413

SWITCHBOARDS

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

- 1. Comply with provisions of "Testing and Test Methods" Chapter in NFPA 70B and NETA ATS.
- 2. After installing switchboard and after electrical circuitry has been energized, test for compliance with requirements.
- 3. Perform visual and mechanical inspections and electrical tests stated in NETA ATS. Certify compliance with test parameters.
- 4. Visual and Mechanical Inspection:
 - a. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study, as well as to circuit breaker's address in control network.
 - b. Verify that current and voltage transformer ratios correspond to Drawings.
 - c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated



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torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.

2) Make key exchange with devices operated in off-normal positions.

e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

f. Inspect insulators for evidence of physical damage or contaminated surfaces.

g. Verify correct barrier and shutter installation and operation.

h. Exercise active components.

i. Inspect mechanical indicating devices for correct operation.

j. Verify that filters are in place and that vents are clear.

k. Perform visual and mechanical inspection of instrument transformers in accordance with "Instrument Transformer Field Tests" Paragraph.

l. Inspect control power transformers.

1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.

2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.

3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.

5. Electrical Tests:

a. Perform DC voltage insulation-resistance tests on bus sections, phase-to-phase and phase-to-ground, for one minute. If bus temperature is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.

1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.

2) Do not proceed to dielectric withstand voltage tests until insulation-resistance levels are raised above minimum values.

b. Perform dielectric withstand voltage test on bus sections, phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, test specimen is considered to have passed test.

c. Perform insulation-resistance tests on control wiring for ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's published instruction.



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- 1) Minimum insulation-resistance values of control wiring may not be less than 2 MΩ.
- d. Control Power Transformers:
 - 1) Perform insulation-resistance tests. Perform measurements from winding-to winding and windings-to-ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.
 - 2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to rated secondary voltage source. Verify correct potential at devices.
 - 3) Verify correct secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with secondary wiring disconnected.
 - 4) Verify correct function of control transfer relays located in switchboard with multiple control power sources.
- e. Voltage Transformers:
 - 1) Perform secondary wiring integrity test. Verify correct potential at devices.
 - 2) Verify secondary voltages by energizing primary winding with system voltage.
- f. Perform current-injection tests on entire current circuit in switchboard sections.
 - 1) Perform current tests by secondary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.
 - 2) Perform current tests by primary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.
- g. Perform system function tests in accordance with "System Function Tests" Paragraph.
- h. Verify operation of space heaters.
- i. Perform phasing checks on double-ended or dual-source switchboard to ensure correct bus phasing from sources.
- B. Circuit-Breaker Field Tests:
 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, and grounding.
 - c. Verify that maintenance devices are available for servicing and operating breaker.
 - d. Verify unit is clean.
 - e. Verify that arc chutes are intact.
 - f. Inspect moving and stationary contacts for condition and alignment.
 - g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.
 - h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.
 - i. Verify cell fit and element alignment.
 - j. Verify racking mechanism operation.
 - k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - l. Perform adjustments for final protective-device settings in accordance with



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coordination study provided by Client Agency.

m. Record as-found and as-left operation counter readings.

2. Electrical Tests:

- a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across open poles. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than Table 100.1 or manufacturer's published instructions must be investigated.
- b. Measure contact resistance across power contacts of circuit breakers. Drop values for $\mu\Omega$ or mV(dc) may not exceed high levels of normal range as indicated in manufacturer's published data. In absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are unavailable, trip times may not exceed value shown in NETA ATS, Table 100.7.
- d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
- e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
- f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.
- g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.
- h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.
- i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
- j. Verify correct operation of auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, ant pump function, and trip-unit battery condition. Reset trip logs and indicators. Auxiliary features must operate in accordance with manufacturer's published data.
- k. Verify operation of charging mechanism. Charging mechanism must operate in accordance with manufacturer's published data.

C. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

- a. Verify that equipment nameplate data complies with Contract Documents.



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- b. Inspect physical and mechanical condition.
- c. Verify correct connection of transformers with system requirements.
- d. Verify that adequate clearances exist between primary and secondary circuit wiring.
- e. Verify that unit is clean.
- f. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.
- g. Verify that required grounding and shorting connections provide contact.
- h. Verify correct operation of transformer withdrawal mechanism and grounding operation.
- i. Verify correct primary and secondary fuse sizes for voltage transformers.
- j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- 2. Electrical Tests of Current Transformers:
 - a. Perform insulation-resistance test of current transformers and secondary wiring for ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
 - b. Perform polarity test on current transformers in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.
 - c. Perform ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.
 - d. Perform excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or be in accordance with IEEE C57.13.1.
 - e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared to, and must match, instrument transformer ratings.
 - f. Perform insulation-resistance tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.5.
 - g. Perform dielectric withstand tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.9.
 - h. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
 - i. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by Engineer in Project Drawings.
- 3. Electrical Tests of Voltage Transformers:
 - a. Perform insulation-resistance tests, winding-to-winding and windings-to-ground. Test voltages must be applied for one minute in accordance with NETA ATS



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Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.

- b. Perform polarity test on transformers to verify polarity marks or H1-X1 relationship as applicable. Polarity results must agree with transformer markings.
- c. Perform turns-ratio test on tap positions. Ratio errors must be in accordance with IEEE C57.13.
- d. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to, and must match, instrument transformer ratings.
- e. Perform dielectric withstand test on primary windings with secondary windings connected to ground. Dielectric voltage must be in accordance with NETA ATS, Table 100.9. Test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, primary windings are considered to have passed test.
- f. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use test equipment manufacturer's published data.
- g. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that circuits are grounded at only one point.

D. Ground-Resistance Test:

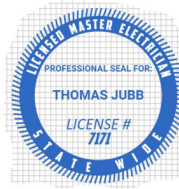
1. Visual and Mechanical Inspection:

- a. Verify that ground system complies with Contract Documents and with Article 250, "Grounding and Bonding," in NFPA 70.
- b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.
- c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Inspect anchorage.

2. Electrical Tests:

- a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on main grounding electrode or system. Resistance between main grounding electrode and ground must be no more than 5 Ω .
- b. Perform point-to-point tests to determine resistance between main grounding system and major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 Ω . Compare equipment nameplate data with the Contract Documents.
- c. Inspect physical and mechanical condition.



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d. Inspect bolted electrical connections for high resistance using one of the following two methods:

- 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

E. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

- a. Inspect physical and mechanical condition.
- b. Inspect bolted electrical connections for high resistance using one of the following two methods:

- 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

d. Verify that unit is clean.

e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

- a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.
- b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.
- c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specifications.
- d. Verify that current transformer and voltage transformer secondary circuits are intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

F. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

- a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.
- c. Record passwords for each access level.
- d. Clean front panel and remove foreign material from case.
- e. Check tightness of connections.
- f. Verify that frame is grounded in accordance with manufacturer's published instructions.
- g. Set relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."



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h. Download settings from relay. Print copy of settings for report and compare settings to those specified in coordination study.

2. Electrical Tests:

a. Perform insulation-resistance tests from circuits to grounded frame in accordance with manufacturer's published data.

b. Apply voltage or current to analog inputs, and verify correct registration of relay meter functions.

c. Check functional operation of elements used in protection scheme as follows:

1) ANSI No. 2/62, Timing Relay:

a) Determine time delay.

b) Verify operation of instantaneous contacts.

2) ANSI No. 24, Volts/Hertz Relay:

a) Determine pickup frequency at rated voltage.

b) Determine pickup frequency at second voltage level.

c) Determine time delay.

3) ANSI No. 25, Sync Check Relay:

a) Determine closing zone at rated voltage.

b) Determine maximum voltage differential that permits closing at zero degrees.

c) Determine set points of live line, live bus, dead line, and dead bus.

d) Determine time delay.

e) Verify control functions of dead bus/live line, dead line/live bus, and dead bus/dead line.

4) ANSI No. 27, Undervoltage Relay:

a) Determine dropout voltage.

b) Determine time delay.

c) Determine time delay at second point on timing curve for inverse time relays.

5) ANSI No. 32, Directional Power Relay:

a) Determine minimum pickup at maximum torque angle.

b) Determine closing zone.

c) Determine maximum torque angle.

d) Determine time delay.

e) Verify time delay at second point on timing curve for inverse time relays.

Plot operating characteristic.

6) ANSI No. 46, Current Balance Relay:

a) Determine pickup of unit.

b) Determine percent slope.

c) Determine time delay.

7) ANSI No. 46N, Negative Sequence Current Relay:

a) Determine negative sequence alarm level.

b) Determine negative sequence minimum trip level.

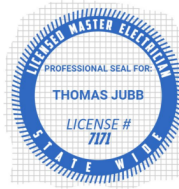
c) Determine maximum time delay.

d) Verify two points on I_2T curve.

8) ANSI No. 47, Phase Sequence or Phase Balance Voltage Relay:

a) Determine positive sequence voltage to close N.O. contact.

b) Determine positive sequence voltage to open N.C. contact



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(undervoltage trip).

c) Verify negative sequence trip.

d) Determine time delay to close N.O. contact with sudden application of 120 percent of pickup.

e) Determine time delay to close N.C. contact on removal of voltage when previously set to rated system voltage.

9) ANSI No. 50, Instantaneous Overcurrent Relay:

a) Determine pickup.

b) Determine dropout.

c) Determine time delay.

10) ANSI No. 51, Time Overcurrent:

a) Determine minimum pickup.

b) Determine time delay at two points on time current curve.

11) ANSI No. 64, Ground Detector Relay:

a) Determine maximum impedance to ground causing relay pickup.

12) ANSI No. 67, Directional Overcurrent Relay:

a) Determine directional unit minimum pickup at maximum torque angle.

b) Determine closing zone.

c) Determine maximum torque angle.

d) Plot operating characteristics.

e) Determine overcurrent unit pickup.

f) Determine overcurrent unit time delay at two points on time current curve.

13) ANSI No. 87, Differential Relay:

a) Determine operating unit pickup.

b) Determine operation of restraint unit.

c) Determine slope.

d) Determine harmonic restraint.

e) Determine instantaneous pickup.

d. Control Verification:

1) Functional Tests:

a) Check operation of active digital inputs.

b) Check output contacts or SCRs, preferably by operating controlled device, such as circuit breaker, auxiliary relay, or alarm.

c) Check internal logic functions used in protection scheme.

d) On completion of testing, reset minimum/maximum recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.

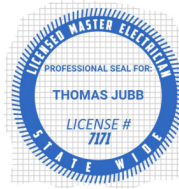
2) In-Service Monitoring: After equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.

G. Ground-Fault Protection Field Tests: Evaluate interconnected system in accordance with switchboard manufacturer's published instructions.

1. Determine proper location of sensors around bus of circuit to be protected. This determination may be done visually, with knowledge of which bus is involved.

2. Verify grounding points of system to determine that ground paths do not exist that would bypass sensors. Use high-voltage testers and resistance bridges.

3. Test installed system for correct response by application of full-scale current into equipment to duplicate ground-fault condition, or by equivalent means such as by



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simulated fault current generated by the following:

- a. A coil around sensors.
- b. A separate test winding in sensors.
4. Record test results on test form provided with instructions provided by manufacturer.
- H. System Function Tests: Perform system function tests after other field quality-control tests have been completed and components have passed specified tests. Verify correct interaction of sensing, processing, and action devices.
 1. Develop test parameters and perform tests for purpose of evaluating performance of integral components and their functioning as complete unit within design requirements and manufacturer's published data.
 2. Verify correct operation of interlock safety devices for fail-safe functions in addition to design function.
 3. Verify correct operation of sensing devices, alarms, and indicating devices.
- I. Nonconforming Work:
 1. Switchboard components will be considered defective if they do not pass tests and inspections.
 2. Remove and replace defective units and retest.
- J. Collect, assemble, and submit test and inspection reports. Record as-left set points of adjustable devices.
- B. Infrared Inspection: Perform survey during periods of maximum possible loading. Remove covers prior to inspection.
 1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of electrical power connections of switchboard.
 2. Instrument: Inspect distribution systems with imaging equipment capable of detecting minimum temperature difference of 1 deg C at 30 deg C.
 3. Record of Infrared Inspection: Prepare certified report that identifies testing technician and equipment used and that lists results as follows:
 - a. Description of equipment to be tested.
 - b. Discrepancies.
 - c. Temperature difference between area of concern and reference area.
 - d. Probable cause of temperature difference.
 - e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
 - f. Identify load conditions at time of inspection.
 - g. Provide photographs and thermograms of deficient area.
 4. Act on inspection results in accordance with recommendations in NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Client Agency's operations permit. Retest until deficiencies are corrected.
 5. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of switches 11 months after date of Substantial Completion.

SECTION 262416

PANELBOARDS

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.



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C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After acceptance by the Department, but not more than 60 days after acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of acceptance by the Department.
- c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

SECTION 262500

ENCLOSED BUS ASSEMBLIES

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Remove and replace units that do not pass tests and inspections and retest as specified above.
- D. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of bus assembly including joints and plug-in units.
 1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
 2. Perform 2 follow-up infrared scans of bus assembly, one at 4 months and the other at 11 months after Substantial Completion.
 3. Prepare a certified report identifying bus assembly checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.
- E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
 2. Test continuity of each line- and load-side circuit.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated



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in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

SECTION 262913

ENCLOSED CONTROLLERS

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports: Retain first two paragraphs below to describe tests and inspections to be performed.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.

2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.

3. Test continuity of each circuit.

4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Using Agency before starting the motor(s).

5. Test each motor for proper phase rotation.

6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each multi-pole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.

b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multi-pole enclosed controller 11 months after date of Substantial Completion.

c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed controllers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

SECTION 262923

VARIABLE-FREQUENCY MOTOR CONTROLLERS

3.8 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:



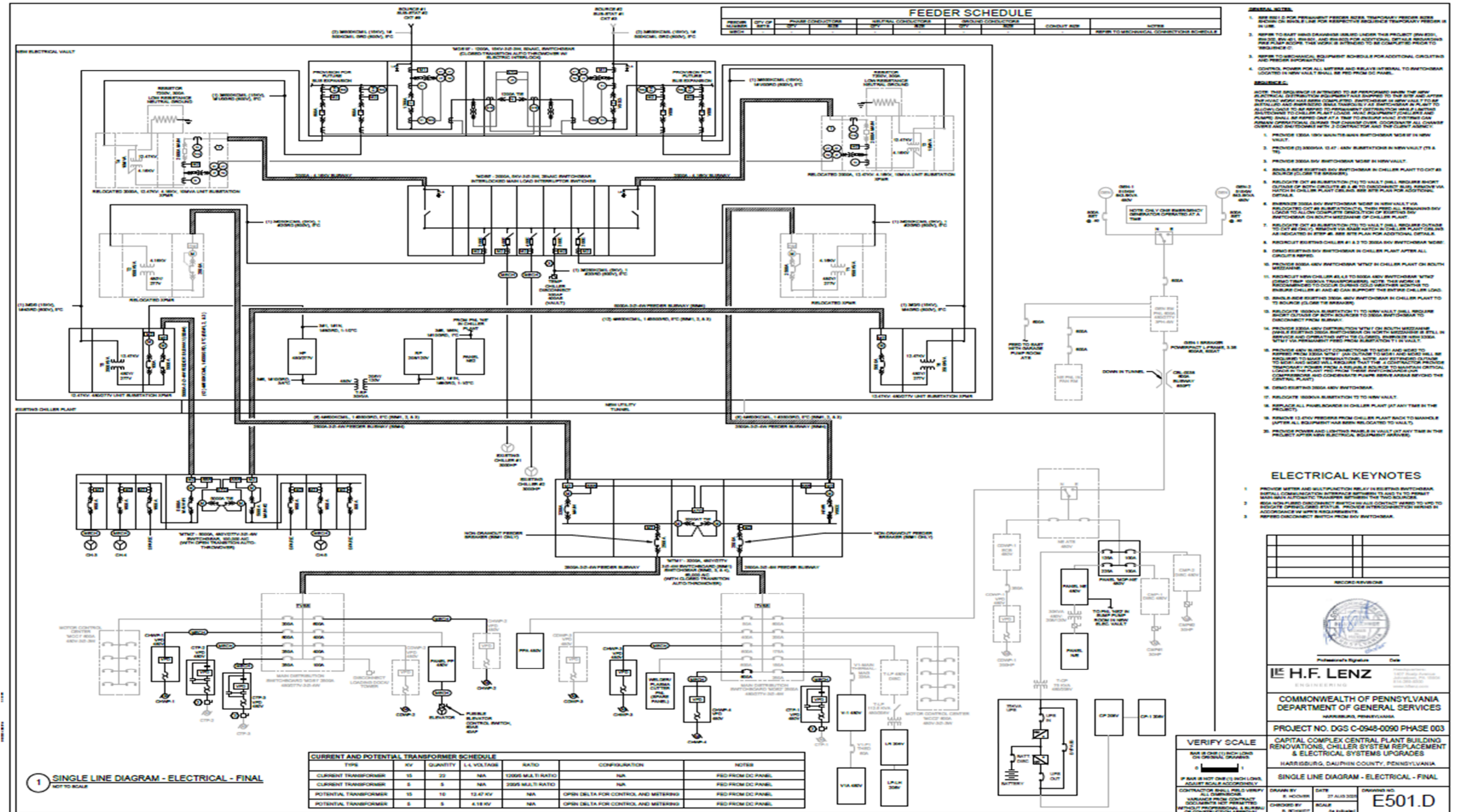
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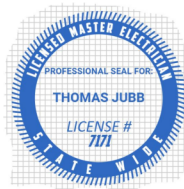
1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
 3. Report results in writing.
- C. Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS. Certify compliance with test parameters.



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DRAWING NEW EQUIPMENT:





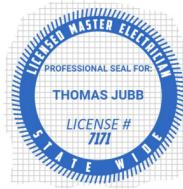
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EQUIPMENT SUPPLIED EQUIPMENT LIST WITH OUR ADDED NOTES HIGHLIGHTED IN YELLOW

es from client:
equipment list below does not include the existing MV transformers and Gear to be altered, relocated and reused.
on testing all transformers for re-installation before removal and after re-installation.
will be testing the Temp 5kV safety switch before and after usage and completion of that phase of work.
on testing the temporary trailer and transformer.
are required to offer two options for the 480V gear...conduit/wire and buss. Plan to test both options. If there is a difference please call that price
in your quote.
specs for further acceptance testing requirements.

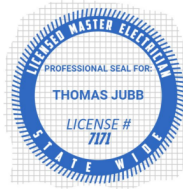
**Equipment List
Panels**

MDP-NE Panelboard Main Lugs Only Surface Mount 600A 480V
LP-LH Panelboard Main Lugs Only Surface Mount 250V 400A
CP Panelboard Main Breaker Surface Mount 250V 175A
V-1 RH Panelboard Main Lugs Only Surface Mount 480V
LR Panelboard Main Breaker Surface Mount 250V 400A
CP-1 Panelboard Main Breaker Surface Mount 250V 100A
V-1 Panelboard Main Breaker Surface Mount 250V 125A
PP Panelboard Main Breaker Only Surface Mount 300A 480V
Welder/Plasma Cutter Panel MLO Surface Mount 480V 250A
V1A Panel MLO Surface Mount 480V 250A
N/E Panelboard Main Lugs Only Surface Mount 250V 225A
NE2 Panelboard Main Breaker Surface Mount 250V 50A
NE Panelboard Main Breaker Surface Mount 250V 225A
RP Panelboard Main Breaker Surface Mount 250V 100A
HP Panel MLO Surface Mount 480V 100A
DC Panelboard Main Breaker Surface Mount 125V DC 50A
Switchgear & relays,ct/pt, cntrl wires



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MTM2 480V 5000A Service Switchgear*
MTM1 480V 3200A Service Switchgear*
MDS15 15KV 1200A Service Switchgear*
MDS5 5KV 2000A Service Switchgear*
Safety Switches
Temp Chiller 5kv Fused Safety Switch- test 2-times
Mechanical Equipment Safety Switches
AHU-6 30AMP 120V Single Phase
EF-1 480V 30Amp 3-phase
EF-2 480V 30Amp 3-phase
EF-3A 480V 30Amp 3-phase
EF-3B 480V 30Amp 3-phase
EF-3C 480V 30Amp 3-phase
EF-3D 480V 30Amp 3-phase
Elevator Power Unit 480V 60Amp 3-phase 40AMP Fuses
Foundation Pump 480V 30Amp 3-phase
TF-1 120V 30Amp 1-phase
TF-2 120V 30Amp 1-phase
Vault Pump 480V 30Amp 3-phase
Transformers
T-RP 30KVA Transformer Wall Mount 480V Primary
T-5 3500KVA New Transformer 15kv to 480v
T-6 3500KVA New Transformer 15kv to 480v
UPS System
75KVA UPS by OEM
1-Temp trailer-sw brd & transf
2-cable/bus sections:5kv
6-cable/bus sections:600v
4-existing transf/sw gear to be moved & relocated- test 2-times



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8-sets mv cable
20-sets lv cable
1-main grnd 3pt tst
10-equip grnd 2-pt tst
2-vfd's

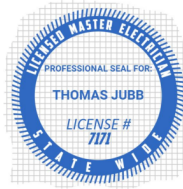
stments:

Acceptance testing-\$159,000

Infrared thermal scans of new equipment per spec- 2 in 11 month window-\$25,900 (client to supply qualified person tto remove/install covers during scans- approx. 14- 8hr days)

TES: (as applicable the specific project work scope)

1. Customer cancellations &/or rescheduling will be subject to an additional fee; 24 to 48 hours prior to scheduled outage - 10% of contract amount. 24 hours or less prior to scheduled outage – 25% of contract amount.
2. Equipment not shown on supplied drawings
3. Equipment excluded-motors, lv riser panels/br panels-or related breakers or branch cables, vfd's, ups, sw/pnl brds/brkrs
4. Retesting, parts, repairs, man hole entry,
5. Client to remove/install covers during IR scans



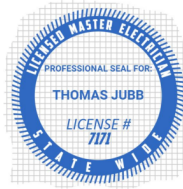
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6. Unless there is an emergency situation , we request a minimum of 48 hours' notice for the scheduling of non-emergency/normal services.
7. Site specific training, access, and/or security requirements, commissioning, as well as costs for testing for illnesses and/or disease are not included in this proposal.
8. Applicable taxes are not included in this proposal.
9. Credit card payments will be assessed a 3% processing fee (2/1/19 Implementation Date) accepted: Visa, Mastercard, American Express (4%).
10. If applicable: the cost of developing test plans is excluded from this proposal.
11. We require a minimum of 8 hours of ready work per day.
12. Provide reasonable parking and sanitary facilities for our technicians.
13. Provide test plans/procedures to us if applicable.
14. Client to supply all information for the Engineering studies
15. Excluded: voltage/current recordings, power quality meters, static ups, engineering studies/device settings, commissioning, retests, -IR may be used in lieu of torquing main connections,

All investments are based on trained TT technicians.

All investments are based upon all work performed during normal business hours, Monday through Friday, 7am-3:30pm

All investments include 1- service vehicle.



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Information is shared with the receiving party. The information contained therein, nor any proprietary information furnished pursuant thereto, shall be disclosed to others or used for any purpose other than set forth above without approval. We sincerely appreciate the opportunity of submitting this proposal and hope that we may have the pleasure of serving you.

Respectfully,

Thomas Jubb

Professional Electrical Services and Management, L.L.C. (PESM)

Victory Gallop Court

Frederick, DE Grace, MD 21078

Contact: Thomas Jubb, ME, SE, FM

tjubbpesm@outlook.com

Phone: 443-417-6265

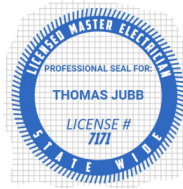
Please assign all purchase orders to Team Member:

Matthew McDermott

Phone: 410-992-5980

Matthew McDermott <tacticaltestingllc@outlook.com>

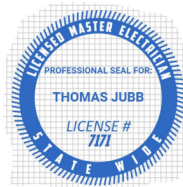
tactical-testing.com -619 Waterside Ct., Balto., MD 21220



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Terms and Conditions:

- **Terms of payment: 1:** Terms are net thirty (30) days. If invoice payment is not received within thirty (30) days, a service charge of 1.5% will be added to the outstanding balance. Based on project work scope, partial invoicing may be implemented.
- **Cancellations:** Cancellations of agreed services must be received twenty-four (24) hours prior to the agreed date and time. Professional Electrical Services and Management's costs plus ten percent (10%), and any rental fee charges will be incurred.
- **Delays:** Professional Electrical Services and Management shall be made aware of delays twenty-four (24) hours prior to site visit or charges will be incurred. Our employees are entitled to a minimum of four (4) hours for time missed to no fault of their own, acts of God, terrorism.
- **Standby time:** Service charges will be incurred if Professional Electrical Services and Management employees cannot perform the services requested due to no fault of their own. Overtime rates will be charged, if necessary, to complete services scheduled for that day.
- **Safety:** Professional Electrical Services and Management employees agree to follow all job specific, state, federal, rules and regulations. Professional Electrical Services and Management employees reserve the right not to perform work that in their trained opinion violates standard safety rules of the trade.
- **Disclaimer:** Professional Electrical Services and Management assumes no responsibility for any damage or injury to any property caused directly or indirectly as a result of Professional Electrical Services and Management performing its duties under this agreement except such damage or injury that may be held to result solely and directly from or out of: Any grossly negligent performance by Professional Electrical Services and Management its obligations under this Agreement or any willful misconduct on the part of Professional Electrical Services and Management, its agents or employees.
- **Responsibility:** All services are performed in accordance with industry standards, project specifications and/or NETA specifications. Where remediation is beyond the scope of normal reliability testing, and where corrective action is required, such services will be quoted separately.
- **Scheduling:** PESM requires a minimum of 48 hours of non-emergency/normal work scheduling notice.



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AUTHORIZATION TO PROCEED

Project: _____

Site Address: _____

Site Contact/Phone: _____ Office Contact/Phone: _____

We instruct TT to proceed with scheduling and performing the work described in the attached proposal.

Proposed date to begin work: _____

Alternate date: _____

Investment reimbursement will be by: (check one)

Company Name: _____

A) Company check before project start date ☐

Number/\$Amount: _____

B) Purchase ☐ or Service ☐ order

Number/\$Amount: _____

C) Charge card: Visa ☐ Master ☐ Other ☐

Number/\$Amount: _____

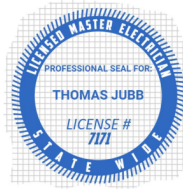
Billing/Company Address: _____

Authorization Signature: _____

Printed Name: _____

Title (Please Print): _____

Date: _____ Phone: _____ Email: _____



A Member of the Professional Electrical Services and Management, L.L.C. (PESM) Team

Professional Electrical Services and Management, L.L.C.

(PESM)



(Master Licensed services for Private/Governmental, Industrial, Commercial, Contractor and Residential Client's)



I) PESM- "ELECTRICAL PROJECT SERVICES and MANAGEMENT": All project services will be reviewed and stamped by a "Licensed Master Electrical Manager"

- *Commissioning/Management – testing-new electrical systems, EV charging systems, solar/wind power projects, maintenance
- *Development/Interpretation of specifications — electrical related projects, maintenance, engineering, equipment evaluation
- *Project Management — all electrical related services and projects
- *Estimating/ Project Procurement Services— electrical services, maintenance, procurement development and reviews
- *Proposal Development — electrical services, maintenance, engineering, equipment verifications
- *Electrical System Inspections/ Assessments- Insurance requirements, real estate transactions, new construction, existing systems
- *Consulting- Codes/Standards compliance, training, specifications, RFP's, OSHA safety programs, new and existing system's

II) PESM- "ELECTRICAL SALES, MARKETING and CLIENT RETENTION SERVICES":

- *Sales assistance with perspective/existing clients— estimating, proposal development, client site visits, agreement negotiations, client retention services
- *Sales Training, Marketing Support-customer relationship management (CRM programs)- information input and management
- *Marketing Plan Development, Client Retention and Management— growing new client base, fostering relationships with client's, creating client retention and referral programs to assist in growing your business

III) PESM- "ELECTRICAL PRODUCTS" and "TEAM MEMBERS"

- *Power Quality Meters
- *Electrical Equipment Replacement, Retrofit, Retro Fills
- *Custom Code/Standards Compliant Field Labels
- *NRTL Labeling (UL)



MISSION STATEMENT:

To ensure our professional licensed electrical, technical, management, and marketing services, assist with the growth and continued success of your business, while protecting your assets.

Providing client assurance that their electrical systems will meet the current industry codes and standards while operating safely and efficiently, thus minimizing their liabilities.

Phone: 443-502-2380
Cell: 443-417-6265



SCHNEIDER ELECTRIC

Philadelphia Branch
125 Rock Rd.
Horsham, PA 19044
Phone: (215) 443-0442
Fax: (215) 443-0995

January 20, 2026

Attention: Mathew Robinson

C/O: IB Abel

Project: State Capitol Central Plant Upgrades – Security

General Scope of the Project:

Schneider Electric will provide material and labor to install the new access control equipment for the above-referenced project.

Scope of Work:

- Schneider Electric will provide and install one (1) access control dual reader module to support two (2) new door locations.
 - This proposal assumes that this reader module will connect to an existing intelligent controller and be installed within an existing enclosure.
- Schneider Electric will provide the card readers, door contacts, request-to-exit buttons and miscellaneous material.
- Schneider Electric will program and test the system to make sure it is in working condition.
- Schneider Electric will provide the appropriate Open Options subcontroller license.
- Schneider Electric will provide the appropriate Verint PSIM system licenses.

Exclusions:

- The electrical installation including cable pathway, cable and cable pulling, as well as any supporting devices are excluded from this proposal.
- Device installation will be executed by others and is excluded from this proposal.
- Electronic lock procurement and installation is excluded this proposal.
- 2026 Prevailing wage and certified payroll are excluded from this proposal.
- Taxes are excluded from this proposal.
- Overtime or premium labor is excluded.
- Patching, painting and all general construction will be done by others.

Investment Pricing:

Base Price.....\$9,100.00

Pricing is valid for thirty (30) days.

Please feel free to contact me at any time with questions or concerns regarding this proposal. I can be reached by phone at 215-469-0078

Respectfully,
Steven Palme
Service Account Manager
Schneider Electric – Philadelphia Branch



State Capitol Central Plant Upgrades - Security

Labor				
	Hours	listed \$/hr		
Installation Technician	16	\$	147.00	\$ 2,352.00
Project Management	8	\$	186.00	\$ 1,488.00
Solutions Engineer	4	\$	171.00	\$ 684.00
As-Built Documentation	4	\$	147.00	\$ 588.00
Software Programming	2	\$	171.00	\$ 342.00
Total:				\$ 5,454.00

Material				
	Quantity	Listed \$		
Open Options Two-Door Module (MR52-S3B)	1	\$	966.70	\$ 966.70
HID Signo20 Card Reader (20NKS-00-000000)	2	\$	366.97	\$ 733.94
Alarm Controls Pneumatic Exit Button (TS-14)	2	\$	368.52	\$ 737.04
Edwards Surface Contact with Armor Cable (2505A-L)	2	\$	93.65	\$ 187.30
Open Options Subcontroller License	1	\$	101.67	\$ 101.67
Verint PSIM License	2	\$	92.50	\$ 185.00
Misc Installation Material (Conduit, Fittings, Back Boxes, Etc.)	1	\$	322.16	\$ 322.16
Total:				\$ 3,233.81

Additional Costs				
Tax	1	\$	-	\$ -
Warranty	1	\$	347.51	\$ 347.51
Freight	1	\$	64.68	\$ 64.68
Total:				\$ 412.19

Sale Price:	\$	9,100.00

TERMS AND CONDITIONS OF SALE

900512PITC R07/15/21

This quotation and any exhibits and attachments hereto (collectively, "Agreement") and any information contained herein, is the property of Schneider Electric Buildings Americas Inc. ("Company") and shall constitute proprietary and confidential information unless given to a public entity and required by law to be public information. The party to whom this quotation is addressed ("Customer") acknowledges the confidential nature of this Agreement and agrees to take all commercially reasonable and necessary precautions to ensure the confidential treatment of this Agreement and all information contained herein. This Agreement will not be used, copied, reproduced, disclosed or otherwise disseminated or made available, directly or indirectly, to any third party for any purpose whatsoever without the prior written consent of Company. The parties agree to be bound by the following terms and conditions.

1. **Quotations and Acceptance.** The quotation is based solely on the bid documents, which consist of the project drawings, specifications and/or instructions of the Customer only modified by written agreement or Company objection. Significant deviations between the actual conditions and circumstances of the work and those specified in the bid documents shall be cause for an adjustment in work scope, price and time allowed for performance. Written quotations shall be valid for no more than thirty (30) days from the date of issue, unless specifically stated otherwise herein. Customer may accept the quotation by signing and returning a copy to Company or by returning Customer's own written instrument or order expressly acknowledging the quotation and terms set forth herein, provided, however, Company hereby gives notice of its objection to any different or additional terms or conditions contained or referenced in Customer's order, which will be of no force or effect except as may be expressly agreed to by Company in writing. It is the intent of the parties that these Terms and Conditions of Sale shall govern the sale of goods delivered and services performed. Upon acceptance, this Agreement constitutes the entire understanding between the parties respecting the goods or services delineated herein and supersede all prior oral or written understandings or representations relating to such goods or services. This Agreement may not be discharged, extended, amended or modified in any way except by a written instrument signed by a duly authorized representative of each party. Company assumes that the Subcontract Agreement offered will contain terms that are substantively similar to the AIA provisions that are in accordance with the provisions of the prime contract, including any supplements. Upon award, Company assumes that contract provisions will be reviewed and negotiated in good faith to reach a mutual acceptance of both parties.
2. **Payment.** Absent a contrary provision herein, Customer will pay Company monthly progress payments on a net thirty (30) days basis from date of invoice for materials delivered (or stored at an off-site storage facility) and services performed, less any retained reserve which will be mutually agreed upon in writing by the parties. The aggregate amount of any such retained reserves shall be paid by Customer to Company within thirty (30) days after the date of substantial completion. If Company provides a Certificate of Substantial Completion, such certificate shall conclusively establish such date. All invoices due and payable to Company, less any applicable retained reserve, shall accrue interest at a compounded per annum rate not to exceed 1½% per month (18% per annum) or the maximum rate permitted by law. Acceptance and endorsement by Company of an instrument for less than the full amount which Company claims to be due shall not be deemed to be an admission of payment in full and any conditions to the contrary which are noted on such an instrument shall not be binding on Company. If Customer does not pay Company, through no fault of Company, within seven (7) days from the time payment was due, Company may, without prejudice to any other remedy it may have, upon seven (7) additional days' written notice to Customer, stop its work until payment of the amount owing has been received and the contract sum shall be equitably adjusted for reasonable costs of shutdown, delay and startup or in the alternative Company may terminate this contract for material breach and all monies due Company for services performed and materials delivered shall be paid upon demand. Company shall be entitled to recover from Customer all costs for collection, including reasonable attorneys' and professionals' fees. To the extent payments are received and as required by law, and upon Customer's request, Company will furnish lien waivers as the work progresses.

Company reserves a security interest in any goods sold to the extent of the invoiced amount to secure payment of Customer's obligation. In event of payment default, Company may repossess such goods and a copy of the invoice may be filed with appropriate authorities as a financing statement to event or perfect Company's security interest in the goods. At Company's request, Customer will execute any necessary instrument to perfect Company's security interest.
3. **Price and Taxes.** The price for the goods and services hereunder are those shown on the face of this Agreement. The price of this Agreement does not include sales, use, excise, duties or other similar taxes, unless otherwise expressly provided herein. Any taxes (other than taxes due on Company's net income) that are payable hereunder shall be the responsibility of Customer. If applicable, Customer shall provide Company a copy of any appropriate tax exemption certificate for the state(s) into which the goods are to be shipped.
4. **Changes and Claims.** All materials and labor furnished hereunder shall be in accordance with shop drawings submitted by Company and approved by Customer. Any changes in the work as set forth in approved shop drawings, or from the scope of work as described herein, will require a written change order submitted to Company by Customer. An equitable adjustment will be made in the contract price or delivery dates or both, and this Agreement will be modified accordingly in writing. The cost or credit to Customer for performance of such change order shall be determined by mutual written agreement prior to the commencement of any work under such change order. Customer shall notify Company promptly in writing of any circumstances arising from the performance of the work herein described which reasonably may be anticipated to result in a claim or back charge to Company. Upon Company's receipt of such notification, Company shall have five (5) working days in which to remedy such circumstances and to avoid the imposition of such claim or back charge. Company will not be liable for any claim or back charge where Company has not been notified in the manner as set forth above.
5. **Access and Overtime.** This Agreement is based upon the use of straight time labor only during regular working hours (8:00 a.m. to 5:00 p.m., Monday through Friday, excluding Company's holidays). If Customer requests Company to perform any work outside of regular working hours, overtime and other additional expense occasioned thereby will be charged to and paid by Customer. If Company's work is to be performed on the project site, Customer will afford unrestricted access to Company and its employees and agents to all work areas.
6. **Damage or Loss to Equipment.** In the case of equipment not to be installed by or under supervision of Company, Company shall not be liable for damage to or loss of equipment after delivery of such equipment to the point of shipment. In the case of equipment to be installed by or under supervision of Company, Company shall not be liable for damage or loss after delivery by the carrier to the site of installation; if thereafter, pending installation or completion of installation or full performance by

Company, any such equipment is damaged or destroyed by any cause whatsoever, other than by the fault of Company, Customer agrees to promptly pay or reimburse Company an amount equal to the damage or loss which Company incurs as a result thereof, in addition to or apart from, any and all other sums due or to become due hereunder.

7. **Delays.** Customer shall prepare all work areas so as to be acceptable for Company's work required hereunder. Customer acknowledges that the contract sum is based upon Company being able to perform the work in an orderly and sequential manner, as Company so determines. If Company's performance is delayed, interfered with, suspended, or otherwise interrupted, in whole or in part, by Customer, other contractors on the project site, or by any other third party or by any act within the power and/or duty of Customer to control, then Customer agrees that it will be liable to Company for all increased costs and damages which Company incurs as a result thereof. Furthermore, if Company is delayed at any time in the progress of the work by any act or neglect of Customer, or by any separate contractor employed by Customer, or by changes ordered in the work or by labor disputes, fire, delay in transportation, adverse weather conditions, casualties, or any other causes beyond Company's control, then the time for completion of the work shall be extended for a period equal to the time lost by reason of such delay.
8. **Warranty.** Company warrants to Customer that all tangible articles manufactured by Company will be free of defects in workmanship and material and that the work performed will be of good quality and will conform to the requirements of the bid documents. If the article is installed by Company, Company's sole obligation under this warranty shall be to provide, without charge, parts and labor necessary to remedy defects which appear within twelve (12) months from the date of beneficial use or occupancy, as applicable. If Company provides a Certificate of Substantial Completion, such certificate shall conclusively establish such date. If article is not installed by Company, the warranty period shall be within twelve (12) months of shipment of said article. Warranty claim must be made to Company in writing within such twelve (12) month period. All transportation charges incurred in connection with the warranty for equipment not installed by Company shall be borne by Customer. Company warrants that for equipment furnished and or installed, but not manufactured by Company, Company will extend the same warranty terms and conditions which Company receives from the manufacturer of said equipment.

This warranty is the sole and exclusive warranty given with respect to any articles delivered or services performed by Company. THE WARRANTIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED (EXCEPT WARRANTIES OF TITLE), INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. This warranty is subject to proper installation of the articles (if installation is not performed by Company or authorized subcontractors of the Company) and maintenance and storage of the articles in accordance with the specifications and directions supplied by Company. This warranty does not apply to any defect, malfunction or failure caused by repairs made by other than or without the consent of Company or the article has been subject to abuse, misuse, neglect, tampering, accident or damage by circumstances beyond Company's control, including without limitation, acts of God, war, acts of government, corrosion, power fluctuations, freeze-ups, labor disputes, differences with workmen, riots, explosions, vandalism, or malicious mischief, nor to defective associated equipment or use of the articles with equipment for which they were not sold. All of Company's obligations under this warranty will immediately terminate and be of no further force or effect if all or any part of the purchase price (including any installment payment) with respect to any article covered by this warranty is not paid to Company when due. If cause of defect is found not to be Company's responsibility, standard rates for repair or replacement and labor shall apply.

9. **Limitation of Liability.** In no event will Company's total aggregate liability in warranty or contract exceed the contract price paid for the specific product or service that gives rise to the claim excluding third party claims for personal injury, death or as may be required by law. IN NO EVENT SHALL COMPANY BE LIABLE FOR ANY LOST PROFITS, LOSS OF USE, DATA, LOSS OF GOODWILL, BUSINESS INTERRUPTION OR ANY OTHER SPECIAL, INDIRECT, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES OF ANY KIND EVEN IF COMPANY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.
10. **Laws and Permits.** Company shall comply with all applicable federal, state, and local laws and regulation and shall obtain all temporary licenses and permits required for the prosecution of the work. Licenses and permits of a permanent nature shall be procured and paid for by the Customer. This contract shall be interpreted and governed under and in accordance with the laws of the jurisdiction in which the goods are delivered or services are performed without regard to its choice of law provisions.
11. **Disputes.** Any controversy or claim arising out of or relating to this Contract, or the breach thereof, shall be settled by good faith consultation and negotiation. If those attempts fail, either party shall provide written notice within thirty (30) days to the other to mutually agree on an arbitration process. If a process is not agreed upon within thirty (30) days, final and binding arbitration in accordance with the then current Construction Industry Arbitration Rules of the American Arbitration Association shall commence and judgment upon the award rendered may be entered in any court having jurisdiction thereof. The arbitration shall be held in the federal, state or municipal courts serving the county in which the project is located unless the parties mutually agree otherwise. The prevailing party shall recover all reasonable legal costs and attorney's fees incurred as a result, which shall be promptly paid by the non-prevailing party. Any dispute or demand for arbitration must be commenced within one (1) year after the cause of action has accrued. Nothing herein shall limit any rights Company may have under construction mechanic or materialmen lien laws. Company shall have the right to suspend affected services pending resolution of disputes.
12. **Insurance.** The parties shall each maintain insurance coverage including without limitation, Workers' Compensation and Employer's Liability at statutory limits, Automobile Liability covering all owned, hired and other non-owned vehicles, and Commercial General Liability covering public liability and property damage with limits generally required for its respective industry with not less than \$1,000,000 minimum coverage per occurrence. Such insurance shall be with reputable and financially responsible carriers authorized to transact business in the jurisdiction in which the project and services are being performed. No credit will be given or premium paid by Company for insurance afforded by others.
13. **Clean Up.** Company agrees to keep the job site clean of debris arising out of its operations. Customer shall not back charge Company for any costs or expenses for clean up or otherwise without prior written notice and Company's written consent.
14. **Severability.** The invalidity or unenforceability of any provision herein shall in no way affect the validity or enforceability of any other provision.
15. **Disclaimer.** Company reserves the right to amend, withdraw or otherwise alter this submission without penalty or charge as a result of any event beyond its control arising from or due to the current COVID-19 epidemic or events subsequent to this epidemic / pandemic including changes in laws, regulations, by laws or direction from a competent authority. The Customer

acknowledges that the products or part thereof are produced in, or otherwise sourced from, or will be installed areas already affected by, or that may be affected in the future by, the prevailing COVID-19 epidemics/pandemic and that the situation may trigger stoppage, hindrance or delays in Company's (or its subcontractors) capacity to produce, deliver, install or service the products, irrespective of whether such stoppage, hindrance or delays are due to measures imposed by authorities or deliberately implemented by the Company (or its subcontractors) as preventive or curative measures to avoid harmful contamination exposure of Company's (or its subcontractors') employees. The Customer therefore recognizes that such circumstances shall be considered as a cause for excusable delay not exposing the Company to contractual sanctions including without limitation delay penalties, liquidated or other damages or termination for default.

16. **Ethics and Compliance with Laws.** Each party shall comply in all respects with all applicable legal requirements governing the duties, obligations, and business practices of that party. Neither party shall take any action in violation of any applicable legal requirement that could result in liability being imposed on the other party. In the event Customer has concerns related to ethics, compliance, or Company's Principles of Responsibility, and/or any potential violations of these policies, Customer is welcome to make use of Company's GreenLine. The GreenLine is Company's global helpline for external stakeholders. It is a confidential channel through which Customers can ask questions and raise concerns. Reports can be made using the link: <https://secure.ethicspoint.eu/domain/media/en/gui/104677/index.html>.

17. **Cybersecurity.**

- 17.1. Customer's Obligations for Its Systems: Customer is solely responsible for the implementation and maintenance of a comprehensive security program ("Security Program") that contains reasonable and appropriate security measures and safeguards to protect its computer network, systems, machines, and data (collectively, "Systems"), including those Systems on which it runs the Products or Services provided by Company, against Cyber Threats. "Cyber Threat" means any circumstance or event with the potential to adversely impact, compromise, damage, or disrupt Customer's Systems or that may result in any unauthorized access, acquisition, loss, misuse, destruction, disclosure, and/or modification of Customer's Systems, including any data, including through malware, hacking, or similar attacks.

- 17.2. Without limiting the foregoing, Customer shall at a minimum:

- (a) have qualified and experienced personnel with appropriate expertise in cybersecurity maintain Customer's Security Program, and have such personnel regularly monitor cyber intelligence feeds and security advisories applicable to Customer's Systems or Customer's industry;
- (b) promptly update or patch its Systems or implement other appropriate measures based on any reported Cyber Threats and in compliance with any security notifications or bulletins, whether publicly disclosed on Company's security notification webpage at <https://www.se.com/ww/en/work/support/cybersecurity/security-notifications.jsp> or otherwise provided to Customer;
- (c) regularly monitor its Systems for possible Cyber Threats;
- (d) regularly conduct vulnerability scanning, penetration testing, intrusion scanning, and other cybersecurity testing on its Systems; and
- (e) meet the recommendations of Company's Recommended Cybersecurity Best Practices, available at <https://www.se.com/us/en/download/document/7EN52-0390/>, as may be updated by Company from time to time, and then-current industry standards.

- 17.3. Customer's Use of the Products, Software, and Services: Company may release Updates and Patches for its Products, Software, and Services from time to time. Customer shall promptly install any Updates and Patches for such Products, Software, or Services as soon as they are available in accordance with Company's installation instructions and using the latest version of the Products or Software, where applicable. An "Update" means any software that contains a correction of errors in a Product, Software, or Service and/or minor enhancements or improvements for a Product, Software, or Service, but does not contain significant new features. A "Patch" is an Update that fixes a vulnerability in a Product, Software, or Service. Customer understands that failing to promptly and properly install Updates or Patches for the Products, Software, or Services may result in the Products, Software, or Services or Customer's Systems becoming vulnerable to certain Cyber Threats or result in impaired functionality, and Company shall not be liable or responsible for any losses or damages that may result.

- 17.4. Identification of Cyber Threats: If Customer identifies or otherwise becomes aware of any vulnerabilities or other Cyber Threats relating to the Products, Software, or Services for which Company has not released a Patch, Customer shall promptly notify Company of such vulnerability or other Cyber Threat(s) via the Company's Report a Vulnerability page (<https://www.se.com/ww/en/work/support/cybersecurity/report-a-vulnerability.jsp#Customers>) and further provide Company with any reasonably requested information relating to such vulnerability (collectively, "Feedback"). Company shall have a non-exclusive, perpetual and irrevocable right to use, display, reproduce, modify, and distribute the Feedback (including any confidential information or intellectual property contained therein) in whole or part, including to analyze and fix the vulnerability, to create Patches or Updates for its customers, and to otherwise modify its Products, Software, or Services, in any manner without restrictions, and without any obligation of attribution or compensation to Customer; provided, however, Company shall not publicly disclose Customer's name in connection with such use or the Feedback (unless Customer consents otherwise). By submitting Feedback, Customer represents and warrants to Company that Customer has all necessary rights in and to such Feedback and all information it contains, including to grant the rights to Company described herein, and that such Feedback does not infringe any proprietary or other rights of third parties or contain any unlawful information.

18. **Import and Export.**

- 18.1. The Products and Services provided by Company under this Contract contain or may contain components and/or technologies from the United States of America ("US"), the European Union ("EU") and/or other nations. Customer acknowledges and agrees that the Products, assignment and/or usage of the Products, Software, Services, information, other deliverables and/or the embedded technologies (hereinafter referred to as "Deliverables") under these Terms and

Conditions of Sale shall fully comply with related applicable US, EU and other national and international export control laws and/or regulations.

- 18.2. Unless applicable export license/s has been obtained from the relevant authority and Company has approved, the Deliverables shall not (i) be exported and/or re-exported to any destination and party (may include but not limited to an individual, group and/or legal entity) restricted by the applicable export control laws and/or regulations; or (ii) be used for those purposes and fields restricted by the applicable export control laws and/or regulations. Customer also agrees that the Deliverables will not be used either directly or indirectly in any rocket systems or unmanned air vehicles; nor be used in any nuclear weapons delivery systems; and will not be used in any design, development, production or use for any weapons which may include but not limited to chemical, biological or nuclear weapons.
- 18.3. If any necessary or advisable licenses, authorizations or approvals are not obtained, whether arising from inaction by any relevant government authority or otherwise, or if any such licenses, authorizations or approvals are denied or revoked, or if the applicable export control laws and/or regulations would prohibit Company from fulfilling any order, or would in Company's judgment otherwise expose Company to a risk of liability under the applicable export control laws and/or regulations if it fulfilled the order, Company shall be excused from all obligations under such order and/or these Terms and Conditions of Sale.

PROPOSAL

PA DGS Central Plant - Fire Alarm

PREPARED BY

Siemens Industry, Inc. ("Siemens")

PREPARED FOR

Bidding Contractors

DELIVERED ON

January 05, 2026

SMART BUILDINGS

Transforming the Everyday



Table of Contents

SIEMENS PROPOSAL 3

 Contact Information 3

 Scope of Work 11-26-25.docx 4

 Equipment List 5

 Sell Price..... 6

 Payment Terms..... 7

TERMS OF SALE 8

 Siemens Terms of Sale (STS) 8

Signature Page 9

 Signature Page 9

Contact Information

Proposal #:	10281483
Date:	January 05, 2026

Sales Executive:	Kevin Hayden
Branch Address:	5095 Ritter Road Mechanicsburg, PA 17055
Telephone:	717-329-9514
Email Address:	kevin.hayden@siemens.com

Customer Contact:	
Customer:	Bidding Contractors
Address:	
Services shall be provided at:	
	Harrisburg, PA

PA Capitol Complex Central Plant – Fire Alarm Scope of Work

Siemens Industry is pleased to present the following scope of work for the PA Capitol Complex Central Plant project. Please note, Siemens scope of work is based on drawings dated 8-27-2025.

This proposal is based on approximate start date of February 2026 and approximate completion of June 2026.

Please be aware that the following proposal and device quantities are per plans and specifications and are to provide complete and operational systems. However, due to necessary design and/or engineering changes, final submittal quantities are subject to change.

Scope of Work:

1. Siemens to provide new fire alarm devices per plans
2. Siemens to provide device terminations
3. Includes device testing
4. Includes engineered drawings
5. Includes project supervision
6. Includes one year warranty

Electrical Contractor Responsibilities:

1. Provide and install necessary wiring and conduit to new device locations
2. Per State of PA requirements, leave 6' excess whip in flex cable at each device

Clarifications:

1. Professional engineer stamped or sealed drawings are not included
2. Pricing does not include providing or installing cabling and/or back boxes
3. Pricing includes project management for the duration of the tentative project schedule.
4. Materials pricing is for the extent of the tentative project schedule.
5. Work is assumed to be completed during normal business hours Monday – Friday (8am-5pm).
6. Pricing includes standard ground shipping.
7. Painting and Patching are excluded.
8. PA Sales Tax is excluded and a current tax exemption form will need to be provided or the applicable taxes will be added to the invoiced amount.
9. Any and all permits are the customers responsibility
10. Unless otherwise stated, this proposal is based on one phase for commissioning, testing and AHJ inspection. Should additional phases, testing and/or inspections be required, they will be provided at additional cost.
11. Prevailing wage labor IS INCLUDED

Equipment List

Fire Alarm Additions

Fire Alarm Additions

Qty	Ref #	Description
3	S54320-F7-A1	Multi-Crit. Fire Det.
3	500-094151	DETECTOR BASE ASSY
5	S54361-F3-A2	Spkr/Str (Wall,Wht,Fire)
5	S54370-F59-A1	SS Surface Mount Box Wht Wall
5	S54370-F44-A1	Wall (square) white standard cover alert text.

Sell Price

Total Quote Price	\$9,850.00*

This price is firm for 30 days from the date of this proposal.

**Siemens reserves the right to adjust prices to reflect the impact of any new or modified taxes, duties, tariffs, or equivalent measures, whether direct or indirect, imposed by any U.S. or foreign governmental authority that are applicable to our offering, including any hardware, software, or service components contained therein.*

Payment Terms

Payment Terms Acceptance Agreement

The total price of: \$9,850.00 and the estimated return on investment are based on the items outlined in this proposal. ANY STATEMENTS MADE HEREIN REGARDING SAVINGS THAT MAY BE ACHIEVED BY IMPLEMENTING THE SERVICES OFFERED IN THIS PROPOSAL ARE ESTIMATES ONLY. NO WARRANTY, EITHER EXPRESSED OR IMPLIED, SHALL BE CONSTRUED TO ARISE FROM SUCH STATEMENTS, NOR SHALL SUCH STATEMENTS BE CONSTRUED AS CONSTITUTING A GUARANTEE BY SIEMENS THAT SUCH SAVINGS WILL OCCUR IF THE SERVICES ARE IMPLEMENTED.

The Buyer acknowledges that when accepted by the Buyer as proposed by Siemens Industry, Inc., this Proposal and the Siemens Buildings Projects Business Standard Terms and Conditions, (together with any other documents incorporated into the forgoing) shall constitute the entire agreement of the parties with respect to its subject matter. BY EXECUTION HEREOF, THE SIGNER CERTIFIES THAT (S)HE HAS READ ALL OF THE TERMS AND CONDITIONS AND DOCUMENTS, THAT SIEMENS OR ITS REPRESENTATIVES HAVE MADE NO AGREEMENTS OR REPRESENTATIONS EXCEPT AS SET FORTH THEREIN, AND THAT (S)HE IS DULY AUTHORIZED TO EXECUTE THE SIGNATURE PAGE ON BEHALF OF THE BUYER.

Proposal is valid for thirty (30) days from the delivery date of January 05, 2026. Payment is due within 30 days of invoice date.

Payment Terms: 25% mobilization in advance, progress payments

Total: \$9,850.00

Siemens Industry, Inc. invoices paid by credit card may be subject to a surcharge of up to 2%.

Siemens Terms of Sale (STS)

Terms of Sale (Click to download)

[Base Terms \(United States\)](#)

Price Escalation. If, during the term of this Contract, the price of various materials or labor or logistics are increased as reflected by CRU/IHS Markit/CMAI/COMEX market index, then Siemens may increase the Contract Sum or apply a surcharge to Customer accordingly.

To the extent applicable, the following Supplements are incorporated and made part of the Siemens Terms of Sale:

Click on supplement(s) below to read/download

[Solutions Supplemental Terms](#)

[Hardware Supplemental Terms](#)

The order of precedence is stated in the Base Terms (United States).

To the extent the Offerings are purchased through an existing master or frame agreement, the terms and conditions of that agreement shall apply instead of the Siemens Terms of Sale.

Siemens reserves the right to adjust prices to reflect the impact of any new or modified taxes, duties, tariffs, or equivalent measures, whether direct or indirect, imposed by any U.S. or foreign governmental authority that are applicable to the Offerings, including any hardware, software, or service components contained therein.

Siemens is entitled to amend these terms and conditions at any time without prior notice. Previous and Retired versions of Base Terms & Supplemental Terms can be found here: www.siemens.com/terms-of-sale

Signature Page

Proposed by:

Siemens Industry, Inc.

Company

Kevin Hayden

Name

10281483

Proposal #

\$9,850.00

Proposal Amount

January 05, 2026

Date

Accepted by:

Bidding Contractors

Company

Name (Printed)

Signature

Title

Date

Purchase Order # ☐ PO for billing/pmnt only ☐ PO not required



Quote for IB Abel 2745 Black Bridge Road York, PA 17406 Re: DGS Central Plant Upgrades January 11, 2026

Electric Line Excavation

Excavating electric line trenches, triads, and box totaling approx.

740' L x 49" D x 36" W.

Disposal of all excavated spoils.

Bring in and pour 20" of concrete in trenches (not the 12' x 10' x 4' D box)
after contractor installs lines and rebar.

Bring in and place 4" of Aashto #57 over concrete. Sidewalk locations will be
backfilled with Aashto #57 to ground level.

Bring in fill and backfill trenches to ground level.

\$74,975.00 _____

or

Backfill trenches with Aashto #57 instead of fill.

\$79,250.00 _____

- *Hauling of Hazmat materials is not included. Certain Hazmat materials can be hauled for an additional cost.*
- *Compaction is not included in price, but can be done for an additional cost.*
- *Does not include cutting/removing sidewalks or replacing/repairing them.*

We try to make our estimates as accurate as possible. Unfortunately, there are times when unforeseen issues making the job more difficult or more expensive than originally estimated. Fluctuating prices in fuel, aggregates, black top and other products can cause changes in the original estimated amount too. Prior to any price change we will contact you to discuss options or alternatives.

- All permits, inspections and other owner, county and township requirements are the responsibility of the IB Abel or acting agent for corporate, state, or federal owners or agent handling bids.
- General Contractor or IB Abel is responsible for calling PA One call prior to start of work.
- All measurements are estimates.
- Delays in job (not the result of PCEP) for engineering delays, inspections, testing, spec changes, etc. will result in additional costs.
- The discovery of limestone or any stone/rock that our on-site equipment is unable to move which requires supplementary equipment and/or contracting a blasting company, will result in additional costs.

- Payment is due within thirty (30) days of the date invoiced. All payments, not made by the agreed upon date, will incur late fees of 18% per month or maximum amount permitted by law.
- All legal fees, filing fees, and any other costs incurred to collect amounts due will be the responsibility of the IB Abel.

Concrete Supplier rules and fees

- The concrete included herein does not include any admixtures, ice or special aggregates.
- The quoted concrete prices do not include the testing of cement, aggregates, trial mixes, test cores, or cylinders.
- Concrete price allows unloading time for 1st cu. yd. - 15Min. Unloading time for each additional cu. yd. - 5 Min. Extended unloading time charge \$3.00/minute
- HOLD TIME CHARGES: Orders that deviate from their scheduled time will be subject to a hold time charge. If an order is placed for a specified time and is not released within 45 minutes of that scheduled time, a hold charge will be billed. The hold time charge is \$175.00 per hour per truck. There will also be a plant charge, if no other orders are scheduled at that specific plant while in a hold status. The plant charge is \$150.00 per hour.
- If an order is cancelled less than 2 hours of the scheduled order time, a cancellation charge will be billed in the amount of \$500.00.

Value Added Charges per CY.			
Non-Chloride per %	\$8.00	Front Discharge	\$5.00
Chloride Accel per %	\$6.00	Ice per 40 lbs. Bag	\$30.00
Retarder per %	\$4.00	#8 Stone	\$6.00
Pump Mix 6"-8" slump	\$6.00	Environmental S/C	\$25.00
Microfiber	\$9.00	Test Cylinders	\$25.00 ea.
Exposed Agg ½" or ¾"	\$130.00	Cylinder Breaks	\$35.00
River Jack	\$130.00	Dye Clean Out	\$85.00 per load
Winter Concrete	\$9.00	Fuel S/C	\$50.00 per load
Straight Cement	\$6.00		

Tara Dawn Hazen

Tara Dawn Hazen/ President - Hauler

Tara-Dawn Hazen

Printed Name

January 11, 2026

Date

Authorized Signature – Contractor

Printed Name of Authorized Signer

Date



Manna Supply, Inc
PO Box 4601
Lancaster, PA 17604
+16102224775
billing@mannasupply.com
www.mannasupply.com

MBE and WBE Certified Small Business

Quote

ADDRESS

Abel, I.B., Inc.
I.B. Abel, Inc.
2745 Black Bridge Rd
York, PA 17406

SHIP TO

Abel, I.B., Inc.
I.B. Abel, Inc.
2745 Black Bridge Rd
York, PA 17406

QUOTE #	DATE	
10796	01/19/2026	

SHIP VIA
Best Way

PRODUCT/VENDOR
Gear Update

PROJECT NAME
DGS Capitol Complex Central Pla

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
MBE/WBE/DBE	Manna Supply, Inc. is a certified Minority Business Enterprise (MBE), Women Business Enterprise (WBE) and Disadvantaged Business Enterprise (DBE). See attached certificates.	0	0.00	0.00T
Space		0	0.00	0.00
Gear (26)	Lot Electrical Distribution Equipment - BASE BID #1 Note: See below breakouts for UPS and VFD's	1	4,069,500.00	4,069,500.00T
Gear (26)	Lot Electrical Distribution Equipment - BASE BID #2/#3	0	4,430,500.00	0.00T
Gear (26)	Lot Electrical Distribution Equipment - BASE BID #4	0	5,166,300.00	0.00T
Space		0	0.00	0.00
Space		1	0.00	0.00
MV Swgr	MV Switchgear (MDS15) - Base Bid #1- #4 Siemens (1) 15kV Main-Tie-Main, 1200A Metal Clad Swgr, N1, 15kV, 50kA, N1, with ATO, Meters and Relays Lead Time: 38-40 weeks	1	0.00	0.00T
MV Swgr	MV Switchgear (MDS5) - Base Bid #1- #4 Siemens (1) 5kV, Main-Main, Metal Clad/Metal, 2000A Enclosed Swgr, 5kV, 25kA, with Key Interlocked Vacuum Main Breakers and Fused Feeder Switches, and meters and relays Lead Time: 38-40 weeks	1	0.00	0.00T
Busway	Non-Segregated Busway (MV) - Existing T3/T4 to new MDS5 - Base Bid #1- #4 Siemens OEM COPPER BUSBAR WITH TIN PLATING AT CONNECTION PARTS & EXTRUDED ALUMINUM	135	0.00	0.00T

THANK YOU FOR YOUR ORDER!

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A 2% finance charge must be applied to all balances over 30 days.

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Battery Sys (26)	HOUSING (60ft) T3 to MDS5: 2000A (2) Horizontal Elbow (2) Vertical Elbow (2) Flange End Box (2) Wall Flange (75ft) T4 to MDS5: 2000A (2) Horizontal Elbow (2) Vertical Elbow (2) Flange End Box (2) Wall Flange Lead Time: 20-22 weeks			
	Lot Station Battery System - For MDS15 and MDS5 - Base Bid #1- #4 Hoppecke (1) 48VDC Battery Cells to support both 15kV and 5kV Swgr (1) Battery Rack (1) Battery Rack Spill Kit (1) Battery Charger (1) Battery Isolation Switch (1) DC Panel (1) Freight (1) Installation Inspection Lead Time: 8-10 weeks	1	0.00	0.00T
Trans-Sub	Substation Transformer (T5 and T6) - Base Bid #1- #4 Hitachi (2) 3500kVA, VPI Transformers, 80 Dg C Rise, Copper Windings, 12.47kV to 480/277V, N1 3 Phase 60 Hertz, 80/80 Degree C Rise, AN/Future AF HIGH VOLTAGE 12470 Delta 95 kV BIL Copper Conductor Termination in ANSI segment 2 Primary Cable Connection - HV 15 kV 12.7 MCOV Distribution Class Polymer Surge Arresters (Set of 3) - HV LOW VOLTAGE 480Y/277 Copper Conductor Braided Flex Connectors - LV Lead Time: 20-22 weeks	2	0.00	0.00T
Switchgear	Switchgear (T5 and T6) - Base Bid #1- #4 Siemens (1) 5000A DO Main Breakers, 480/277V, N1 (1) 5000A/100A DO Main Breakers, 480/277V, N1 Lead Time: 30-32 weeks	2	0.00	0.00T
Switchboard	Switchboard (MTM1) - Base Bid #1 Siemens (1) 3200A Main-Tie-Main, 480/277V, 65kA, N1, Fixed Breakers, UL891, with PQ Metering Lead Time: 20-24 weeks	1	0.00	0.00T
Switchgear	Switchgear (MTM1) - Base Bid #2- #4 Siemens (1) 3200A Main-Tie-Main, 480/277V, 65kA, N1, DO	1	0.00	0.00T

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Switchgear	Breakers, UL1558, with PQ Metering Lead Time: 30-32 weeks Switchgear (MTM2) - Base Bid #1- #4 Siemens (1) 5000A Main-Tie-Main, 480/277V, 100kA, N1, DO Breakers, UL1558, with PQ Metering Lead Time: 30-32 weeks	1	0.00	0.00T
Busway	Busway (LV) - Base Bid #1- #4 Siemens (140ft) MTM1 to MDS1: 2500A (120ft) MTM1 to MDS2: 2500A 19 - Elbow: SX425C14ES 26 - Trapeze Hanger: SXTH2 2 - Flanged End: SX425C14FRND Lead Time: 34-40 weeks	260	0.00	0.00T
Busway	Busway (LV) - Base Bid #4 Siemens (170ft) T1 to MTM1: 2500A (180ft) T2 to MTM1: 2500A 20 - Elbow: SX425C14ES 70 - Trapeze Hanger: SXTH2 2 - Flanged End: SX425C14FRND Lead Time: 34-40 weeks	350	0.00	0.00T
Busway	Busway (LV) - Base Bid #4 Siemens (210ft) T5 to MTM2: 5000A (200ft) T6 to MTM2: 5000A 15 - Elbow: SX450C14ES 2 - Flanged End: SX450C14FRND 82 - Trapeze Hanger: SXTH1 Lead Time: 34-40 weeks	410	0.00	0.00T
UPS	Uninterruptible Power Supply (UPS) - Base Bid #1- #4 Named Mfg (1) 75kVA/kW UPS with 3-Breaker Main ByPass and 8-min battery system Includes: - Start-up - Extended Warranty - Load Bank Test - PM Note: We have excluded "Additional Battery Monitoring" called out in 263353-1 section 2.15 as this is not applicable/appropriate to this small size UPS Lead Time: 18-20 weeks	1	107,500.00	107,500.00T
VFD	Variable Frequency Drives (VFD's) - Base Bid #1- #4 (8) ABB VFD's Tags: CHWP-1, 3, 4 Model: (3) ACH580-3PCR-302A-4 Ultra Low Harmonic (ULH) Input Voltage: 480 VAC Three Phase Rated Output Current: 302A Enclosure: UL (NEMA) Type 1 Nominal Horsepower: 250 HP	1	390,900.00	390,900.00T

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
	Frame Size: R11 Input Disconnecting Means: Circuit Breaker Bypass: None Input Impedance: 10% LCL High Frequency Filter Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP) Includes freight and start-up Tags: CTF-1, 2, 3 Model: (3) ACH580-3BCR-180A-4+F267+G390 Ultra Low Harmonic (ULH) Input Voltage: 480 VAC Three Phase Rated Output Current: 180A Enclosure: UL (NEMA) Type 1 Nominal Horsepower: 150 HP Frame Size: R8 Input Disconnecting Means: Circuit Breaker Bypass: E-Clipse Soft Start Bypass (Box) Input Impedance: 10% LCL High Frequency Filter Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP) Other Options: Service Switch Tags: EF-1, 2 Model: (2) ACH580-BCR-04A8-4+F267 Six Pulse Input Voltage: 480 VAC Three Phase Rated Output Current: 4.8A Enclosure: UL (NEMA) Type 1 Nominal Horsepower: 3 HP Frame Size: R1 Input Disconnecting Means: Circuit Breaker Bypass: E-Clipse Bypass (Box) Input Impedance: 5% equivalent impedance Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP) Other Options: Service Switch Includes: Start-up and 30 month warranty Lead Time: 18-20 weeks			
Panel	Panelboard - (HP, RP, NE2, MDP-NE, NE, N/E, CP, CP-1, V-1, V1A, LR, LP-LH, PPA, PP & Welder) Base Bid #1- #4 Siemens	15	0.00	0.00T
Trans-LV	LV Distribution Transformer - Base Bid #1- #4 Siemens (1) 30kVA, 480V to 208/120V, Cu, N1	1	0.00	0.00T
Study	Base Bid #1- #4 Electrical Engineering Study to include: 1) Short Circuit Study, 2) Coordination Study and 3) Arc Fault Analysis in a Study Report, including providing Arc Flash Labels for field installation. Existing Construction: Back to two levels prior to new equipment, unless previous study can be provided New Equipment: Back to the incoming normal and emergency service	1	0.00	0.00

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Gear Start-up	Data Collection: By others Mfg Start-up for MV Swgr and LV Swgr	1	0.00	0.00
Comments	Comments and Notes - Gear BOM does not include any temporary equipment for the Chiller plant including: - 5kV LIS - 1500kVA Transformer - 2000A Swbd	0	0.00	0.00
Comments	Comments and Notes - VFD Comments: Not Included Items and Clarifications: Harmonic analysis Field harmonic testing Additional harmonic filtration beyond what is mentioned above Passive filter / Output filter AC Line reactor - 6 Pulse VFDs come with 5% DC Bus Choke as standard LonWorks or BACnet IP communication cards Digital input interface Hauling, rigging, piping, wiring and installation Emergency service or regular maintenance Manual service switch provided in place of 3rd contactor in bypass configurations 18 Pulse Architecture - ULH Provided as Modern Solution (See Technical Note 032) VFDs come standard with built in overcurrent and overload protection (no external MPR), as well as motor I ² t (See Technical Note 072)	1	0.00	0.00
Prog Bill	Progress billing schedule: 20% - Receipt of approved submittals 30% - Equipment released to factory 50% - Shipment from factory	0	0.00	0.00
Space		0	0.00	0.00
Space		1	0.00	0.00
Optional	Optional Equipment/Services	0	0.00	0.00
Gear (26)	OPTIONAL ADDER TO BASE QUOTES Modifications to existing substation transformers T1/T2 and T3/T4: Bill of Material (BOM) and summary work scope for modifications to Transformers T1, T2, T3, and T4 based on the provided one-line diagrams and project specifications for relays and metering. Engineering and Design: • A short outage will be required in order to gather all information related to providing these modifications. After completion of this site visit, Vendor to design and integrate new relay and metering cubicles for T3 and T4. • We will develop updated one-line and three-line drawings reflecting added sections. • Relay settings for T3 and T4 (overcurrent, ground, voltage, frequency, negative sequence), to be	0	619,990.00	0.00T

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Trans-MV	provided by others. RESA Power will provide programming based on provided settings. • Configure meter scaling, CT/PT ratios, and communication protocols. Lead Time: 10-12 weeks after approvals. MV Transformer (T1 and T2) (2) Add Meter to vacuum breaker per notes on dwgs Transformers T1 and T2 (1500 kVA Substations) Bill of Material (BOM): 1. LV Power Meter Schneider Electric PM8000 (Type M2) or ION8650 2. 480 V Metering CT's 3. CT Shorting Terminal Block & Fusing 4. Communications Interface Module Material Summary Totals: • MV Relay & Metering Cubicles: 2 (T3, T4) • Protective Relays: 2 required (T3, T4). • Meters: 4 total (T1–T4) • CT Sets: 6 total (4 MV for T3/T4, 2 LV for T1/T2) • PT/VT Sets: 2 total (T3, T4) • Communications Interfaces: 4 total Field Installation - T1 and T2: • Install LV power meters on 2500 A mains. • Install CTs, voltage references, and communication wiring. Testing and Commissioning: • Perform ratio, polarity, and insulation testing of new CTs and PTs. • Verify metering accuracy, phase rotation, and demand functions. • Confirm SCADA/monitoring communications. Actual SCADA set up and testing by others. Documentation: • Provide as-left settings, test reports, and updated one-line diagrams. • Label all new cubicles and devices and update equipment records.	2	0.00	0.00T
Trans-MV	MV Transformer (T3 and T4) (2) Add Meters, Relays and PT's per note 1 on the dwg This scope includes an additional medium-voltage cubicle that will be added to Transformers T3 and T4 to house protective relays, metering, CTs, and PTs. T3 and T4 will be equipped with multifunction protective relays providing the following functions: • 51 / 51G – Phase and Ground Overcurrent • 27 / 59 – Under/Overtovoltage • 47 – Negative Sequence / Phase Loss • 81 – Under/Over Frequency • Metering (M2) Bill of Material (BOM): Transformers T3 and T4 (10 MVA Unit Substations – With Added Cubicles) Item Description: 1. Medium-Voltage Relay & Metering Cubicle, Custom	2	0.00	0.00T

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
	auxiliary section includes structure, bus extension, barriers 2. Feeder/Main Protective Relay Eaton EDR-5000 (or equal) 1 2 51, 51G, 27, 59, 47, 81, metering 3. MV Power Quality / Revenue Meter Schneider Electric ION9000 or PM8000 1 2 Ethernet-enabled 4. MV CT Set (Protection + Metering) Mounted in added cubicle 5. MV PT/VT 12.47 kV / 120 V Fused, drawout or fixed 6. Relay Test Switch & Terminal Hardware Various FT-style or equivalent 7. Communications Interface / Cabling for SCADA/monitoring Field Installation - T3 and T4: • De-energize and implement lockout/tagout procedures. • Provide assistance to contractor to remove end plates and extend lineup to install new cubicles. • Install CTs, PTs, protective relays, meters, and terminal blocks within new sections. • Extend bus, control wiring, and grounding to new cubicles. Testing and Commissioning: • Perform secondary injection testing on T3 and T4 protective relays. • Perform ratio, polarity, and insulation testing of new CTs and PTs. • Verify metering accuracy, phase rotation, and demand functions. • Confirm SCADA/monitoring communications. Actual SCADA set up and testing by others. Documentation: • Provide as-left settings, test reports, and updated one-line diagrams. • Label all new cubicles and devices and update equipment records.			
Space		0	0.00	0.00
Space		0	0.00	0.00
Price-30	Price valid for 30 days only due to changing market conditions and fluctuations, including both commodities and Tariffs. Equipment must also be released in a timely manner in accordance with each manufacturers requirements. Tariff increases may be assessed by mfgs at the time of shipment without prior notification or acceptance. Siemens has an announced price increase effective 1/1/2026, so all quotes must be executed prior to that date to be effective.	0	0.00	0.00
Tariff	Tariffs and Surcharges: Prices quoted include only current tariffs, duties, or government-imposed surcharges. If any such tariffs, duties, or surcharges are imposed or modified after the issuance of a quote, purchase order, or agreement, the additional costs will be the responsibility of the purchaser and will be	0	0.00	0.00

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
	added to the final invoice. Manna Supply reserves the right to adjust pricing accordingly to reflect these costs. This policy applies to all products and services offered and will remain in effect unless explicitly stated otherwise in writing by an authorized representative of Company.			

Thank you for your business! If you would like to pay by card, please note there will be an additional fee (outlined in your invoice).	SUBTOTAL	4,567,900.00
Thank you for the opportunity to support you on this project.	TAX	0.00
	TOTAL	\$4,567,900.00

Manna Supply, Inc. Terms:

- 1) Payments will be due 30 days after shipment of products or completion of services on all Invoices
- 2) Standard Freight is FOB Factory
- 3) Retainages will not be accepted
- 4) No payment discounts, unless agreed to in writing
- 5) Complete Manna Supply Terms and Conditions of Sales are available to review and download at www.mannasupply.com.
- 6) Sales and Use Tax to be determined upon acceptance of order.
- 7) All Quotes are valid for 30 days only, due to volatile market conditions.
- 8) Tariffs, known and unknown, may impact mfg's prices up to including at time of shipment, which may differ than what was quoted previously.

Accepted By

Accepted Date

THANK YOU FOR YOUR ORDER!

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Keystone Electrical Supply
237 Pillow St.
Butler, PA 16001
Robstern7@aol.com
PH# 724-822-3508



Brian DeCesare
305 Gregson Drive
Cary, North Carolina 27511
Brian.DeCesare@us.abb.com
+1 215-384-6999

ABB

January 07, 2026

Quote No.: UAP-00000560

Doc Rev. 0

Project: Capital Complex Central Plant Chiller

Quote Version: Field quote with temporary

Quote Expiration: 02/07/2026

Dear Valued Customer,

Thank you for your inquiry for **Capital Complex Central Plant Chiller**. We are pleased to respond with our proposal based on the requirements of your inquiry. Please contact us with any questions. We look forward to working with you on this opportunity.

Best Regards,

Brian DeCesare
ABB

Notes

Project Level

a. Referenced Document(s)

Commonwealth of Pennsylvania
Department of General Services
Project No. DGS C-0948-0090 Phase 003
Drawings dated 27 August 2025...
E001, E100, E200, E201.D, E202.D, E401, E601, E604, E703, E704, E706,

Addendum 5 Drawings dated December 15, 2025...
E501.A, E501.D, E705

DGS-C-1101-0055 PHASE 1 specifications...
262200, 262816

DGS C-0948-0090 PHASE 3 specifications...
261116, 261323, 262300, 262413, 262416, 262500, 262713, 264313, 262813

b. Comment(s)

IMPORTANT NOTICE:

Any contract to sell the subject matter of the proposal shall be subject to prior mutual agreement as to price (which may be different than that shown herein), schedule, scope of work and terms.

Due to confusion on the drawings and specifications, we are quoting per this scope only.
As changes are requested, or as the design progresses, we are happy to revise our proposal and pricing.

Standard GE by ABB Design & Construction
GE/ABB to provide standard one-line nameplates.

Standard ABB lug size and quantities are provided based on amperage of the breaker(s) & equipment as shown in this proposal.

Cable length & voltage drop has not been considered.

Modifications may incur an adder/change order.

Only Standard Test Reports Provided, unless noted otherwise in this Bill of Material

Quoting standard GE by ABB Warranty - 1 year from energization or 18 months whichever occurs first.

For Extended Warranty see information at the end of the BOM.

Standard Terms and Conditions apply, including but not limited to FCA Factory, Progress Payments. (See terms at end of proposal)

ABB does not and will not represent, certify, or warrant that the products proposed herein satisfy any U.S. domestic preference requirement such as the Pennsylvania Steel Products Procurement Act. Purchaser agrees it is solely responsible for its obligations to its customer, such as adherence to any U.S. domestic preference requirement or requesting and obtaining an agency waiver, providing an equitable adjustment in scope, schedule, price, and other provisions to change ABB manufacturing location, manufacturing processes, and acquisition of components if mutually agreed to by ABB and Purchaser, or the supply and replacement of substitution products, and will defend and indemnify ABB from and against all liability resulting from any variance between the terms of this proposal and any of its contract terms with its customer. In no event shall Purchaser withhold payment due to ABB for any dispute or liability incurred between Purchaser and its customer. ST forms also will not be provided."

Country of Origin for the products in this proposal:

- Lighting panelboards=USA and Mexico
- Lighting panelboard outdoor enclosures=Mexico
- Power panelboards=Mexico
- Switchboards=Mexico
- LV Transformers=Mexico
- Tranquell Surge Protective devices=Mexico
- Disconnects and fuses = Mexico
- MV Switchgear Load Interrupter Switches = Mexico
- Breakmaster Load Interrupter Switches = Mexico
- Liquid filled substation Transformers = USA and Mexico
- Dry Type substation Transformers = USA
- Low Voltage Switchgear = USA
- Medium Voltage Switchgear = USA
- LV Busway = USA
- MV Busway = USA

Power Systems Studies specifications indicate studies are to be prepared by a PE who is a full time employee of the equipment manufacturer.

Specifications also indicate the study preparer is to provide Arc Flash Training certified for continuing education units.

Exception: We are including Power System Studies by a third party, who is a PE. (Not a Full Time Employee of ABB)

Exception: We are NOT including Training.

Any changes required as a result of Power Studies, may require revision of our proposal and pricing.

MV Switchgear specifications indicate to provide Arc-Resistant construction.

However, the room layouts do not appear to allow for venting to the outside.

We suspect that the specifications need to be edited.

We are quoting Fusible Load Interrupter SWGR as NON-Arc-Resistant.

We are quoting Primary and Secondary Unit Substation Breakers as NON-Arc-Resistant.

The 12.4kV Switchgear MDS15 is quoted with arc-resistant design features at the exterior (front, rear, and sides) and arc protection to the low voltage compartment (Type 2B). This means arcing does not cause holes in the walls isolating the low voltage instrument compartments.

Switchboard specifications call for Pull Boxes and Cable Supports.

Since all connections are via Busway, we are not providing either of these features.

Switchboard specifications call for Key Interlocks, and Mechanical Interlocks.
Since we are providing an Automatic Throw Over, we are not providing these features.

Panelboard specifications call for Main lug interiors up to 400A to be field convertible to Main Breaker (Not offered)

Panelboard specifications call for Interior Phase bus to be pre-drilled to accomodate field installable options (Sub-feed lugs, Sub-feed breakers, Thru-Feed Lugs) (Not offered)

Panelboard specifications call for Mono-Flat Front. (Not offered)

We take exception to these requirements.

Panelboard specification for Breakers appears to be un-edited.

We are only quoting breaker features as indicated on the plans.

c. Exclusion(s)

1. Programming of Schneider PM8000 meters, Programming of existing Power Monitoring System, Battery System for LV SWGR, UPS, VFD's, SPD for Panel "DC", Spare Fuses, Spare Fuse Cabinet, Starters, Temporary Trailer, Modifications to existing equipment. ****Quoting HV & LV Swgr on transformers T3 & T4 as New.****

Disconnects are included only if they are shown on the One-line drawings.

Busway Product Family - Notes

a. Comment(s)

1. The quoted Bill of Material (BOM) is based on estimates at the time of quote configuration. The actual footage/fitting quantities will be determined when the fully dimensioned ABB drawings are available. As a result, if there is a change in actual quantities verses quoted quantities the adder will be provided for the additional material released on the project at this time. The Change Order PO must be issued before ABB will proceed with completion of the busway project.

Low Voltage Switchgear Product Family - Notes

a. Comment(s)

1. This job is planned to be built in Mebane, North Carolina, USA. Please verify that this will be acceptable to end user.
2. ABB Low Voltage Switchgear It is designed and tested in conformance with applicable standards of UL 1558 , CSA C22.2 NO 31 , ANSI/IEEE 37.20.1, ANSI C37.51. Any equipment requiring a UL 1558 or CSA labeling will be provided with a cUL us label. The switchgear is manufactured in an ISO 9001-certified facility.
3. Unless negotiated differently Drawings (Submittals), Testing, Quality, Warranty, Delivery and Transportation are as outlined below.
4. OPTIONAL MAINTENANCE & SAFETY FEATURES:
 - Ekip T&P - Programming and Test Unit \$2,904.00 net each
 - Breaker Remote Racker \$13,957.00 net each
 - Breaker Remote Racker Plate (Reliagear)..... \$966.00 net each
 - Portable Breaker Hoist (Crane) \$1,792.00 net each
 - Breaker Transfer Cart \$978.00 net each
 - Electrically Operated Breaker Test Box \$5,789.00 net each
5. TYPICAL ADDERS:
 - Visual Inspection of Equipment \$3,500.00 net (per 8 hr day)
 - Customer Witness Tests \$5,500.00 net (per 8 hr day)(adds 1 week To ship cycle) Please note, If the customer does Not purchase Witness Test at time of equipment order placement, price must be negotiated with Project Management Team and a revised ship schedule will be established based on current factory capacity/loading.
 - Open Top Truck(NYC & Chicago) \$1,750.00 per truck

(maximum of 10 vertical sections per truck)

6. SPARE PARTS:

Spare parts are not included in current quote. A list can be made available after order is released from engineering to manufacturing. Seller takes exception to any non-standard format or requirements for this list.

7. TYPICAL START UP SPARE PACKAGE:

Startup package includes the following items for a single ended substation. If line-up should have multiple sources, buyer may choose to add one package for each source of incoming power.

=> Typical start up package \$1,750.00 net each

- 100% replacement fuses for primary of CPT and PT circuits
- 20% replacement secondary control fuses
- Qty 5 interconnect terminal blocks/plugs
- Qty 5 customer access terminal blocks
- 100 ft of SIS control wire
- Qty 10 spare lamps for indicating lights (5 for red, 5 for green)
- Qty 20 control wiring terminals

8. Factory equipment quotation does not provide programming of customer settings for protective devices (relay/trip unit) Or communication mapping. These items, selective coordination, And all system studies should be quoted And provided by ABB Lifecycle Solutions (Engineering Services) Or the installing contractor. Items mentioned above are Not included In quotation BOM Or pricing.

9. FACTORY TESTS:

Contact Low Voltage Proposals Group for prices on special tests not listed below.

Standard tests performed during factory testing and Witness Test (optional):

- Device check
- Control lead check
- Stationary instrument transformer ground test
- Meter check (3-phase) & polarity check
- Control power check (sequence tests)
- Heater, lights, receptacle, and fan check
- Bus check - visual check of phases, neutral, and ground per drawing.
- Clearance check - inspection of bus, neutral, and devices for proper clearance
- Connection tightness
- Nameplate check
- Current/voltage transformer polarity check (visual)

The following tests are also performed during standard factory testing.

- Secondary hi-pot of control wiring (1500vac for 1 minute)
- Primary hi-pot of primary bus (2200v, 19kv or 36kv as required)

An adder Is required If hi-pot tests are required To be performed during Customer Witness tests.

ABB does not allow for witness or hold points in the manufacturing process. Should the customer like to inspect the equipment at any point during the manufacturing cycle, the factory will advise within five working days in advance when those milestone dates are approached. Customer will have responsibility to make necessary arrangements to attend inspection dates as communicated. Customer inspection(CI) requirements must be established at the time Of the order, Or through a formal change order process If CI requirements arise later In the execution Of the order.

10. The ABB Standard Documentation Package includes:

** For Approval (when required)

- a) Front View/Floor Plan - Arrangement with basic dimensions, device locations, 1-line, cable space, shipping sections, etc. This Is Not certified For construction.
- b) Summary (Bill of Material) - Breaker, device and nameplates.
- c) Elementary Drawing - 3-line schematic of current, potential and control circuits. Preliminary - no terminal numbers.

** Final Drawings

- a) Front View/Floor Plan - Final dimensions for construction.
- b) Summary - Final breaker, device and nameplate list.
- c) Final Elementary Drawing - 3-line schematic of all circuits with terminal numbers.
- d) Connection Diagram - Internal unit wiring diagrams.
- e) Interconnect Drawings - External and inter-unit connections.
- f) Instruction Books - For switchgear and all major items.

(Relay instruction books include time curves.)

g) Installation Drawings - Foundation requirements, loading/unloading And installation methods.

h) Certified Test Reports (If ordered)

If changes are made during factory testing, the affected sheets of the final drawings are reissued.

11. For Low voltage switchgear, the standard practice for LV breakers is for them to arrive after the gear ships from the factory. This is to allow customers to have time to set the gear, pull cables, make inter-unit connections, and not have breakers in the way where they may get damaged. If breakers are required on site at the same time of the switchgear, they will be shipped external to the switchgear, and an adder will be required.
12. Clarification to job scope, many assumptions were made with this specification provided. This quote is only limited to the attached BOM. If any deviation is required, then Seller reserves the right to update BOM and price accordingly.
13. In the event of conflicting information in the documents provided, seller is using the following order: DATA SHEET, DRAWING, SPECIFICATION.
14. Proposed switchgear is in conformance with applicable standards of ANSI, IEEE, NEMA & UL. Exception is taken to all other codes & standards. Note that NEC & NFPA refer to the actual installation, operation & maintenance of the equipment, not the design of the equipment. Seller has reviewed the NFPA standards, only NFPA 70 (the NEC Code), NFPA 70B (Recommended Practice for Electrical Equipment Maintenance) and NFPA 70E (Standard for Electrical Safety Requirements for Employee Workplaces) have any relevance to our product. 70B and 70E both apply directly to the safety and use of electrical equip. NFPA 70, is commonly called the NEC Code.
15. Seller is quoting Switchgear which is provided with Trip Units and/or solid state relays. Most relay functions such as Ammeter, Ammeter Switch, Voltmeter, Voltmeter Switch and Demand are performed by the trip unit integrated into the front of each Breaker. Seller is taking exception to providing a dedicated device for these functions if they are required.
16. Seller is quoting standard factory lead times. If customer requires lead times sooner than these estimates field sales will need to prenegotiate with factory.
17. Seller is quoting standard factory Switchgear submittals which will be per the SHIPMENT AND DRAWING SCHEDULE section below. If customer requires a shipment sooner than these estimates field sales will need to prenegotiate with factory. Optional price adders have been provided below and can be added at order entry.
18. Switchgear will be shipped per the DELIVERY AND TRANSPORTATION section below. All exception is taken to any shipping methods. Optional price adders have been provided below and can be added at order entry. Any STORAGE AND HANDLING is to be quoted and provided by others.
19. Seller is quoting standard ABB Terms and Conditions per section below. All exception is taken to any other T&C's and Liquidated Damages. If buyer finds seller's proposal competitive, seller will be glad to negotiate, in good faith, a mutually agreeable set of terms & conditions before the order is placed.
20. Any possible execution of field services, site coordination between switchgear and other products/devices, performance bonding, testing & training, short circuit studies or preliminary trip unit/relay settings are to be quoted and provided by others.
21. If required, any DC voltage to be quoted and provided by others.
22. Seller has provided an option for remote racking. The remote racking device for Emax2 breaker requires a plate to be mounted on the face of the breaker for operation. Seller has provided one plate for each main and tie breaker and an additional plate that can be utilized for the feeders and moved from breaker to breaker. If a mounting plate is required for each feeder, seller would gladly revise the bill of material and price accordingly.

23. TPHE Series SPD

Providing an ABB TPHE Series SPD per the BOM in our bid. The TPHE Series SPD is engineered for reliability, flexibility, and long surge life in the most extreme transient surge environments. The true maximum single surge current ratings are not limited by fusing or other serial components within the

surge discharge path like some other manufacturer's SPD devices.

The full TPHE assembly, including all fusing and components, is 3rd party tested to confirm that it is capable of surviving a single IEEE 8x20us surge current impulse per each mode, up to *200kA. The TPHE protects all available modes of the power system (L-N, L-G, L-L and N-G) and is offered in per mode ratings of 125kA, 150kA, 200kA or 300kA per mode (equal to 250kA, 300kA, 400kA And 600kA per phase). Per phase ratings are the aggregate sum of the combined L-N and L-G tested modes and are provided for comparison only since per phase ratings are not specifically endorsed by standards organizations within the SPD industry.

ABB has not included a circuit breaker to feed the SPD device due to its additional impedance. The provided SPD comes with a surge rated 4-pole disconnect which allows the SPD to be 'turned off'.

b. Deviation(s)

1. The Project Specification Review attachment references important clarifications and deviations to customer's specifications and/or drawings that shall be applied in the equipment to be manufactured and offered in this quote. In case of discrepancy and/or clarification, notify and review with your sales representative.

Uploading in Empower saves a record of your original CDE file on the quote version for reference as needed. File attachment in empower cannot be edited or deleted by anyone but the file creator!

Medium Voltage Switchgear Product Family - Notes

a. Comment(s)

1. Material shortage clause

"The Parties are aware of the shortage of raw materials, electronic components worldwide which is likely to last for the foreseeable future, as well as of market fluctuations in the availability and cost of other raw materials, commodities, other critical components and transportation capacities. Notwithstanding anything to the contrary in the contract/terms and conditions/purchase order, if after the date of ABB's proposal / offer or during the term of the performance of the contract/purchase order there are any changes to availability and / or market conditions for electronic components, raw materials, commodities and transportation capabilities directly or indirectly affecting ABB's performance, ABB shall be entitled to relief in the schedule of the performance or delivery of the directly or indirectly affected scope of work under the contract/purchase order. In such circumstances, the Parties shall meet without delay and discuss in good faith to find a mutually agreeable solution, with equitable adjustment to the contract/purchase order date of delivery or completion. Customer hereby acknowledges and agrees that in said circumstances ABB may not be able to comply with the originally agreed delivery or completion schedule and that ABB shall not be liable for any liquidated or actual damages in connection thereto."

Transportation cost clause

"The offer is based on [CPT (Carriage Paid To) Destination: Switchgear is loaded onto truck and shipped to named destination. Offer does not include offloading of switchgear. ABB Standard inland packing applies]. Due to current fluctuations in transportation cost, the transportation cost is given as a separate line item and is to be considered a non-binding estimate based on current market prices. At the time of delivery, ABB will use reasonable efforts to get optimum transport arrangements, and the actual cost will be invoiced by ABB to the Purchaser. In no case will ABB be liable for any increase in transportation cost at the time of delivery."

Price escalation clause

Prices are firm until [30 days] except they are subject to adjustment as follows: On the day the Purchase Order is received, the prices are subject to adjustment if the cost of labor, copper and/or steel has increased by more than 2% since the date of bid submission or last price adjustment based on local labor index from the country of manufacture, London Metal Exchange (www.lme.com) LME Copper rates for copper and CRU Group (<https://cruonline.crugroup.com>) for steel. In such case ABB reserves the right to adjust the price to include the respective increase.

Standard Price Adjustment Clause 7A

The prices stated herein are subject to adjustment to reflect changes in the Producer Price Index, PPI, and the date of release for manufacture. The adjustment hereunder shall be determined from Bureau of Labor Statistics data.

1. Definitions

For the purpose of this provision the following definitions apply:

- a. The "Switchgear and Switchboard Apparatus Manufacturer Index" (Series Id: pcu335313335313) as determined and published monthly by the Bureau of Labor Statistics of the U.S. Department of Labor

in "Producer Prices and Price Indexes" will be applied to all products.

b. The "Base Switchgear and Switchboard Apparatus Manufacturer Index" shall be the latest final Switchgear and Switchboard Apparatus Manufacturer Index that is published on the date 12/17/2025. An index is "published" when it appears in an issue of "Monthly Labor Review" or "Producer Prices and Price Indexes", as applicable, which can be obtained from the Washington office of the Bureau of Labor Statistics.

c. An index is "final" when it appears in the appropriate publication given in (c) above, without a superscript "p" which identifies it as preliminary.

2. Adjustment for Increased of Index Costs:

a. Each payment shall be adjusted for any change relevant Index. The adjustment shall be equal to the percent by which the latest final Index, which is published at the time of release, is greater than the Baseline Index (Outlined above in 1 b), subject to the following bounds.

MV SWGR

Escalation Bounds: (Based on Standard Lead Time release to manufacturing date/drawing approval date when a PO is received by Planned Order Date - TBD)

Approval occurs:

1. Planned Order Date through Required Drawing Approval Date; Fixed Price

2. Required Drawing approval date through 30 days after required drawing approval date; the greater of the following:

- 2% increase over base price or;
 - Adjustment as defined in (a) above
3. Greater than 30 days from required drawing approval date;
- Remaining unreleased material to be repriced at market value

3. General

a. The Base Switchgear and Switchboard Apparatus Manufacturer Index shall be determined to the nearest first decimal place. In either case, if the next succeeding place is five or more, the preceding decimal place shall be raised to the next highest figure.

b. Should the indexes specified in the above paragraphs be discontinued, or should the basis of their calculation be modified, the Company shall substitute equivalent indexes.

c. Above Price Adjustment clause does not negate the need for schedule adjustments. Any delay in drawing approval can impact delivery schedule.

Reference Links

Producer Price Index SWGR - https://data.bls.gov/timeseries/PCU335313335313?data_tool=XGtable

Base Switchgear and Switchboard Apparatus Manufacturer Index

Series Id: pcu335313335313

Tarif Price Adjustment

Seller shall have the right to adjust the Agreement Price in the event of a Change in Law affecting the cost of materials, labor, or other contributory costs that are put into effect after the Effective Date of this Agreement which are beyond the reasonable control of the Seller. Such Change in Law events shall include, but not limited to, a change in national tariffs, tax treaties, or trade agreements. In the event of a Change in Law, Seller shall be entitled to a Change Order, in accordance with the terms of this Agreement, with an equitable adjustment to the Agreement Price and/or the schedule for performance.

Hyperinflation

In the event of unusual and significant changes in the raw material costs of produced products, due to hyperinflationary circumstances not captured by the Switchgear and Switchboard Apparatus Manufacturer Index, the Power and Distribution Transformers Manufacturer Index, or the Comex CU Spot Price, the Seller may adjust the discount multipliers by a factor other than the index as described in 1A above.

Unusual Market Volatility

The Parties are aware of the challenges related to outbreaks, epidemics, government regulations and acts of governmental authorities (including sanctions), civil unrest, and general shortages of electronic components and elements, market volatility, availability and cost of raw materials, commodities, costs and capacities that may impact the normal business activity and the delivery dates and/or the execution of the scope, the impacts of which are currently unknown. Notwithstanding anything in the proposal to the contrary, if as a result of any of the above aforementioned events, the costs of ABB's performance

increase or ABB's performance obligations are materially adversely affected or delayed, the Parties in the spirit of cooperation, will work together in good faith and within a reasonable time after the invocation of this Clause, to negotiate alternative contractual terms in terms of equitable adjustments to delivery and/or possible reductions of the contractually owed quantity of the Goods to be delivered to the Buyer. The aforementioned shall be performed with a view to employing reasonable efforts to ensure that the PO can be at least fulfilled in part.

Delivery Schedule:

Contract drawings, information submittals, manufacturing, and shipment schedules will follow the outline below and are contingent on customer approval in the timeframe indicated:

Approval Drawings – Class I & II: 10 - 12 weeks after receipt of purchase order.

Customer drawing approval time: 2 weeks to keep order timeline on schedule.

Switchgear Ready for Shipment: 28 weeks after return of approved drawings and release to manufacture.

TOTAL Typical LEAD TIME: 40– 42 weeks** (with 2 weeks customer approval)

**Lead time shall be confirmed at the time of Order acknowledgement.

If the approval drawings and all necessary information are not returned approved and released for manufacture within the timeframe specified above, this project becomes subject to delay.

Timeline is based on current production and engineering and shop loading at time of order placement and is subject to change based on loading at the time of order receipt.

Date span from "release for manufacturing" to "shipment" is determined by the lead time on that date.

The scheduled delivery dates shall be presented in the order acknowledgement letter provided by the project manager. If the approval drawings are not returned within the time frame listed above, the time of delay shall be given by the project manager.

To expedite order acceptance, please provide the following information on your purchase order documents:

- Reference to ABB Quote number and date of submittal.
- List items numbers included in the quotation by copying the item list & pricing information.
- Reference to the agreed terms and conditions, delivery terms and payment terms (Net 30). If order amount is greater than \$500,000.00, please include the following milestone payments on the PO
 - o 20% upon delivery of drawings
 - o 30% upon release of equipment
 - o 50% upon shipment
- Freight terms (CPT), "Ship To" address and required delivery date.
- E-mail address for the transmittal of drawings, and file.
- Agreed warranty period (months/years).
- Taxable status – if Tax Exempt, please send certificate with PO documents.
- P. O. must include multiple line items as defined per the ABB offering.
- Requested delivery date.

***For MV SWITCHGEAR COMMENTS and / or CLARIFICATIONS to Customer's Specification (s) and/or Drawing (s) please refer to "CDE-R0_UAP-00000560_MVSWGR.pdf" document attached at Empower quote Tab "Attachments". ***

PROPRIETARY AND CONFIDENTIAL INFORMATION

This document contains confidential and proprietary information. By accepting this document, the recipient agrees not to disclose its contents except to individuals within their organization who are directly involved in evaluating this proposal. No copies may be made without prior written permission. Upon written request, this document must be returned.

Summarized Bill of Material(s)

Quantity	Description	Item(s)	Mark(s)
5	Medium Voltage Switchgear	1	15KV SWGR 'MDS15'
		2	PLENUM
		3	ACCESSORIES
		4	SPARE PARTS
		5	FREIGHT
4	Low Voltage Switchgear	10	MTM1
		11	MTM2 - OPEN
		12	MAIN 1
		13	MAIN 2
2	Secondary Substation Transformer	15	3500 KVA
16	Panelboard	16	MDP-NE
		17	LP-LH
		18	CP
		19	LR
		20	CP-1
		21	V-1 RH
		22	V-1
		23	V1A
		24	PP
		25	WELDER/PLASMA CUTTER
		26	N/E
		27	NE
		28	NE2
		29	RP
		30	HP
		31	DC
1	Transformer	32	T-RP
15	Switches and Disconnects	33	VFD DISCONNECT
		34	ELEVATOR CONTROL SW
		50	450A FUSIBLE DISC
		51	500A FUSIBLE DISC
6	Busway	52	650A FUSIBLE DISC
		35	BUS MTM1-T1
		36	BUS MTM1-T2
		37	BUS MTM1-MDS1
		38	BUS MTM1-MDS2
2	Bus Duct	39	BUS MTM2-T5
		40	BUS MTM2-T6
2	Bus Duct	41	4160V 2000A NSB RUN1
		42	4160V 2000A NSB RUN2
1	Switchboard	49	TEMP SWBD
1	Load Interrupter Switch	53	TEMP CHILLER DISC
2	5kV Drawout Breaker 2000A Close Couple to XFMR with PM8240 Meter	6	
2	5kV Drawout Breaker 2000A Close Couple to LIS7 with PM8240 Meter	7	
2	12.4kV Drawout Breaker 600A Close Couple to XFMR	8	

Quantity	Description	Item(s)	Mark(s)
1	Switchgear "MDS5" - (2) 2000 Drawout Main Breakers, (5) Fusible Branch Switches with Fuses- PM8214	9	
4	Battery System for LV Switchgear	14	BATTERY SYSTEM
1	Power Study - Base Study	43	
1	Power Study - Load Flow Study Adder	44	
1	Power Study - Harmonic Study Adder	45	
1	Startup Assistance - SWGR and SWBD's		
1	Temporary Equipment	47	
1	Temporary 4160V-480V 1500kva XFMR	48	

Total Net Price

The total net price for the item(s) defined in this quotation is:

\$8,995,964. Net Contractor Cost

Quote includes Temporary Chiller 5kV Disconnect, Temporary 4160V Transformer, Temporary Switchboard, or Temporary Chiller Disconnects.

This version includes "MTM1" as LV Switchgear (BB#2, 3, & 4)

Note: They want BB#1 to have MTM1 as a SWBD. (I'm sure they expect the SWBD to be cheaper than the LV SWGR... it is not)

ADDER to Provide "MTM1" as Switchboard \$ 17,850

Includes Power Studies by third party (Not ABB as spec'd)

Does NOT include Arc Flash Training

Includes estimated line items for Substation T3 & T4 Primary and Secondary MV Breakers (Metal-Clad)(I have sent RFQ to Advance SWGR to quote these)

Includes MDS5 with Metal Clad Main Breakers, and Metal Enclosed LIS fused branches with PM8240 on each branch

This includes MV Busway (Contractor to verify lengths)

This includes LV Busway (Contractor to verify lengths).

Does not include VFD's, UPS's, PMCS System, Programming of PM8000's to communicate with PMCS, Loose PM8000's for other existing equipment, SPD for DC Panel (Not offered).

See the attached Marked Up One-Lines for your customer to review Green Items included in proposal, and Red items not included.

Summary of Proposal

Estimated Lead Time

The lead times contained in this proposal are for estimating purposes only and do not include approval drawing cycle, factory holidays/shutdowns, witness testing, or transit time. Lead-times are subject to change and may require staggered shipments beyond stated lead times. Please contact ABB if firm or alternate lead times are required.

Item No.	Product Description	Mark(s)	Estimated Lead Time (Weeks)	Quantity
1	Medium Voltage Switchgear, SafeGear, T2B/15kV/50kA/1200A (A01)	15KV SWGR 'MDS15'	42	1
2	Medium Voltage Switchgear, Plenum, (A02)	PLENUM	42	1
3	Medium Voltage Switchgear, Accessories, (A03)	ACCESSORIES	42	1
4	Medium Voltage Switchgear, Spare Parts, (A04)	SPARE PARTS	42	1
5	Medium Voltage Switchgear, Freight, (A05)	FREIGHT	42	1
6	5kV Drawout Breaker 2000A Close Couple to XFMR with PM8240 Meter		CONTACT ABB SALES	2
7	5kV Drawout Breaker 2000A Close Couple to LIS with PM8240 Meter		CONTACT ABB SALES	2
8	12.4kV Drawout Breaker 600A Close Couple to XFMR		CONTACT ABB SALES	2
9	Switchgear "MDS5" - (2) 2000 Drawout Main Breakers, (5) Fusible Branch Switches with Fuses- PM8214		CONTACT ABB SALES	1
10	Low Voltage Switchgear, Reliagear	MTM1	CONTACT ABB SALES	1
11	Low Voltage Switchgear, Reliagear	MTM2 - OPEN	CONTACT ABB SALES	1
12	Low Voltage Switchgear, Reliagear	MAIN 1	CONTACT ABB SALES	1
13	Low Voltage Switchgear, Reliagear	MAIN 2	CONTACT ABB SALES	1
14	Battery System for LV Switchgear	BATTERY SYSTEM	CONTACT ABB SALES	4
15	SEPS Secondary Substation Transformer, Vent Dry	3500 KVA	CONTACT ABB SALES	2
16	Power Panelboard, ReliaGear neXT	MDP-NE	8	1
17	Lighting Panelboard, ReliaGear RQ	LP-LH	8	1
18	Lighting Panelboard, ReliaGear RQ	CP	8	1
19	Lighting Panelboard, ReliaGear RQ	LR	8	1
20	Lighting Panelboard, ReliaGear RQ	CP-1	8	1
21	Lighting Panelboard, ReliaGear RS	V-1 RH	16	1
22	Lighting Panelboard, ReliaGear RS	V-1	16	1
23	Lighting Panelboard, ReliaGear RS	V1A	16	1
24	Lighting Panelboard, ReliaGear RS	PP	16	1
25	Lighting Panelboard, ReliaGear RS	WELDER/PLASMA CUTTER	16	1
26	Lighting Panelboard, ReliaGear RQ	N/E	8	1
27	Lighting Panelboard, ReliaGear RS	NE	16	1
28	Lighting Panelboard, ReliaGear RS	NE2	16	1
29	Lighting Panelboard, ReliaGear RQ	RP	8	1
30	Lighting Panelboard, ReliaGear RS	HP	16	1
31	Lighting Panelboard, ReliaGear RE	DC	6	1
32	Transformer, Copper, 9T10C1002G32	T-RP	6	1
33	Switches and Disconnects, Heavy Duty Safety Switch, THN3366A1	VFD DISCONNECT	CHECK AVAILABILITY	3
34	Switches and Disconnects, Elevator Disconnect, ES6T48R1KGN1A	ELEVATOR CONTROL SW	8	1
35	Busway, ReliaGear Series Busway	BUS MTM1-T1	28	1
36	Busway, ReliaGear Series Busway	BUS MTM1-T2	28	1
37	Busway, ReliaGear Series Busway	BUS MTM1-MDS1	28	1
38	Busway, ReliaGear Series Busway	BUS MTM1-MDS2	28	1
39	Busway, ReliaGear Series Busway	BUS MTM2-T5	28	1
40	Busway, ReliaGear Series Busway	BUS MTM2-T6	28	1
41	SEPS Bus Duct	4160V 2000A NSB RUN1	CONTACT ABB SALES	1
42	SEPS Bus Duct	4160V 2000A NSB RUN2	CONTACT ABB SALES	1
43	Power Study - Base Study		CONTACT ABB SALES	1
44	Power Study - Load Flow Study Adder		CONTACT ABB SALES	1

Item No.	Product Description	Mark(s)	Estimated Lead Time (Weeks)	Quantity
45	Power Study - Harmonic Study Adder		CONTACT ABB SALES	1
46	Startup Assistance - SWGR and SWBD's		CONTACT ABB SALES	1
47	Temporary Equipment		CONTACT ABB SALES	1
48	Temporary 4160V-480V 1500kva XFMR		CONTACT ABB SALES	1
49	Switchboard, ReliaGear Configured, RG-GM-CBSB-CTO	TEMP SWBD	16	1
50	Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR	450A FUSIBLE DISC	CHECK AVAILABILITY	3
51	Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR	500A FUSIBLE DISC	CHECK AVAILABILITY	5
52	Switches and Disconnects, Heavy Duty Safety Switch, TC72367R	650A FUSIBLE DISC	CHECK AVAILABILITY	3
53	Load Interrupter Switch, VersaRupter	TEMP CHILLER DISC	33	1

Bill of Material(s)

Item No.	Quantity	Description
1	1	Medium Voltage Switchgear, SafeGear, T2B/15kV/50kA/1200A (A01) Marks: 15KV SWGR 'MDS15' SafeGear® Arc-Resistant Metal-Clad Switchgear A/R-Rating Type 2B, 10-cycle arc duration per IEEE C37.20.7 Enclosure: Indoor, ANSI # 61 Light Gray enamel Bus System: 15 kV Max Rated Voltage, 60 Hz System Voltage - 13.80 kV Rated Main Bus Current - 1200 A Short-CircuitCurrent-50 kA 1 System, 3-phase, 3-wire Delta System Switchgear shall be designed and manufactured in accordance with the standards of ANSI / IEEE Dimensions and Weight (Estimated) Height: 95 Inches; Width : 252 Inches; Depth: 85 Inches Weight: 18711 lbs. Bus Insulation: Main Bus Support: Molded Epoxy Primary Bushings: Molded Epoxy Standoff Insulators: Molded Epoxy Bus Material is 98% Copper with silver-plated joints Bus Insulation is fluidized bed baked-on epoxy with vinyl boots over joints Ground Bus, ¼ in x 2 in, solid copper, tin plated, continuous throughout lineup and extended to the rear of the frame Wiring: AC Control Bus is 40 A, 1-ph, 3-wire circuit with #8 AWG connected to power terminal blocks DC Control Bus is 40 A, 2-wire circuit with #8 AWG connected to power terminal blocks Breaker Charging Motor Voltage 125 V dc Breaker Closing Voltage 125 V dc Breaker Opening Voltage 125 V dc All control wire is #14 AWG minimum, multi-stranded extra-flexible, SIS 600 V flame retardant wire gray color for control, green color for ground All CT circuits will be #10 AWG, multi-stranded extra-flexible, SIS 600 V flame retardant, gray wire UL-rated, 600 V, 30 A, 35 mm DIN-rail mount barrier type terminal block For control circuits a maximum of two wires per terminal point 20% additional terminal blocks per frame Ring-tongue, Vinyl pre-insulated Slip-on destination type wire markers, white with black letters Pre-wired harness to terminal block from the following devices: Breaker control secondary, 52TOC switch, CT's & PT's 2 EnRack Plus Pendant Controller, 120/240VAC 2 Cat 5E/6E Ethernet Cable, 50ft, used to connect pendant to cable port on LV door. RJ45 connectors at both ends Additional Features: Circuit breakers will be shipped in bottom breaker compartments. Circuit breakers belonging to top breaker compartments will be shipped separately 1 Breaker Control Transfer Scheme, 3-breaker, close-transition (25 / 27 / 47 / 59) 1 O&M Manuals, via electronic media on compact disc 2 Level 2 - Factory Witness Test (FWT), 3-people for # of days A01 : Frame Sequence 1 (1200A FDRS) 1200A Feeder Breaker - LV Instrument Panel (19") - 1200A Feeder Breaker Breaker A/B: 1 CT Sec Wire Harness, multi ratio, set of (3) 3 CT / PT Production Test Reports 1 CT Sec Wire Harness, multi ratio, set of (3)

Bill of Material(s)

3	CT / PT Production Test Reports
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"A"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Breaker D/E:
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched

Bill of Material(s)

- 1 Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
- 1 EnRack Controller Module, Basic or Plus, 120VAC
- 1 EnRack Plus Relay Module, 120/240VAC
- 1 Racking Motor Overcurrent Relay
- 1 Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
- 1 RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
- 1 Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
- 1 Cable Harness, D-sub connector on top breaker to terminal blocks
- 1 Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
- 1 E90 Class CCFH 2P, 30A, 600V
- 1 Time Delay, 5A, 250V, Type ATDR

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, 2-high, 1.2 kAF Main or Feeder - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R End Panel Assembly - standard depth
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 2 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, End Frame - 1200 A
- 1 Cable Support Assembly
- 1 Cable Support Assembly
- 1 Cable Lug Boot, 3-ph, 1200 A
- 1 Cable Lug Boot, 3-ph, 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V
- 1 Ground Cable Lugs, compression type, #4/0 AWG
- 1 Cable Lugs, compression type, 2-hole, set of (3), up to #4/0 AWG
- 1 Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 19 in high, with MPL Door
- 3 Door Stop Assembly
- 1 DC Control Bus, 40 A 2-wire
- 1 AC Control Bus, 40 A 1ph 3-wire
- 1 DC Control Bus, MCCB, 40 A 250 V dc 2-pole, UL
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 1 Molded Case Circuit Breaker, 40 A 22 kA 480 V 3-pole, UL
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL
- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 2 Indicating Lamp LED
- 2 Indicating Lamp LED
- 4 Test Switch, ABB FT-1, 10-pole
- 2 PM8244 Intermediate Power Meter, DIN rail mount + remote display
- 2 (PM8) Digital I/O Module - 6 digital inputs, 2 relay outputs
 - # Note: All Devices for this frame that cannot be fit in the 19" Instrument
- 1 Compartment Door will be mounted on the adjacent 38" or 57" Instrument Compartment Door.
- 2 # P/N: 751001A1A0X0X85B200 (751#MHJB); SEL-751 Feeder Protection Relay

A01 : Frame Sequence 2 (MAIN 1)

LV Instrument Panel (57") - 1200A Main Breaker

Breaker D/E:

- 1 CT Sec Wire Harness, multi ratio, set of (3)

Bill of Material(s)

3	CT / PT Production Test Reports
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Surge Arrester Mounting Assembly, Dist / Intmed Class
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
1	Surge Arrester, Distribution Class, ABB POLIM-D, 18kV, 15.3kV MCOV (set of 3)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for
1	2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector,
1	Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45
1	connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC
1	and 90-300 VDC, Output 24 VDC / 10 A
1	Selector Switch 2-position, Type M2SS1-10B, 2 Position, Maintained, operator only
1	(needs holder & contact block)
1	Contact Block with Holder For Pilot Device, 1 NO & 1 NC, Type MCBH-11, Front
1	Mounting
1	Contact Block For Pilot Device, 1NC, Type MCB-01 (Without Holder)
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Frames:
1	Shipping Base Assembly - Indoor, set per cubicle
1	A/R type 2 Base Frame, 1-high, 1.2 kAF Main or Feeder - std depth
1	Main Bus, 1200 A, 50 kA, 3-phase, polyester support
1	A/R Rear Panels, Split Bolted with handles
1	A/R type 2B Construction, per frame
1	Front Door Adder - SmartRack Assembly (Electric Racking)
1	A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
1	Cable Support Assembly
1	Cable Lug Boot, 3-ph, 1200 A
1	Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
1	Strip Heater Circuit, Total 300 W applied at 1/2 V
2	Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM
	LV Instrument:
1	A/R type 2 Instrument Compartment - 57 in high, with MPL Door
2	Door Stop Assembly
1	DC Control Bus, 40 A 2-wire

Bill of Material(s)

- 1 AC Control Bus, 40 A 1ph 3-wire
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL
- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 2 Indicating Lamp LED
- 3 Test Switch, ABB FT-1, 10-pole
- 1 ION9200, Power Quality Meter, DIN mount, 7.56"-display, B2B adapter, HW kit
- 1 (9200) Remote Display, color touchscreen, 7.56" x 7.56" window
- 1 (9200) I/O Module, 2 relay outputs, 6 digital inputs
- 1 (86) Lockout Relay, ES - LOR, manual-reset, 2-deck (4)NO, (4)NC
- 1 # P/N: 751401ACACA7085A200 (751#F6C7); SEL-751 Feeder Protection Relay
- 1 # P/N: 2730M0ARAX1111CCCCX0 (2730M#28CN); Managed 24-Port Ethernet
- 1 Switch
- 1 # Lot of CAT6 Ethernet Cable and connectors for Relay and Ethernet Switch
- 1 (internal wiring)
- 1 # Senseor Power Supply
- 1 # Senseor HMI with mounting kit

.
A01 : Frame Sequence 3 (LPTs; BPTs)

Line PT - LV Instrument Panel (19") - Bus PT

PT A/B:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

PT D/E:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, Auxiliary, Tie Transition - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 2 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 19 in high, with MPL Door
 - 3 Door Stop Assembly
 - 1 DC Control Bus, 40 A 2-wire
 - 1 AC Control Bus, 40 A 1ph 3-wire
 - 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
 - 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
 - 1 20% Spare Terminal Blocks
 - 1 Wired to Terminal Block, unused relay contacts
 - 1 Wire Markers - SPECIAL
- .

Bill of Material(s)

A01 : Frame Sequence 4 (TIE)

LV Instrument Panel (57") - 1200A Tie Breaker

Breaker D/E:

- 1 CT Sec Wire Harness, single ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, single ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, multi ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 (C) Motorized truck 125VDC with protection
- 1 # 10 AWG, CT Secondary Wiring
- 1 ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
- 1 Breaker Interrupting Time = 3 cycle
- 1 Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
- 1 Breaker Auxiliary Switch, 16-pole (9a, 7b)
- 3 Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
- 3 Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
- 1 Circuit Breaker Production Test Reports
- 1 A/R type 2 Breaker Compartment, Pos "B" - 1200A (40&50kA) Epoxy
- 1 Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
- 1 (52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
- 3 Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
- 1 Padlock Provisions - Hinged Panel
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
- 1 Breaker Door Interlock with Defeat-Reset Features
- 1 Interlock, door with breaker in disconnect position, defeatable
- 1 Interlock, prevent breaker racking unless door is closed and latched
- 1 EnRack Controller Module, Basic or Plus, 120VAC
- 1 Tie and Transition Phase Bus Assembly, 1200 A
- 1 EnRack Plus Relay Module, 120/240VAC
- 1 Racking Motor Overcurrent Relay
- 1 Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
- 1 RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
- 1 Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
- 1 Cable Harness, D-sub connector on top breaker to terminal blocks
- 1 Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
- 1 E90 Class CCFH 2P, 30A, 600V
- 1 Time Delay, 5A, 250V, Type ATDR

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, 1-high, 1.2 kAF Tie Breaker - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 1 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 57 in high, with MPL Door
- 2 Door Stop Assembly
- 1 DC Control Bus, 40 A 2-wire
- 1 AC Control Bus, 40 A 1ph 3-wire
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL

Bill of Material(s)

- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 2 Indicating Lamp LED
- 3 Test Switch, ABB FT-1, 10-pole
- 2 (86) Lockout Relay, ES - LOR, manual-reset, 10-deck (20)NO, (20)NC
- 1 (86) Lockout Relay, ES - LOR, manual-reset, 2-deck (4)NO, (4)NC
- 1 # P/N: 751401AA0CA7085A200 (751#8MHJ); SEL-751 Feeder Protection Relay
- 1 # SEL M-T-M Quickset Design Template Parametrization
- 2 # P/N: 0587Z0X635312XX (587Z#F93X); SEL-587Z High-Impedance Differential Relay

.

A01 : Frame Sequence 5 (LPTs; BPTs)

Line PT - LV Instrument Panel (19") - Bus PT

PT A/B:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

PT D/E:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, Auxiliary - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 2 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 19 in high, with MPL Door
- 3 Door Stop Assembly
- 1 DC Control Bus, 40 A 2-wire
- 1 AC Control Bus, 40 A 1ph 3-wire
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL

.

A01 : Frame Sequence 6 (MAIN 2)

LV Instrument Panel (57") - 1200A Main Breaker

Breaker D/E:

- 1 CT Sec Wire Harness, multi ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, single ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, multi ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 (C) Motorized truck 125VDC with protection
- 1 # 10 AWG, CT Secondary Wiring
- 1 ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA

Bill of Material(s)

1	Surge Arrester Mounting Assembly, Dist / Intmed Class
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
1	Surge Arrester, Distribution Class, ABB POLIM-D, 18kV, 15.3kV MCOV (set of 3)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
1	Selector Switch 2-position, Type M2SS1-10B, 2 Position, Maintained, operator only (needs holder & contact block)
1	Contact Block with Holder For Pilot Device, 1 NO & 1 NC, Type MCBH-11, Front Mounting
1	Contact Block For Pilot Device, 1NC, Type MCB-01 (Without Holder)
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Frames:
1	Shipping Base Assembly - Indoor, set per cubicle
1	A/R type 2 Base Frame, 1-high, 1.2 kAF Main or Feeder - std depth
1	Main Bus, 1200 A, 50 kA, 3-phase, polyester support
1	A/R Rear Panels, Split Bolted with handles
1	A/R type 2B Construction, per frame
1	Front Door Adder - SmartRack Assembly (Electric Racking)
1	A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
1	Cable Support Assembly
1	Cable Lug Boot, 3-ph, 1200 A
1	Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
1	Strip Heater Circuit, Total 300 W applied at 1/2 V
2	Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM
	LV Instrument:
1	A/R type 2 Instrument Compartment - 57 in high, with MPL Door
2	Door Stop Assembly
1	DC Control Bus, 40 A 2-wire
1	AC Control Bus, 40 A 1ph 3-wire
2	Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
1	Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
1	Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
1	20% Spare Terminal Blocks
1	Wired to Terminal Block, unused relay contacts
1	Wire Markers - SPECIAL
1	Breaker Control Switch, pistol, (1)C & (1)T

Bill of Material(s)

2	Indicating Lamp LED
3	Test Switch, ABB FT-1, 10-pole
1	ION9200, Power Quality Meter, DIN mount, 7.56"-display, B2B adapter, HW kit
1	(9200) Remote Display, color touchscreen, 7.56" x 7.56" window
1	(9200) I/O Module, 2 relay outputs, 6 digital inputs
1	(86) Lockout Relay, ES - LOR, manual-reset, 2-deck (4)NO, (4)NC
1	# P/N: 751401ACACA7085A200 (751#F6C7); SEL-751 Feeder Protection Relay
1	# P/N: 2730M0ARAX1111CCCCX0 (2730M#28CN); Managed 24-Port Ethernet
1	Switch
1	# Lot of CAT6 Ethernet Cable and connectors for Relay and Ethernet Switch
1	(internal wiring)
1	# Sensor HMI with mounting kit
	.
	A01 : Frame Sequence 7 (1200A FDRS)
	1200A Feeder Breaker - LV Instrument Panel (19") - 1200A Feeder Breaker
	Breaker A/B:
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"A"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for
1	2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector,
1	Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45
1	connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC
1	and 90-300 VDC, Output 24 VDC / 10 A
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Breaker D/E:
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports

Bill of Material(s)

1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for
1	2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector,
1	Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45
1	connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC
1	and 90-300 VDC, Output 24 VDC / 10 A
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Frames:
1	Shipping Base Assembly - Indoor, set per cubicle
1	A/R type 2 Base Frame, 2-high, 1.2 kAF Main or Feeder - std depth
1	A/R End Panel Assembly - standard depth
1	A/R Rear Panels, Split Bolted with handles
1	A/R type 2B Construction, per frame
2	Front Door Adder - SmartRack Assembly (Electric Racking)
1	A/R External Plenum Assembly, 36 in W, End Frame - 1200 A
1	Cable Support Assembly
1	Cable Support Assembly
1	Cable Lug Boot, 3-ph, 1200 A
1	Cable Lug Boot, 3-ph, 1200 A
1	Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
1	Strip Heater Circuit, Total 300 W applied at 1/2 V
1	Ground Cable Lugs, compression type, #4/0 AWG
1	Cable Lugs, compression type, 2-hole, set of (3), up to #4/0 AWG
1	Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM
	LV Instrument:
1	A/R type 2 Instrument Compartment - 19 in high, with MPL Door
3	Door Stop Assembly
1	DC Control Bus, 40 A 2-wire
1	AC Control Bus, 40 A 1ph 3-wire
2	Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
2	Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
1	Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
1	Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
1	20% Spare Terminal Blocks
1	Wired to Terminal Block, unused relay contacts
1	Wire Markers - SPECIAL

Bill of Material(s)		
	1	Breaker Control Switch, pistol, (1)C & (1)T
	1	Breaker Control Switch, pistol, (1)C & (1)T
	2	Indicating Lamp LED
	2	Indicating Lamp LED
	4	Test Switch, ABB FT-1, 10-pole
	2	PM8244 Intermediate Power Meter, DIN rail mount + remote display
	2	(PM8) Digital I/O Module - 6 digital inputs, 2 relay outputs
		# Note: All Devices for this frame that cannot be fit in the 19" Instrument
	1	Compartment Door will be mounted on the adjacent 38" or 57" Instrument
		Compartment Door.
	2	# P/N: 751001A1A0X0X85B200 (751#MHJB); SEL-751 Feeder Protection Relay
2	1	Medium Voltage Switchgear, Plenum, (A02)
		Marks: PLENUM
	6	A/R External Plenum Assembly, Straight Run, per foot
	1	A/R External Plenum Assembly, Wall Duct
3	1	Medium Voltage Switchgear, Accessories, (A03)
		Marks: ACCESSORIES
	1	Advac Breaker Accessory Kit
	1	CB Test Jumper, dual plug
	1	CB Test Station, dual plug, single trip, wall mounted (Advac, Amvac)
	1	Electric Racking Device, ABB SmartRack, 120V AC w/ 25ft cord
	1	Breaker Lift Truck - hydraulic operated (AD/SFG bolted or turn handle doors)
4	1	Medium Voltage Switchgear, Spare Parts, (A04)
		Marks: SPARE PARTS
	1	Lubricant, NO-OX-ID (1-pint can)
	3	Touch-Up Paint, 12 oz can, ANSI # 61 or ANSI # 70
	1	Test Plug, ABB type FT-1, current circuits
	1	Test Plug, ABB type FT-1, potential circuits
	12	Spare Indicating Lamp Assy w/ LED Bulb & color cap
	12	Spare Lamp Bulb, LED
	1	Spare Fuses, Breaker Control, 250V DC (box of 10)
	1	Spare PT Secondary Fuse, 250V AC (box of 10)
	6	Spare PT Primary Fuse, CLE-PT 8.25kV or 15kV
5	1	Medium Voltage Switchgear, Freight, (A05)
		Marks: FREIGHT
	1	INCO-Terms: CPT (Carriage Paid To) Destination: Switchgear is loaded onto truck and shipped to named destination. The offer does not include offloading of switchgear. Term: Carriage Paid To Place of Destination: Harrisburg, PA
6	2	5kV Drawout Breaker 2000A Close Couple to XFMR with PM8240 Meter
7	2	5kV Drawout Breaker 2000A Close Couple to LIS with PM8240 Meter
8	2	12.4kV Drawout Breaker 600A Close Couple to XFMR
9	1	Switchgear "MDS5" - (2) 2000 Drawout Main Breakers, (5) Fusible Branch Switches with Fuses- PM8214
10	1	Low Voltage Switchgear, Reliagear
		Marks: MTM1

Bill of Material(s)

5 Section(s), NEMA 1 Enclosure
3200 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 65 kA
Breaker Min Withstand Rating: 65 kA
Bus Bracing Rating: 65 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 152 in, Depth: 64.33 in, Weight: 13375 lbs

Main Breaker 1

2 E4.2S-A 3200 Ekip Hi-Touch LSIG
2 AUX 4Q 400 V E2.2...E6.2
2 YC E1.2..E6.2 110-120 V AC/DC
2 M E2.2...E6.2 100-130 V AC/DC
2 YO E1.2..E6.2 110-120 V AC/DC
2 UVR E1.2..E6.2 110-120 V AC/DC
2 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
2 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
2 Disabling Bluetooth
2 PLP Position padlock D=4/6/8mmE2.2..E6.2
2 None - Push Button Locking Options
2 MOC E2.2..E6.2
2 Breaker Compartment
2 Ekip Com Modbus RS-485 E1.2..E6.2
2 RELT
2 E4.2-A W Cradle UL
2 AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
2 RELT Switch

Tie Breaker 2

1 E4.2S-A 3200 Ekip Hi-Touch LSIG
1 AUX 4Q 400 V E2.2...E6.2
1 YC E1.2..E6.2 110-120 V AC/DC
1 M E2.2...E6.2 100-130 V AC/DC
1 YO E1.2..E6.2 110-120 V AC/DC
1 UVR E1.2..E6.2 110-120 V AC/DC
1 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1 Disabling Bluetooth
1 PLP Position padlock D=4/6/8mmE2.2..E6.2
1 None - Push Button Locking Options
1 MOC E2.2..E6.2
1 Breaker Compartment
1 Ekip Com Modbus RS-485 E1.2..E6.2
1 RELT
1 E4.2-A W Cradle UL
1 AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
1 RELT Switch

Feed Breaker 3

2 E4.2S-A 3200 Ekip Hi-Touch LSIG
2 AUX 4Q 400 V E2.2...E6.2
2 YC E1.2..E6.2 110-120 V AC/DC
2 M E2.2...E6.2 100-130 V AC/DC
2 YO E1.2..E6.2 110-120 V AC/DC
2 UVR E1.2..E6.2 110-120 V AC/DC
2 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
2 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
2 Disabling Bluetooth
2 PLP Position padlock D=4/6/8mmE2.2..E6.2
2 None - Push Button Locking Options
2 MOC E2.2..E6.2

Bill of Material(s)

2	Breaker Compartment
2	Ekip Com Modbus RS-485 E1.2..E6.2
2	RELT
2	E4.2-A W Cradle UL
2	None - AUP
2	RELT Switch
	Item Options
10	Wire Tags, Origin and/or Destination
3	Special #16 AWG SIS Control Wire
5	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
5	Shutters (3200A)
5	Bus Plating
5	Cable Supports
5	Rear Door Full Height, Bolted without Key
5	Rear Padlocking
2	Side Barrier Between Sections
5	Rail Padlock
1	UL Service Entrance Label/IL Isolation
1	Pull Box
5	Nameplate -
1	PRINT HOLDER
	Lineup
5	100% Neutral 30 in Stack
1	30 in 1-High Tie Breaker Stack
5	30 in Ground Bus 800A CU
5	Auxiliary Compartment (30 in W x 21 in H)
5	Auxiliary Compartment (30 in W x 42 in H)
5	Bus Construction -Bus Isolation/Insulation
1	GE Busway 30 in Aux Stack
1	GE Busway 30 in Aux Stack
1	GE Busway 30 in Aux Stack
1	GE Busway 30 in Aux Stack
1	Shipping Split
2	SPECTRA Riser 3200A-4W (F)
2	SPECTRA Riser 3200A-4W (R)
	Devices
1	10-Trip Selector Switch 4 POS
1	110V Remote Racker
12	288/120 Singe Phase PT
1	43-Auto/Manual Switch
2	ABB FT-1 Test Plug
6	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
3	Breaker Control Switch ATO
1	Breaker Lifting Spreader E2.2-E4.2
1	Breaker Portable Lift Truck
2	CPT 5KVA
1	CPT T/O Contactor
1	CPT T/O UV Relay
3	CT-3200/5A
12	CT-3200/5A
2	E4.2/E6.2 Neutral Sensor 1% Main/Tie
1	Ekip Programming Kit
1	Emax 2 racking handle E2.2-E6.2
4	Emax 2 Racking Plate
20	Fuse Block - 30A
2	Fuse Block-2P 30A
4	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
2	GE SPD TPHE277Y20SG w/Disc
11	IL-P9 LED (Std)

Bill of Material(s)

4 Infrared Viewport
1 Lifting Plate
1 MOXA-Serial to Ethernet
5 Pilot Light - Green
5 Pilot Light - Red
9 Relay- Aux-Light Duty 4NO
5 RELT Switch-Lighted
2 Schweitzer SEL-751 Relay
4 SCTB-4 pole
3 SP - PM 8214 Meter
1 SP - PM 8214 Meter
1 Spare Fuse Set-Control
1 Spare Fuse Set-Primary
1 Spare Fuse Set-Secondary
1 Spare IL-LED set
1 Spare Paint
2 THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil
1 Three Bkr Transfer (Relay)

11 1 Low Voltage Switchgear, Reliagear
Marks: MTM2 - OPEN

5 Section(s), NEMA 1 Enclosure
5000 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 100 kA
Breaker Min Withstand Rating: 85 kA
Bus Bracing Rating: 100 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 160 in, Depth: 71.33 in, Weight: 15344 lbs

Main Breaker 1

2 E6.2V-A 5000 Ekip Hi-Touch LSIG
2 AUX 4Q 400 V E2.2...E6.2
2 YC E1.2..E6.2 110-120 V AC/DC
2 M E2.2...E6.2 100-130 V AC/DC
2 YO E1.2..E6.2 110-120 V AC/DC
2 UVR E1.2..E6.2 110-120 V AC/DC
2 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
2 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
2 Disabling Bluetooth
2 PLP Position padlock D=4/6/8mmE2.2..E6.2
2 None - Push Button Locking Options
2 MOC E2.2..E6.2
2 Breaker Compartment
2 Ekip Com Modbus RS-485 E1.2..E6.2
2 RELT
2 E6.2-A W Cradle UL
2 AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
2 RELT Switch

Tie Breaker 2

1 E6.2V-A 5000 Ekip Hi-Touch LSIG
1 AUX 4Q 400 V E2.2...E6.2
1 YC E1.2..E6.2 110-120 V AC/DC
1 M E2.2...E6.2 100-130 V AC/DC
1 YO E1.2..E6.2 110-120 V AC/DC
1 UVR E1.2..E6.2 110-120 V AC/DC
1 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1 Disabling Bluetooth
1 PLP Position padlock D=4/6/8mmE2.2..E6.2

Bill of Material(s)

1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E6.2-A W Cradle UL
1	AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
1	RELT Switch
	Feed Breaker 3
4	E2.2V-A 1600 Ekip Hi-Touch LSIG
4	AUX 4Q 400 V E2.2...E6.2
4	YC E1.2..E6.2 110-120 V AC/DC
4	M E2.2...E6.2 100-130 V AC/DC
4	YO E1.2..E6.2 110-120 V AC/DC
4	UVR E1.2..E6.2 110-120 V AC/DC
4	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
4	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
4	Disabling Bluetooth
4	PLP Position padlock D=4/6/8mmE2.2..E6.2
4	None - Push Button Locking Options
4	MOC E2.2..E6.2
4	Breaker Compartment
4	Ekip Com Modbus RS-485 E1.2..E6.2
4	RELT
4	E2.2-A W Cradle UL
4	None - AUP
4	RELT Switch
	Feed Breaker 4
1	E2.2V-A 1600 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	YC E1.2..E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2..E6.2 110-120 V AC/DC
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E2.2-A W Cradle UL
1	None - AUP
1	RELT Switch
	Feed Breaker 5
1	E2.2V-A 800 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	YC E1.2..E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2..E6.2 110-120 V AC/DC
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E2.2-A W Cradle UL

Bill of Material(s)

1	None - AUP
1	RELT Switch
	Item Options
11	Wire Tags, Origin and/or Destination
9	Special #16 AWG SIS Control Wire
9	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
1	Shutters (800A)
5	Shutters (1600A)
3	Shutters (5000A)
5	Bus Plating
5	Cable Supports
5	Rear Door Full Height, Bolted without Key
5	Rear Padlocking
4	Side Barrier Between Sections
9	Rail Padlock
1	UL Service Entrance Label/IL Isolation
3	Pull Box
5	Nameplate -
	Lineup
2	100% Neutral 22 in Stack
3	100% Neutral 38 in Stack
1	22 in 3-High Feeder Stack
1	22 in 3-High Feeder Stack
2	22 in Ground Bus 800A CU
1	38 in 1-High Tie Breaker Stack
3	38 in Ground Bus 800A CU
2	45 in Cable Compartment (22 in Stks)
3	45 in Cable Compartment (38 in Stks)
2	Auxiliary Compartment (22 in W x 21 in H)
3	Auxiliary Compartment (38 in W x 14 in H)
3	Auxiliary Compartment (38 in W x 42 in H)
3	Auxiliary Compartment (38 in W x 7 in H)
5	Bus Bracing 100,000 Amps
5	Bus Construction -Bus Isolation/Insulation
1	GE Busway 38 in Aux Stack
1	GE Busway 38 in Aux Stack
2	Shipping Split
1	SPECTRA Riser 5000A-4W (F)
1	SPECTRA Riser 5000A-4W (R)
	Devices
1	110V Remote Racker
1	25-Sync Check Relay, Basler BE1
2	27 UV Relay, Basler (ES)
12	288/120 Singe Phase PT
1	43-Auto/Manual Switch
2	47-PHASE BALANCE RELAY (ES)
3	5000A Fan Package
2	ABB FT-1 Test Plug
6	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
3	Breaker Control Switch ATO
1	Breaker Lifting Spreader E2.2-E4.2
1	Breaker Lifting Spreader E6.2
1	Breaker Portable Lift Truck
2	CPT 5KVA
1	CPT T/O Contactor
1	CPT T/O UV Relay
15	CT-1600/5A
12	CT-5000/5A
3	CT-5000/5A
3	CT-800/5A

Bill of Material(s)

6	E2.2 Neutral Sensor 1% Feeder
1	Ekip Programming Kit
2	Emax 2 racking handle E2.2-E6.2
4	Emax 2 Racking Plate
36	Fuse Block - 30A
2	Fuse Block-2P 30A
4	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
11	IL-P9 LED (Std)
8	Infrared Viewport
2	Lifting Plate
1	MOXA-Serial to Ethernet
9	Pilot Light - Green
9	Pilot Light - Red
9	Relay- Aux-Light Duty 4NO
9	RELT Switch-Lighted
2	Schweitzer SEL-751 Relay
10	SCTB-4 pole
8	SP - PM 8214 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
2	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil
44	THOMAS&BETTS CRIMP TERM FOR CU Cable 500kcmil
1	Three Bkr Transfer (Relay)
2	Timer-TDDO, Agastat
2	Timer-TDPU, Agastat

12 1 Low Voltage Switchgear, Reliagear Marks: MAIN 1

3 Section(s), NEMA 1 Enclosure
5000 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 100 kA
Breaker Min Withstand Rating: 85 kA
Bus Bracing Rating: 100 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 83 in, Depth: 71.33 in, Weight: 6898 lbs

Main Breaker 1

1	E6.2V-A 5000 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2..E6.2
1	None - Closing Coil (YC) and Redundant Closing Coil (YC2)
1	None - Spring Charging Motor (M) and Ekip Com Actuator
1	None - Opening Coil (YO)
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply 110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and Disabling Bluetooth
1	PLP Position padlock D=4/6/8mm E2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E6.2-A W Cradle UL
1	None - AUP
1	RELT Switch

Bill of Material(s)

Feed Breaker 2

1	E2.2V-A 800 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2..E6.2
1	YC E1.2..E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2..E6.2 110-120 V AC/DC
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E2.2-A W Cradle UL
1	None - AUP
1	RELT Switch

Item Options

7	Wire Tags, Origin and/or Destination
2	Special #16 AWG SIS Control Wire
2	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
1	Shutters (5000A)
1	Shutters (800A)
3	Bus Plating
2	Cable Supports
2	Rear Door Full Height, Bolted without Key
3	Rear Padlocking
1	Side Barrier Between Sections
2	Rail Padlock
1	Pull Box
3	Nameplate -

Lineup

2	100% Neutral 22 in Stack
1	100% Neutral 38 in Stack
1	22 in 1-High Feeder Stack
2	22 in Ground Bus 800A CU
1	38 in Ground Bus 800A CU
1	45 in Cable Compartment (22 in Stks)
1	45 in Cable Compartment (38 in Stks)
1	53 in Transition Rear Compt (22 in Stks)
1	Auxiliary Compartment (22 in W x 21 in H)
3	Auxiliary Compartment (22 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 14 in H)
1	Auxiliary Compartment (38 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 7 in H)
3	Bus Bracing 100,000 Amps
2	Bus Construction -Bus Isolation/Insulation
1	GE Busway 38 in Aux Stack
1	GE/EPO Transformer Transition
1	SPECTRA Riser 5000A-4W (R)

Devices

1	110V Remote Racker
3	288/120 Singe Phase PT
1	5000A Fan Package
2	ABB FT-1 Test Plug
6	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
1	Breaker Lifting Spreader E2.2-E4.2
1	Breaker Lifting Spreader E6.2

Bill of Material(s)

1	Breaker Portable Lift Truck
1	CPT 5KVA
4	CT-5000/5A
3	CT-5000/5A
3	CT-800/5A
1	E2.2 Neutral Sensor 1% Feeder
1	Ekip Programming Kit
2	Emax 2 racking handle E2.2-E6.2
2	Emax 2 Racking Plate
6	Fuse Block - 30A
1	Fuse Block-2P 30A
1	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
3	Infrared Viewport
2	Lifting Plate
1	MOXA-Serial to Ethernet
2	Pilot Light - Green
2	Pilot Light - Red
2	RELT Switch-Lighted
3	SCTB-4 pole
3	SP - PM 8214 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
1	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil
4	THOMAS&BETTS CRIMP TERM FOR CU Cable 500kcmil

13 **1** **Low Voltage Switchgear, Reliagear**
Marks: MAIN 2

2 Section(s), NEMA 1 Enclosure
5000 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 100 kA
Breaker Min Withstand Rating: 85 kA
Bus Bracing Rating: 100 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 61 in, Depth: 71.33 in, Weight: 5283 lbs

Main Breaker 1

1	E6.2V-A 5000 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	None - Closing Coil (YC) and Redundant Closing Coil (YC2)
1	None - Spring Charging Motor (M) and Ekip Com Actuator
1	None - Opening Coil (YO)
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply 110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and Disabling Bluetooth
1	PLP Position padlock D=4/6/8mm E2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E6.2-A W Cradle UL
1	None - AUP
1	RELT Switch

Item Options

Bill of Material(s)

5	Wire Tags, Origin and/or Destination
1	Special #16 AWG SIS Control Wire
1	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
1	Shutters (5000A)
2	Bus Plating
1	Cable Supports
1	Rear Door Full Height, Bolted without Key
2	Rear Padlocking
	Side Barrier Between Sections
1	Rail Padlock
2	Nameplate -
	Lineup
1	100% Neutral 22 in Stack
1	100% Neutral 38 in Stack
1	22 in Ground Bus 800A CU
1	38 in Ground Bus 800A CU
1	45 in Cable Compartment (38 in Stks)
1	53 in Transition Rear Compt (22 in Stks)
2	Auxiliary Compartment (22 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 14 in H)
1	Auxiliary Compartment (38 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 7 in H)
2	Bus Bracing 100,000 Amps
1	Bus Construction -Bus Isolation/Insulation
1	GE Busway 38 in Aux Stack
1	GE/EPO Transformer Transition
1	SPECTRA Riser 5000A-4W (R)
	Devices
1	110V Remote Racker
3	288/120 Singe Phase PT
1	5000A Fan Package
1	ABB FT-1 Test Plug
1	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
1	Breaker Lifting Spreader E6.2
1	Breaker Portable Lift Truck
1	CPT 5KVA
1	CT-5000/5A
3	CT-5000/5A
1	Ekip Programming Kit
1	Emax 2 racking handle E2.2-E6.2
1	Emax 2 Racking Plate
2	Fuse Block - 30A
1	Fuse Block-2P 30A
1	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
2	Infrared Viewport
1	Lifting Plate
1	MOXA-Serial to Ethernet
1	Pilot Light - Green
1	Pilot Light - Red
1	RELT Switch-Lighted
2	SCTB-4 pole
1	SP - PM 8000 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
1	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil

Bill of Material(s)		
14	4	Battery System for LV Switchgear Marks: BATTERY SYSTEM
15	2	SEPS Secondary Substation Transformer, Vent Dry Marks: 3500 KVA VPI/3500 KVA/12470 HV/480Y LV/CU/80Deg
16	1	Power Panelboard, ReliaGear neXT Marks: MDP-NE 1 Section(s), Nema 1 Enclosure 600 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz Minimum Interrupt Rating: 35kA Fully Rated Incoming Feed: Bottom Surface Mounted UL67 Certified Height: 72 Inches; Width: 40 Inches; Depth: 11 Inches; Est. Weight: 531 lbs 1 600 Amps Main Breaker XT5NU360BBYN000XXX 1 TMA Horiz. XT5 (2) 2/0-500 mcm, No Feed Through Lugs Main Option Details 1 Silver Plated Copper Bus Heat Rated 1 100% Rated Neutral 1 CU Neutral, Mech (CU Cables) 1 NEMA 1 Enclosure Feeders 3 Breaker Device 20 Amps 3 Poles XT1SU3020AYD000XXX 3 TMF 3 (1) 10 - 2/0 AWG 1 Breaker Device 50 Amps 3 Poles XT1SU3050AYD000XXX 1 TMF 1 (1) 10 - 2/0 AWG 1 Breaker Device 125 Amps 3 Poles XT1SU3125AYD000XXX 1 TMF 1 (1) 10 - 2/0 AWG 1 Breaker Device 225 Amps 3 Poles XT4SU3225AYJ000XXX 1 TMF 1 (1) 4 AWG-300 MCM 8 Breaker Space Device 20 Amps 3 Poles XT1SU3020AYD000XXX 8 TMF 8 (1) 10 - 2/0 AWG Modifications 1 Door within Door 1 Nameplates (75C141109P109) 1 Key Lock 1 Ground: GDBG47CU 1 Interior Bus Stack: IN2406NN3H2 1 Neutral: NL12I0NSTNDCU 1 Enclosure: ER7240B 1 Interior Frame: IF2440F 1 Door within Door Deadfront: DD4072AHFS 1 Door within Door Filler 1: DDFIL404509SF 1 Door within Door Filler 2: DDFIL404515SF 1 Door within Door Filler Support: DDSUP24 1 Surge Protection: RGPPSP277Y08T2 1 1X Filler & Blank: SR01BF 1 1X Blank only: SR01BB 1 5 XT1 Mtg Kit, Narrow: SR5XBR 1 5 XT1 Mtg Kit, Wide: SR5XBF 1 2 XT1 Mtg Kit, Wide: SR2XBF 1 1 XT1 Mtg Kit, Narrow: SR1XBR

Bill of Material(s)		
	8	XT1 Blank only: SRT1BB
	1	Lifting Bar: IL40F
	1	Circuit Directory Kit, Metal: RGRPCDKM
	1	Nameplates: 75C141109P109
	1	Disconnect for SPD: XT1SU3030AYD000XXX
	1	SPD Disc XT1 Mtg Kit: SR1XBR
	1	PPXT FA INT
	1	PPXT FA BOX
17	1	Lighting Panelboard, ReliaGear RQ Marks: LP-LH
		1 Section(s), Nema 1 Enclosure 400 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz Minimum Interrupt Rating: 22kA Fully Rated Incoming Feed: Bottom Surface Mounted 42 Circuits UL67 / CSA C22.2 No. 29 Certified cULus Certified Height: 64.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	400 Amps Main Lugs 1-lug/phase 1-cable/lug #4 -600 kcmil Or 1-lug/phase 2-cable/lug 1/0 -250 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	4	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	5	Breaker Device 30 Amps 1 Poles THHQB
	1	Breaker Device 30 Amps 3 Poles THHQB
	1	Breaker Device 20 Amps 3 Poles THHQB
	27	Breaker Device 20 Amps 1 Poles THHQB
	4	Breaker Space Device 20 Amps 1 Poles THHQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3424MBX AXT6B7
	1	Box: AB64B
	1	Front: AF64SDUM
18	1	Lighting Panelboard, ReliaGear RQ Marks: CP
		1 Section(s), Nema 1 Enclosure 225 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz Minimum Interrupt Rating: 10kA Fully Rated Incoming Feed: Bottom Surface Mounted 42 Circuits UL67 / CSA C22.2 No. 29 Certified cULus Certified Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	175 Amps Main Breaker A2A225 Al - 1-lug/phase 1-cable/lug 2/0 -300 kcmil Or Cu - 1-lug/phase 1-cable/lug #1 -250 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	4	Ground-Cu box bonded TGC2

Bill of Material(s)		
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	1	Breaker Device 100 Amps 3 Poles THQB
	39	Breaker Device 20 Amps 1 Poles THQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3422ABX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDUM
19	1	Lighting Panelboard, ReliaGear RQ
		Marks: LR
		1 Section(s), Nema 1 Enclosure
		400 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 22kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		60 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 82.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	300 Amps Main Breaker XT5N400
	1	TMA
		1-lug/phase 2-cable/lug 2/0 -500 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	5	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	10	Breaker Device 30 Amps 1 Poles THHQB
	1	Breaker Device 20 Amps 3 Poles THHQB
	47	Breaker Device 20 Amps 1 Poles THHQB
		Modifications
	1	Power Distribution Panel
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Quarter Turn Latch
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3604JBX AXT6B7
	1	Box: AB82B
	1	Front: AF82SDTUM
20	1	Lighting Panelboard, ReliaGear RQ
		Marks: CP-1
		1 Section(s), Nema 1 Enclosure
		250 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 10kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		24 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches

Bill of Material(s)		
	1	100 Amps Main Breaker XT4N250
	1	TMF
		1-lug/phase 1-cable/lug #4 -300 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	2	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	1	Breaker Device 40 Amps 2 Poles THQB
	1	Breaker Device 50 Amps 2 Poles THQB
	20	Breaker Device 20 Amps 1 Poles THQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3242JBX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDUM
21	1	Lighting Panelboard, ReliaGear RS
		Marks: V-1 RH
		1 Section(s), Nema 1 Enclosure
		225 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		48 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	225 Amps Main Lugs
		1-lug/phase 1-cable/lug #6 -350 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	4	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	10	Breaker Device 20 Amps 3 Poles TEYD
	4	Breaker Device 20 Amps 1 Poles TEYD
	14	Breaker Space Device 20 Amps 1 Poles TEYD
		Modifications
	1	Power Distribution Panel
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3482MBX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDLUM

22 1 Lighting Panelboard, ReliaGear RS
Marks: V-1

1 Section(s), Nema 1 Enclosure
125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 25kA Fully Rated

Bill of Material(s)

- Incoming Feed: Bottom
Surface Mounted
12 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 31.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 125 Amps Main Breaker TEYD
1-lug/phase 1-cable/lug #14 -1/0
- Main Option Details**
- 1 Copper Bus Heat Rated
2 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 3 Breaker Device 20 Amps 3 Poles TEYD
1 Breaker Device 60 Amps 3 Poles TEYD
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Corbin Latch Bolt 15767
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3121BBX AXT6B7
1 Box: AB31B
1 Front: AF31SDLUM

23 1 Lighting Panelboard, ReliaGear RS
Marks: V1A

- 1 Section(s), Nema 1 Enclosure
125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 25kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
30 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 43.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 125 Amps Main Lugs
1-lug/phase 1-cable/lug #14 -2/0
- Main Option Details**
- 1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 4 Breaker Device 20 Amps 3 Poles TEYD
1 Breaker Device 20 Amps 2 Poles TEYD
16 Breaker Space Device 20 Amps 1 Poles TEYD
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Corbin Latch Bolt 15767
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3301MBX AXT6B7
1 Box: AB43B
1 Front: AF43SDLUM

24 1 Lighting Panelboard, ReliaGear RS
Marks: PP

Bill of Material(s)

1 Section(s), Nema 1 Enclosure
400 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 42kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
48 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 76.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
1 300 Amps Main Breaker XT5S400
1 TMA
1-lug/phase 2-cable/lug 2/0 -500 kcmil
Main Option Details
1 Copper Bus Heat Rated
4 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
3 Breaker Device 20 Amps 3 Poles TEYL
4 Breaker Device 40 Amps 3 Poles TEYL
6 Breaker Space Device 20 Amps 1 Poles TEYL
1 Breaker Device 60 Amps 3 Poles TEYL
14 Breaker Device 20 Amps 1 Poles TEYL
Modifications
1 Power Distribution Panel
1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Quarter Turn Latch
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3484KBX AXT6B7
1 Box: AB76B
1 Front: AF76SDTUM

25 1 Lighting Panelboard, ReliaGear RS
Marks: WELDER/PLASMA CUTTER

1 Section(s), Nema 1 Enclosure
400 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 35kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
30 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
1 400 Amps Main Lugs
1-lug/phase 1-cable/lug #4 -600 kcmil
Or 1-lug/phase 2-cable/lug 1/0 -250 kcmil
Main Option Details
1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
1 Breaker Device 20 Amps 3 Poles TEYH
2 Breaker Device 30 Amps 3 Poles TEYH
12 Breaker Space Device 20 Amps 1 Poles TEYH
1 Breaker Device 60 Amps 3 Poles TEYH
2 Breaker Device 50 Amps 3 Poles TEYH

Bill of Material(s)		
		Modifications 1 Front Hinged To Box 1 Metal Directory Card Hldr 1 Screw-On Nameplate 1 Corbin Latch Bolt 15767 1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2) 1 Interior: ASF3304MBX AXT6B7 1 Box: AB55B 1 Front: AF55SDLUM
26	1	Lighting Panelboard, ReliaGear RQ Marks: N/E 1 Section(s), Nema 1 Enclosure 225 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz Minimum Interrupt Rating: 10kA Fully Rated Incoming Feed: Bottom Surface Mounted 30 Circuits UL67 / CSA C22.2 No. 29 Certified cULus Certified Height: 49.5 Inches; Width: 20 Inches; Depth: 5.75 Inches 1 225 Amps Main Lugs 1-lug/phase 1-cable/lug #6 -350 kcmil Main Option Details 1 Copper Bus Heat Rated 3 Ground-Cu box bonded TGC2 1 Ground main lug TGL20 1 100% Rated Neutral 1 NEMA 1 Enclosure Feeders 1 Breaker Device 25 Amps 2 Poles THQB 1 Breaker Device 20 Amps 2 Poles THQB 26 Breaker Device 20 Amps 1 Poles THQB Modifications 1 Front Hinged To Box 1 Metal Directory Card Hldr 1 Screw-On Nameplate 1 ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2) 1 Interior: AQF3302MBX AXT6B7 1 Box: AB49B 1 Front: AF49SDUM
27	1	Lighting Panelboard, ReliaGear RS Marks: NE 1 Section(s), Nema 1 Enclosure 250 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz Minimum Interrupt Rating: 25kA Fully Rated Incoming Feed: Bottom Surface Mounted 42 Circuits UL67 / CSA C22.2 No. 29 Certified cULus Certified Height: 64.5 Inches; Width: 20 Inches; Depth: 5.75 Inches 1 225 Amps Main Breaker XT4N250 1 TMF 1-lug/phase 1-cable/lug #4 -300 kcmil Main Option Details 1 Copper Bus Heat Rated 4 Ground-Cu box bonded TGC2 1 Ground main lug TGL20 1 100% Rated Neutral

Bill of Material(s)		
	1	NEMA 1 Enclosure
		Feeders
	2	Breaker Device 30 Amps 3 Poles TEYD
	2	Breaker Device 20 Amps 2 Poles TEYD
	4	Breaker Device 20 Amps 3 Poles TEYD
	1	Breaker Device 50 Amps 3 Poles TEYD
	2	Breaker Device 15 Amps 3 Poles TEYD
	1	Breaker Device 30 Amps 1 Poles TEYD
	10	Breaker Device 20 Amps 1 Poles TEYD
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3422KBX AXT6B7
	1	Box: AB64B
	1	Front: AF64SDLUM
28	1	Lighting Panelboard, ReliaGear RS
		Marks: NE2
		1 Section(s), Nema 1 Enclosure
		125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		24 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 37.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	50 Amps Main Breaker TEYD
		1-lug/phase 1-cable/lug #14 -1/0
		Main Option Details
	1	Copper Bus Heat Rated
	2	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	4	Breaker Device 20 Amps 3 Poles TEYD
	12	Breaker Device 20 Amps 1 Poles TEYD
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3241BBX AXT6B7
	1	Box: AB37B
	1	Front: AF37SDLUM
29	1	Lighting Panelboard, ReliaGear RQ
		Marks: RP
		1 Section(s), Nema 1 Enclosure
		125 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 22kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		30 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified

Bill of Material(s)

- Height: 43.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 100 Amps Main Breaker THHQB
1-lug/phase 1-cable/lug #14 -1/0
- Main Option Details**
- 1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 30 Breaker Device 20 Amps 1 Poles THHQB
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
1 Interior: AQF3301CBX AXT6B7
1 Box: AB43B
1 Front: AF43SDUM

30 1 Lighting Panelboard, ReliaGear RS
Marks: HP

- 1 Section(s), Nema 1 Enclosure
125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 35kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
30 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 43.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 100 Amps Main Breaker TEYH
1-lug/phase 1-cable/lug #14 -1/0
- Main Option Details**
- 1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 8 Breaker Device 20 Amps 3 Poles TEYH
6 Breaker Device 20 Amps 1 Poles TEYH
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Corbin Latch Bolt 15767
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3301BBX AXT6B7
1 Box: AB43B
1 Front: AF43SDLUM

31 1 Lighting Panelboard, ReliaGear RE
Marks: DC

- 1 Section(s), Nema 1 Enclosure
125 Amps, 3 Wire 125/250V DC, 50/60 Hz, 1 & 2 Pole
Minimum Interrupt Rating: 10kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
42 Circuits
UL67 / CSA C22.2 No. 29 Certified

Bill of Material(s)

- 1 cULus Certified
Height: 37.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
125 Amps Main Lugs
1-lug/phase 1-cable/lug #14 -2/0
Main Option Details
1 Copper Bus Heat Rated
4 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
20 Breaker Device 15 Amps 2 Poles TEYF
Modifications
1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Interior: AEF1421MBX AXB7
1 Box: AB37B
1 Front: AF37SDUM

32 1 Transformer, Copper, 9T10C1002G32
Marks: T-RP

- 1 3 Phase, 60 Hz, 30 kVA
Ambient Temperature : 40°C
Coil Material : Copper
Primary Voltage : 480, Primary Connection : Delta
Secondary Voltage : 208Y/120, Secondary Connection : Wye
Temperature Rise : 115
Energy Efficiency : DOE 2016 (Std)
Enclosure : NEMA 1/NEMA 2
Taps(Nominal) : 2 above 4 below 2.5%
Impedance (+/- 7.5%) : 3.7%
K Factor : K1
Sound Level : -3dB(42dB)
UL : Yes, cUL : No, CE : No,
Accessories :
1 9T18Y1072G10 Lug Kit included
1 9T18Y1071G11 Ground Bar Kit included
Factory Individualized Transformer Test Reports :
1 NEMA ST-20 Sound Level Test Report
IEEE std C57.12.91 Electrical Test Performance Report - Not Required

33 3 Switches and Disconnects, Heavy Duty Safety Switch, THN3366A1
Marks: VFD DISCONNECT

- 1 Suitable for use as Service Equipment
Heavy Duty 600 Amps
No Fuse 3 Poles 600VAC/250VDC
NEMA 1 (Indoor)
For Use Size With (2) 4-600* Copper or Size (2) 4-600* Aluminum wire
*600MCM restricted to side entry only
Height1: 49.39, Height2: 49.39, Width1: 23.65, Width2: 24.5, Depth1: 8.51, Depth2: 13.26, Weight: 107
Accessories:
1 TGL6 , Equipment Ground Kit, (3) #2-250MCM CU/AL
1 THAUX66DA , Aux Contact Kit-DPDT

34 1 Switches and Disconnects, Elevator Disconnect, ES6T48R1KGN1A
Marks: ELEVATOR CONTROL SW

- 1 Mersen Elevator Switch 30-100A N1
NEMA 1 Enclosure

Bill of Material(s)

60 A, 480 V ac Primary, 120 V ac Secondary Control Transformer
120 V ac Fire Safety Interface Relay
1 NO/NC Mechanical Interlock Auxiliary Contact
UL98, cULus 508 Listed
Dimensions and Weight (Estimated)
Height: 8.7 in, Width: 16.3 in, Length: 24.39 in
Gross Weight: 58 lb, Net Weight: 51 lb

Options

60 A (2/0-#14) Isolated Neutral Lug
Key to Test Switch
Green Pilot Light

Accessories

3 60 A, 600 V ac, Class J Time Delay, AJT60 Fuse

35 1 Busway, ReliaGear Series Busway
Marks: BUS MTM1-T1

Build America, Buy America (2 CFR Part 184) Compliant
176 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

1 ANSI - 61 Gray, Standard
1 Standard Warranty
176 Ft of Feeder Indoor (IP40)
12 Each 90 Degree Elbow Forming Charge
1 Each Expansion Section Forming Charge
1 Each Unfused Reducer / Phase Transposition Forming Charge
1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
1 Each Non ABB Switchboard Stub Forming Charge
10 Spring Hanger (Pair)

36 1 Busway, ReliaGear Series Busway
Marks: BUS MTM1-T2

Build America, Buy America (2 CFR Part 184) Compliant
181 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

1 ANSI - 61 Gray, Standard
1 Standard Warranty
181 Ft of Feeder Indoor (IP40)
12 Each 90 Degree Elbow Forming Charge
1 Each Expansion Section Forming Charge
1 Each Unfused Reducer / Phase Transposition Forming Charge
1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
1 Each Non ABB Switchboard Stub Forming Charge
10 Spring Hanger (Pair)

37 1 Busway, ReliaGear Series Busway

Bill of Material(s)

Marks: BUS MTM1-MDS1

Build America, Buy America (2 CFR Part 184) Compliant
151 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

- 1 ANSI - 61 Gray, Standard
- 1 Standard Warranty
- 151 Ft of Feeder Indoor (IP40)
- 11 Each 90 Degree Elbow Forming Charge
- 1 Each Expansion Section Forming Charge
- 1 Each Unfused Reducer / Phase Transposition Forming Charge
- 1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
- 1 Each Non ABB Switchboard Stub Forming Charge
- 10 Spring Hanger (Pair)

38 1 Busway, ReliaGear Series Busway**Marks: BUS MTM1-MDS2**

Build America, Buy America (2 CFR Part 184) Compliant
131 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

- 1 ANSI - 61 Gray, Standard
- 1 Standard Warranty
- 131 Ft of Feeder Indoor (IP40)
- 12 Each 90 Degree Elbow Forming Charge
- 1 Each Expansion Section Forming Charge
- 1 Each Unfused Reducer / Phase Transposition Forming Charge
- 1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
- 1 Each Non ABB Switchboard Stub Forming Charge
- 10 Spring Hanger (Pair)

39 1 Busway, ReliaGear Series Busway**Marks: BUS MTM2-T5**

Build America, Buy America (2 CFR Part 184) Compliant
222 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
5000 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 200 kA for 3 Cycles, 200 kA for 1 s, and 200 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

- 1 ANSI - 61 Gray, Standard
- 1 Standard Warranty

Bill of Material(s)		
		222 Ft of Feeder Indoor (IP40) 14 Each 90 Degree Elbow Forming Charge 1 Each Expansion Section Forming Charge 1 Each Unfused Reducer / Phase Transposition Forming Charge 2 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge 10 Spring Hanger (Pair)
40	1	Busway, ReliaGear Series Busway Marks: BUS MTM2-T6 Build America, Buy America (2 CFR Part 184) Compliant 212 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s) 5000 A, 3 Phase 4 Wire, 600 V Maximum, ac Short Circuit Withstand Ratings of 200 kA for 3 Cycles, 200 kA for 1 s, and 200 kA for 3 s Tin Plated Copper Bus 100% Rated Neutral 50% Rated Internal Ground ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA IBC-2021, UBC Zone 4 List of Materials 1 ANSI - 61 Gray, Standard 1 Standard Warranty 212 Ft of Feeder Indoor (IP40) 14 Each 90 Degree Elbow Forming Charge 1 Each Expansion Section Forming Charge 1 Each Unfused Reducer / Phase Transposition Forming Charge 2 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge 10 Spring Hanger (Pair)
41	1	SEPS Bus Duct Marks: 4160V 2000A NSB RUN1 Non-Segregated/5KV/2000Amps
42	1	SEPS Bus Duct Marks: 4160V 2000A NSB RUN2 Non-Segregated/5KV/2000Amps
43	1	Power Study - Base Study
44	1	Power Study - Load Flow Study Adder
45	1	Power Study - Harmonic Study Adder
46	1	Startup Assistance - SWGR and SWBD's
47	1	Temporary Equipment
48	1	Temporary 4160V-480V 1500kva XFMR
49	1	Switchboard, ReliaGear Configured, RG-GM-CBSB-CTO Marks: TEMP SWBD 3 Section(s) Service Entrance Estimated Shipping Weight:2794 lbs

Bill of Material(s)	
1	Service Entrance Labeling 3P4W/480/277V/60Hz 2000A 65 kAIC Fully Rated Incoming Feed: Bottom Incoming Left Feeding Right Type 3R (non-walk-in) Enclosure Front/Rear Lineup Front Only Access Full Height Panel Bus Option
2	Hinged Wire Gutter Cover Configured Switchboard
1	ReliaGear Switchboard Lineup Estimated total factory connected wiring points for the lineup 28
1	Certified Test Reports requested (Per Lineup Item)
1	Evolution Main Section 30W 35D 90H (Est.) lbs 642
1	Group Mounted Feeder ReliaGear Panel Section 40W 35D 90H (Est.) lbs 1082
1	Group Mounted Feeder ReliaGear Panel Section 40W 35D 90H (Est.) lbs 1070
3	Bus Bracing 65000 AIC
3	Evolution - Fully Rated Aluminum Bus 750 A/Sq. in.
3	Ground: Equipment U/L With Lugs
1	Full Height Side Barriers
	Main Breaker
1	2000A 3 Pole E2.2SF 100% Rated (2000A Frame) Indiv. Mtd. Main Manually Operated MAIN Programmer(EKIP Touch) LSIG
1	RELT
1	RELT-EKIP SIGNALLING 2K3
1	(4Q) AUXILIARY CONTACTS - 400V
1	(S51/2) Bell Alarm - 250V
1	PADLOCK IN OPEN POSITION
1	DC SUPPLY - 24V - 48V
16	Mechanical (2 Hole) AL Line Lugs
	Feeders
3	700A 3 Pole XT6H800 (0A Frame)
3	Manually Operated Programmer (EKIP DIP) LSI
9	Mechanical AL Load Lugs
7	500A 3 Pole XT5H600 (600A Frame)
7	Manually Operated Programmer (EKIP DIP) LSI
14	Mechanical AL Load Lugs
3	450A 3 Pole XT5H600 (600A Frame)
3	Manually Operated Programmer (EKIP DIP) LSI
6	Mechanical AL Load Lugs
	Monitoring/Control Devices
1	Power Supply Plate
	Others
14	Engraved Nameplates
14	Screw-On Nameplates
	Others
1	Lifting Brackets
2	Reliagear (C/B feeders only) 40X Bus Stack
29	Neutral Lugs
1	Bonding Jumper
37	Equipment Ground Lugs
1	Ground Lug

50 3 Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR
Marks: 450A FUSIBLE DISC

- 1 Suitable for use as Service Equipment

Bill of Material(s)		
		Heavy Duty 600 Amps Fusible 3 Poles 600VAC/250VDC NEMA 3R (Outdoor) For Use Size With (2) 4-600* Copper or Size (2) 4-600* Aluminum wire *600MCM restricted to side entry only Height1: 54.49, Height2: 54.49, Width1: 23.65, Width2: 24.5, Depth1: 9.35, Depth2: 13.26, Weight: 117 Switch is NEC 2020 Article 230.62 compliant for service equipment barriers. Accessories: 1 TGL6 , Equipment Ground Kit, (3) #2-250MCM CU/AL 1 TRK66A , Class R Fuse Kit 3 A6D450R, 450 Amps, RK1 - Time Delay
51	5	Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR Marks: 500A FUSIBLE DISC 1 Suitable for use as Service Equipment Heavy Duty 600 Amps Fusible 3 Poles 600VAC/250VDC NEMA 3R (Outdoor) For Use Size With (2) 4-600* Copper or Size (2) 4-600* Aluminum wire *600MCM restricted to side entry only Height1: 54.49, Height2: 54.49, Width1: 23.65, Width2: 24.5, Depth1: 9.35, Depth2: 13.26, Weight: 117 Switch is NEC 2020 Article 230.62 compliant for service equipment barriers. Accessories: 1 TGL6 , Equipment Ground Kit, (3) #2-250MCM CU/AL 1 TRK66A , Class R Fuse Kit 3 A6D500R, 500 Amps, RK1 - Time Delay
52	3	Switches and Disconnects, Heavy Duty Safety Switch, TC72367R Marks: 650A FUSIBLE DISC 1 Suitable for use as Service Equipment Heavy Duty 800 Amps Fusible 3 Poles 600VAC NEMA 3R (Outdoor) For Use Size With (6) 1/0-250 or (3) 2-600 Copper or Size (6) 1/0-250 or (3) 2-600 Aluminum wire Height1: 61.64, Height2: 65.35, Width1: 41.99, Width2: 44.19, Depth1: 11.92, Depth2: 17.71, Weight: 480 Switch is NEC 2017 compliant for service equipment. To make this switch compliant with NEC 2020 Article 230.62 for service equipment barriers, install kit THSHLD8 Accessories: Standard Fuse Clips Supplied 3 A4BY650, 650 Amps, L - Current Limiting Time Delay
53	1	Load Interrupter Switch, VersaRupter Marks: TEMP CHILLER DISC 1 Single Configuration, 1 Section(s), Indoor Enclosure 1200 A Bus, 3 Phase 3 Wire, 5 kV, 60 kV BIL, 50/60 Hz with solidly grounding system 61 kA Momentary, 61 kA Fault Closing, Silver Plated Contacts, Copper-Silver Bus Front and Rear Access Required IEEE C37.20.3 , ANSI C37.57 , IEEE C37.20.4, ANSI C37.58 , CSA C22.2 No. 31, CSA C22.2 No. 193 1 Certified Test Reports Enclosure Paint: ANSI-61 (Light Gray) tested to minimum withstand of 600 hour humidity and salt spray test Dimensions And Weight (Estimated) Section 1 - Single Switch: Width = 35 in; Height = 90 in; Depth = 60 in, Weight = 1200 lb

Bill of Material(s)

Options

- 1 UL Label
- 1 60 in Depth
- 1 Bus Boots
- 1 Fully Insulated Bus
- 1 Horizontal Barrier
- 2 Metal Screen Barriers
- 1 Front and Rear Door Pad Locks
- 1 Rear Door
- 1 Non-Removable Handle
- 1 Full Vertical Barrier

Single Switch

- 1 1200 A Switch Stand Alone, No Transition
- 1 Distribution Class Arrester, 9L20FXX006XHS
- 1 Top Entry, (1) 300 kcmil per Phase, NEMA Drill Only, Without Loop
- 1 Bottom Exit, (1) 300 kcmil per Phase, NEMA Drill Only

Fuses

- 1 Current Limiting Fuse Model, 9F62FCB300
 - 1 Set of 3 Spare Fuses
- Note: Fuses/Spare Fuses could be split from the order for shipment and invoice by separate.
- 1 Double Barrel Fuse Clips
 - 1 Ground Studs, Line Side
 - 1 Run Back Bus

TERMS AND CONDITIONS OF SALE

General Policies and Conditions

1. This Proposal is offered subject to the following: 1) attached TERMS AND CONDITIONS OF SALE, 2) an executed Master Supply Agreement ("MSA"), and 3) ABB Inc.'s current general Terms and Condition of Sale. Any conflict among the documents comprising the terms of this Proposal shall be resolved in accordance with the following order of precedence: (i) an executed MSA incorporating the following Terms and Conditions of Sale (ii) attached TERMS AND CONDITIONS OF SALE incorporating ABB Inc. General Terms and Conditions of Sale (iii) or ABB Inc. General Terms and Conditions of Sale. Non-ABB preprinted PO terms have no force and/or effect and are hereby rejected by ABB.
2. All quoted or agreed prices are subject to revision at any time in the event of: (i) a material increase in component, raw material, or energy costs; or (ii) governmental action such as new or increased tariffs.
3. Buyer represents and warrants that there are no federal, state, or local (collectively "Governmental") contracting provisions, regulations, flow-downs, or requirements that apply to this transaction, including without limitation any Governmental domestic preference or prevailing wage, other than such terms that have been disclosed and agreed to by Seller in writing. Buyer assumes sole responsibility for any costs associated with non-compliance of terms not agreed by Seller in writing. Unless expressly provided in writing, Seller makes no representation that the quoted product(s) or service(s) comply with any Governmental contracting provisions and regulations.
4. This proposal expires in 30 calendar days, unless terminated sooner by notice. This proposal is not inclusive of taxes of any kind, unless explicitly stated.
5. Orders not requiring engineered drawings for approval must be released by Buyer for manufacture within 90 days of PO receipt. If engineered drawings are required, they must be returned and approved by Buyer for release within 60 days of mailing. If not, and/or shipment is delayed for any reason the price will increase by 1.5% for each partial/full month that shipment release is delayed after the 90-day period. If project is delayed 6 months or more after PO receipt, project will be repriced based off current market values.
6. For MV Transformers (including Padmount, Substation, & Power transformers), refer to the factory proposal for applicable terms and conditions including, but not limited to quote validity, price validity, escalation, warranty, cancellation, estimated delivery, and freight terms.

Payment Terms

1. Net 30 days from the date of invoice
2. For projects up to \$1,000,000 net, terms of payment are 100% upon invoicing.
3. If project value exceeds \$1,000,000 net, progress payments are required payable at the following milestones. These milestones will be applied at a line-item level and will be tailored to the project schedule.
 - 20% upon delivery of drawings
 - 30% upon release of equipment
 - 50% upon shipment

Warranty

1. The warranty for Products shall expire one (1) year from date of installation or eighteen (18) months after date of shipment, whichever occurs first, except that software is warranted for ninety (90) days from delivery. The warranty for Services shall expire one (1) year after performance of the Service, except that software related Services are warranted for ninety (90) days.
2. Additional 12 months available for 2% adder, 24 months for 4% adder. Engage ABB representative if longer durations are needed.
3. All warranty claim remedies are provided under the General Terms and Conditions of Sale, or any applicable MSA, whichever is applicable between the parties.

Order Cancellation – Schedule of Charges

1. 10% - Order received.
2. 30% - Drawings for approval submitted, if required.
3. 50% - Revisions to approval drawings submitted, if required.
4. 80% - Order released for manufacturing and shipment.
5. 100% - Production started.

Delivery and Transportation

1. CPT/FCA ABB's facility, place of manufacture or warehouse (Incoterms 2020). Title and risk of loss passes upon shipment.
2. ABB will assume the risk of loss or damage to the destination for a 2% adder (but not less than \$500 net) applied to the total price of the equipment. "Destination" is defined as ABB's common carrier's delivery point nearest first destination or point of export within the continental U.S.
3. Transportation and handling are prepaid and billed, unless otherwise noted in this quotation or MSA.
4. Shipment via Air or Open Top/Flatbed/Lift gate truck not included unless specifically listed herein.
5. Special Instruction - The Receiving Associate is required to sign, date, and note specific visible or concealed damage on Bill of Lading at time of delivery. Freight Company Associate is required to witness Receiver's signature, date, and damage claim annotations. ABB's Post Sales Service Department must be provided with copy of annotated BOL within five (5) days of delivery or Shipper's responsibility ends.

Other Notes

1. Standard factory test procedures will be performed. Customer inspections, customer witness tests, and any other non-standard test procedures are not included unless specifically noted herein.
2. The accompanying Bill of Material is our interpretation of what is required to meet the intent of the listed Drawings and Specifications. Please review thoroughly for accuracy and completeness and advise immediately if any revisions are required. This proposal is limited to the attached Bill of Material only. Selective coordination of the system should be verified by a qualified engineer and may require changes to the design, Bill of Material, and price.
3. The Parties are aware of the shortage of raw materials, electronic components worldwide which is likely to last for the foreseeable future, as well as, of market fluctuations in the availability and cost of other raw materials, commodities, other critical components, and transportation capacities. Notwithstanding anything to the contrary in the contract terms and conditions / purchase order, if after the date of ABB's proposal / offer or during the term of the performance of the contract / purchase order there are any changes to availability and / or market conditions for electronic components, raw materials, commodities, and transportation capabilities directly or indirectly affecting ABB's performance, ABB shall be entitled to relief in the schedule of the performance or delivery of the directly or indirectly affected scope of work under the contract / purchase order. In such circumstances, the Parties shall meet without delay and discuss in good faith to find a mutually agreeable solution, with equitable adjustment to the contract / purchase order date of delivery or completion. Customer hereby acknowledges and agrees that in said circumstances ABB may not be able to comply with the originally agreed delivery or completion schedule and that ABB shall not be liable for any liquidated or actual damages in connection thereto.

ABB INC. GENERAL TERMS AND CONDITIONS OF SALE

(2025-02 U.S.)

1. General.

The terms and conditions contained herein, together with any additional or different terms contained or referenced in ABB's proposal or, quotation and ("Proposal"), any addenda to the Proposal, the purchase order (excluding any pre-printed terms and conditions and any terms that conflict with the Proposal or ABB's acknowledgment), and ABB's acknowledgement, submitted to Purchaser constitute the entire agreement (the "Agreement") between the parties with respect to the purchase order and supersede all other prior communications and agreements regarding the purchase order and ABB objects to any additional terms proposed by Purchaser. Acceptance by ABB of the purchase order, or Purchaser's acceptance of ABB's Proposal, is expressly limited to and conditioned upon Purchaser's acceptance of these terms and conditions, payment for or acceptance of any performance by ABB being acceptance. "Equipment" as used herein means all the equipment, parts, accessories sold, and all software and software documentation, if any, licensed to Purchaser by ABB ("Software") under the purchase order. "Services" as used herein means all labor, supervisory, technical and engineering, installation, repair, consulting or other services provided by ABB under the purchase order. "Purchaser" shall include the initial end user of the Equipment and/or services; provided, however, that Article 14(a) shall apply exclusively to the initial end user. "Hazardous Materials" means any toxic or hazardous substance, hazardous material, dangerous or hazardous waste, dangerous good, radioactive material, petroleum or petroleum-derived products or by-products, or any other chemical, substance, material or emission, that is regulated, listed or controlled pursuant to any national, state, provincial, or local law, statute, ordinance, directive, regulation or other legal requirement of the United States ("U.S.") or the country of the Site.

2. Prices.

(a) Unless otherwise specified in writing, all Proposals expire thirty (30) days from the date thereof and may be modified or withdrawn by ABB before receipt of Purchaser's conforming acceptance. All prices set forth in a purchase order may be revised by ABB at any time prior to delivery or performance based on ABB's sole but reasonable estimate of its cost increases (after the Proposal date) resulting directly or indirectly from factors such as: (i) a significant increase in raw material, component, labor, or energy costs or (ii) governmental actions, such as increased tariffs on the Equipment, raw material, or components.

(b) Unless otherwise stated herein, Services prices are based on normal business hours (8 a.m. to 5 p.m. Monday through Friday). Overtime and Saturday hours will be billed at one and one-half (1 1/2) times the hourly rate; and Sunday hours will be billed at two (2) times the hourly rate; holiday hours will be billed at three (3) times the hourly rate. If a Services rate sheet is attached hereto, the applicable Services rates shall be those set forth in the rate sheet. Rates are subject to change without notice.

(c) Except as otherwise agreed by ABB, the price does not include any federal, state or local property, license, privilege, sales, use, excise, gross receipts, tariffs or other like taxes ("Taxes") which may now or hereafter be applicable. Purchaser agrees to pay or reimburse any such Taxes, or ABB's reasonable estimated cost impact thereof, which ABB or its suppliers are required to pay or collect. If Purchaser is exempt from the payment of any Tax or holds a direct payment permit, Purchaser shall, upon purchase order placement, provide ABB a copy, acceptable to the relevant governmental authorities of any such certificate or permit.

3. Payment.

(a) Unless specified to the contrary in writing by ABB, payment terms are net cash, payable without offset, in United States Dollars, 30 days from date of invoice by wire transfer to the account designated by ABB in the Proposal. ABB is not required to commence or continue its performance unless and until invoiced payments have been received in a timely fashion. For each day of delay in receiving required payments, ABB shall be entitled to a matching extension of the schedule.

(b) If in the judgment of ABB, the financial condition of Purchaser at any time prior to delivery does not justify the terms of payment specified, ABB may require payment in advance, payment security satisfactory to ABB and suspend its performance until said advance payment or payment security is received or may terminate the purchase order, whereupon ABB shall be entitled to receive reasonable cancellation charges. If delivery is delayed by Purchaser, payment shall be due on the date ABB is prepared to make delivery. Delays in delivery or nonconformities in any installments delivered shall not relieve Purchaser of its obligation to accept and pay for remaining installments.

(c) Purchaser shall pay, in addition to the overdue payment, a late charge equal to the lesser of 1 1/2% per month or any part thereof or the highest applicable rate allowed by law on all such overdue amounts plus ABB's attorneys' fees and court costs incurred in connection with collection. If Purchaser fails to make payment of any amounts due under any purchase order and fails to cure such default within ten (10) days after receiving written notice specifying such default, then ABB may by written notice, at its option, suspend its performance under the purchase order until such time as the full balance is paid or terminate the purchase order, as of a date specified in such notice. In the event of suspension, cancellation or termination hereunder, ABB will be entitled to recover all costs for work performed to date, costs associated with suspension, cancellation or termination of the work and all other costs recoverable at law.

4. Changes.

(a) Any changes requested by Purchaser affecting the ordered scope of work must first be reviewed by ABB and any resulting adjustments to affected provisions, including price, schedule, and guarantees mutually agreed in writing prior to implementation of the change.

(b) ABB may, at its expense, make any changes in the Equipment or Services as it deems necessary, in its sole discretion, to conform the Equipment or Services to the applicable specifications (including but not limited to technical, standards, codes, performance, schedule, location or performance, plus applicable laws and regulations). If Purchaser objects to any such changes, ABB shall be relieved of its obligation to conform to the applicable specifications to the extent that conformance may be affected by such objection. ABB will not be obligated to meet specifications if not provided by Purchaser in the scope of work.

5. Delivery.

(a) All Equipment manufactured, assembled or warehoused in the continental United States is delivered FCA ABB point of shipment, Incoterms® 2020 unless otherwise mutually agreed in writing. Equipment shipped outside the continental United States is delivered FCA Incoterms® 2020 United States port of export unless otherwise mutually agreed in writing. Purchaser shall be responsible for any and all demurrage or detention charges.

(b) If the scheduled delivery of Equipment is delayed by Purchaser or by Force Majeure, ABB may move the Equipment to storage for the account of and at the risk of Purchaser whereupon it shall be deemed to be delivered.

(c) Shipping and delivery dates are contingent upon Purchaser's timely approvals and delivery by Purchaser of any documentation required for ABB's performance hereunder.

(d) Claims for shortages or other errors in delivery must be made in writing to ABB within ten (10) days of delivery. Equipment may not be returned except with the prior written consent of and subject to terms specified by ABB. Claims for damage after delivery shall be made directly by Purchaser with the common carrier.

6. Title & Risk of Loss.

Except with respect to Software (for which title shall not pass, use being licensed) title to Equipment shall transfer to Purchaser upon delivery according to the applicable freight term. Notwithstanding any agreement with respect to delivery terms or payment of transportation charges, risk of loss or damage with respect to the sale of Equipment shall pass from ABB to Purchaser at delivery as defined in this Agreement.

7. Inspection, Testing and Acceptance.

(a) Any inspection by Purchaser of Equipment on ABB's premises shall be scheduled in advance to be performed during normal working hours and subject to rules and regulations in place at the ABB premises.

(b) If the purchase order provides for factory acceptance testing, ABB shall notify Purchaser when ABB will conduct such testing prior to shipment. Unless Purchaser states specific objections in writing within ten (10) days after completion of factory acceptance testing, completion of the acceptance test constitutes Purchaser's factory acceptance of the Equipment and its authorization for shipment.

(c) If the purchase order provides for site acceptance testing, testing will be performed by ABB personnel to verify that the Equipment has arrived at site complete, without physical damage, and in good operating condition. Completion of site acceptance testing constitutes full and final acceptance of the Equipment. If, through no fault of ABB, acceptance testing is not completed within thirty (30) days after arrival of the Equipment at the site, the site acceptance test shall be deemed completed and the Equipment shall be deemed accepted.

8. Warranties and Remedies.

(a) Equipment and Services Warranty. ABB warrants that Equipment (excluding Software, which is warranted as specified in paragraph (d) below) shall be delivered free of defects in material and workmanship and that

Services shall be free of defects in workmanship. The Warranty Remedy Period for Equipment (excluding Software and spare parts) shall end twelve (12) months after installation or eighteen (18) months after date of shipment, whichever first occurs. The Warranty Remedy Period for new spare parts shall end twelve (12) months after date of shipment. If the purchase order includes the sale of refurbished or repaired parts, the Warranty Remedy Period for such parts shall end ninety (90) days after date of shipment. The Warranty Remedy Period for Services shall end ninety (90) days after the date of completion of Services.

(b) Equipment and Services Remedy. If a nonconformity to the foregoing warranty is discovered in the Equipment or Services during the applicable Warranty Remedy Period, as specified above, under normal and proper use and provided the Equipment has been properly stored, installed, operated and maintained and written notice of such nonconformity is provided to ABB promptly after such discovery and within the applicable Warranty Remedy Period, ABB shall, at its option, either (i) repair or replace the nonconforming portion of the Equipment or re-perform the nonconforming Services or (ii) refund the portion of the price applicable to the nonconforming portion of Equipment or Services. If any portion of the Equipment or Services so repaired, replaced or re-performed fails to conform to the foregoing warranty, and written notice of such nonconformity is provided to ABB promptly after discovery and within the original Warranty Remedy Period applicable to such Equipment or Services or thirty (30) days from completion of such repair, replacement or re-performance, whichever is later, ABB will repair or replace such nonconforming Equipment or re-perform the nonconforming Services. The original Warranty Remedy Period shall not otherwise be extended.

(c) Exceptions. ABB shall not be responsible for providing temporary power, removal, installation, reimbursement for labor costs or working access to the nonconforming Equipment, including disassembly and re-assembly of non-ABB supplied equipment, or for providing transportation to or from any repair facility, or for any other expenses incurred in connection with the repair or replacement, all of which shall be at Purchaser's risk and expense. ABB shall have no obligation hereunder with respect to any Equipment which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to ABB's instructions; (iv) is comprised of materials provided by or a design specified by Purchaser; or (v) has failed as a result of ordinary wear and tear. Equipment supplied by ABB but manufactured by others is warranted only to the extent of the manufacturer's warranty, and only the remedies, if any, provided by the manufacturer will be allowed.

(d) Software Warranty and Remedies. ABB warrants that, except as specified below, the Software will, when properly installed, execute in accordance with ABB's published specification. If a nonconformity to the foregoing warranty is discovered during the period ending one (1) year after the date of shipment and written notice of such nonconformity is provided to ABB promptly after such discovery and within that period, including a description of the nonconformity and complete information about the manner of its discovery, ABB shall correct the nonconformity by, at its option, either (i) modifying or making available to the Purchaser instructions for modifying the Software; or (ii) making available at ABB's facility necessary corrected or replacement programs. ABB shall have no obligation with respect to any nonconformities resulting from (i) unauthorized modification of the Software or (ii) Purchaser-supplied software or interfacing. ABB does not warrant that the functions contained in the software will operate in combinations which may be selected for use by the Purchaser, or that the software products are free from errors in the nature of what is commonly categorized by the computer industry as "bugs".

(e) THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE, WHETHER WRITTEN, ORAL OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USAGE OF TRADE ARE HEREBY DISCLAIMED. THE REMEDIES STATED HEREIN CONSTITUTE PURCHASER'S EXCLUSIVE REMEDIES AND ABB'S ENTIRE LIABILITY FOR ANY BREACH OF WARRANTY.

9. Intellectual Property Infringement.

(a) ABB shall defend at its own expense any action brought against Purchaser alleging that the Equipment or the use of the Equipment to practice any process for which such Equipment is specified by ABB ("a Process") directly infringes a patent in effect in the United States, an European Union member state or the country of the Site (provided there is a corresponding patent issued by the U.S., UK or an EU member state), or any

copyright or trademark registered in the country of the Site and to pay all damages and costs finally awarded in any such action, provided that Purchaser has given ABB prompt written notice of such action, all necessary assistance in the defense thereof and the right to control all aspects of the defense thereof including the right to settle or otherwise terminate such action in behalf of Purchaser.

(b) ABB shall have no obligation hereunder and this provision shall not apply to: (i) any other equipment or processes, including Equipment or Processes which have been modified or combined with other equipment or process not supplied by ABB; (ii) any Equipment or Process supplied according to a design, other than an ABB design, required by Purchaser; (iii) any products manufactured by the Equipment or Process; (iv) any use of the Equipment or Process contrary to ABB instructions; (v) any patent issued after the date hereof; or (vi) any action settled or otherwise terminated without the prior written consent of ABB.

(c) If, in any such action, the Equipment is held to constitute an infringement, or the practice of any Process using the Equipment is finally enjoined, ABB shall, at its option and its own expense, procure for Purchaser the right to continue using said Equipment; or modify or replace it with non-infringing equipment or, with Purchaser's assistance, modify the Process so that it becomes non-infringing; or remove it and refund the portion of the price allocable to the infringing Equipment. THE FOREGOING PARAGRAPHS STATE THE EXCLUSIVE LIABILITY OF ABB AND EQUIPMENT MANUFACTURER FOR ANY INTELLECTUAL PROPERTY INFRINGEMENT.

(d) To the extent that said Equipment or any part thereof is modified by Purchaser, or combined by Purchaser with equipment or processes not furnished hereunder (except to the extent that ABB is a contributory infringer) or said Equipment or any part thereof is used by Purchaser to perform a process not furnished hereunder by ABB or to produce an article, and by reason of said modification, combination, performance or production, an action is brought against ABB, Purchaser shall defend and indemnify ABB in the same manner and to the same extent that ABB would be obligated to indemnify Purchaser under this "Intellectual Property Indemnification" provision.

10. Waiver of Consequential Damages.

In no event shall ABB, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, whether in contract, warranty, tort, negligence, strict liability or otherwise, including, but not limited to, loss of profits or revenue, loss of data, loss of use, loss of use of any of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, delays, and claims of customers of the Purchaser or other third parties for any damages.

11. Limitation of Liability.

(a) ABB's aggregate liability for all claims whether in contract, warranty, tort, negligence, strict liability, or otherwise for any loss or damage arising out of, connected with, or resulting from this Agreement or the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, repair, replacement, installation, technical direction of installation, inspection, operation or use of any equipment covered by or furnished under this Agreement, or from any services rendered in connection therewith, shall in no case (except as provided in the section entitled "Intellectual Property Indemnification") exceed the purchase order price.

(b) All causes of action against ABB arising out of or relating to this Agreement or the performance or breach hereof shall expire unless brought within one (1) year of the time of accrual thereof.

(c) In no event, regardless of cause, shall ABB be liable for penalties or penalty clauses of any description or for indemnification of Purchaser or others for costs, damages, or expenses arising out of or related to the Equipment and/Services.

(d) The rights and remedies of the parties contained under these terms and conditions shall be sole and exclusive.

12. Laws and Regulations.

ABB does not assume any responsibility for compliance with federal, state or local laws and regulations, except as expressly set forth in this Agreement, and compliance with any laws and regulations related to Purchaser's duties, obligations, and business practices including the application, operation, or use and disposal of the Equipment Services or Software is the sole responsibility of the Purchaser. All laws and regulations referenced in this Agreement shall be those in effect as of the original Proposal date. In the event of any subsequent revisions or changes thereto, ABB assumes no responsibility for compliance therewith. If Purchaser desires a modification as a result of any such change or revision, it shall be treated as a change per Article 4. Nothing contained herein shall be construed as imposing responsibility or liability upon ABB for obtaining any permits, licenses or approvals from any agency required in connection with the supply, erection or operation of the Equipment. This Agreement shall in all respects be governed by, and construed, interpreted and enforced in accordance with the laws of the State of New York, USA, excluding its conflicts of laws rules and the provisions of the United Nations Convention on Contracts for the International Sale of Goods, and both parties hereby agree that any litigation concerning, arising out of, or related to this Agreement, whether claims are based on contract, tort, equity or otherwise, shall be conducted only in the state or federal courts functioning in the State of New York, New York County and waive the defense of an inconvenient forum in respect to any such litigation. If any provision hereof, partly or completely, shall be held invalid or unenforceable, such invalidity or unenforceability shall not affect any other provision or portion hereof and these terms shall be construed as if such invalid or unenforceable provision or portion thereof had never existed.

13. OSHA.

ABB warrants that the Equipment will comply with the relevant standards of the Occupational Safety and Health Act of 1970 ("OSHA") and the regulations promulgated thereunder as of the date of the Proposal. Upon prompt written notice from the Purchaser of a breach of this warranty, ABB will replace the affected part or modify it so that it conforms to such standard or regulation. ABB's obligation shall be limited to such replacement or modification. In no event shall ABB be responsible for liability arising out of the violation of any OSHA standards relating to or caused by Purchaser's design, location, operation, or maintenance of the Equipment, its use in association with other equipment of Purchaser, or the alteration of the Equipment by any party other than ABB.

14. Software License. (a) ABB owns all rights in or has the right to sublicense all of the Software, if any, to be delivered to Purchaser under this Agreement. As part of the sale made hereunder Purchaser hereby obtains a limited license to use the Software, subject to the following: (i) the Software may be used only in conjunction with equipment specified by ABB; (ii) the Software shall be kept strictly confidential; (iii) the Software shall not be copied, reverse engineered, or modified; (iv) the Purchaser's right to use the Software shall terminate immediately when the specified equipment is no longer used by the Purchaser or when otherwise terminated, e.g. for breach, hereunder; and (v) the rights to use the Software are non-exclusive and non-transferable, except with ABB's prior written consent.

(b) Nothing in this Agreement shall be deemed to convey to Purchaser any title to or ownership in the Software or the intellectual property contained therein in whole or in part, nor to designate the Software a "work made for hire" under the Copyright Act, nor to confer upon any person who is not a named party to this Agreement any right or remedy under or by reason of this Agreement. In the event of termination of this License, Purchaser shall

immediately cease using the Software and, without retaining any copies, notes or excerpts thereof, return to ABB the Software and all copies thereof and shall remove all machine-readable Software from all of Purchaser's storage media.

15. Intellectual Property, Inventions and Information.

(a) "Intellectual Property Rights" means all current and future rights in copyrights, trade secrets, trademarks, mask works, patents, design rights, trade dress, and any other intellectual property rights that may exist anywhere in the world, including, in each case whether unregistered, registered or comprising an application for registration, and all rights and forms of protection of a similar nature or having equivalent or similar effect to any of the foregoing. "Technology" means all inventions, discoveries, ideas, concepts, methods, code, executables, manufacturing processes, unique compositions, mask works, designs, marks, and works of authorship fixed in the medium of expression, and materials pertaining to any of the preceding; whether or not patentable, copyrightable or subject to other forms of protection.

(b) ABB shall maintain all right, title and interest in any Technology and Intellectual Property Rights that ABB owned, created, conceived or discovered prior to entering into this Agreement, or owns, creates or discovers separately from the activities contemplated by this Agreement. Unless otherwise agreed in writing by ABB and Purchaser, ABB shall have all right, title and interest in any Technology and Intellectual Property Rights that ABB creates, conceives or discovers in furtherance of this Agreement, and ABB shall have all right, title and interest in any Technology and Intellectual Property Rights embodied in the Equipment and Services. Any design, manufacturing drawings or other information submitted to the Purchaser remains the exclusive property of ABB. Purchaser shall not, without ABB's prior written consent, copy or disclose such information to a third party, unless required by a public information request from a governmental body. Such information shall be used solely for the operation or maintenance of the Equipment and not for any other purpose, including the duplication thereof in whole or in part.

16. Force Majeure.

ABB shall neither be liable for loss, damage, detention or delay nor be deemed to be in default for failure to perform when prevented from doing so by causes beyond its reasonable control including but not limited to acts of war (declared or undeclared), delays attributable to outbreaks, epidemics and pandemics (including any variations),

Acts of God, fire, strike, labor difficulties, acts or omissions of any governmental authority or of Purchaser, compliance with government regulations, insurrection or riot, embargo, delays or shortages in transportation or inability to obtain necessary labor, materials, or manufacturing facilities from usual sources or from defects or delays in the performance of its suppliers or subcontractors due to any of the foregoing enumerated causes. In the event of delay due to any such cause, the date of delivery will be extended by period equal to the delay plus a reasonable time to resume production, and the price will be adjusted to compensate ABB for such delay.

17. Cancellation.

Special order, custom designed, and made-to-order Equipment are non-cancelable and non-returnable. Any other purchase order may be cancelled by Purchaser only upon prior written notice and payment of termination charges as set forth in the cancellation schedule included in the Proposal or payment of, including but not limited to, the purchase price of the work performed prior to the effective date of notice of termination, the costs identified to the purchase order incurred by ABB for work not completed, and all expenses incurred by ABB attributable to the termination, plus a fixed sum of ten (10) percent of the final total price to compensate for disruption in scheduling, planned production and other indirect costs.

18. Termination.

(a) No termination by Purchaser for material default shall be effective unless, within fifteen (15) days after receipt by ABB of Purchaser's written notice specifying such default, ABB shall have failed to initiate and pursue with due diligence correction of such specified default.

(b) If the event of termination for a material default, ABB shall reimburse Purchaser the difference between that portion of the Agreement price allocable to the terminated scope and the actual amounts reasonably incurred by Purchaser to complete that scope, and Purchaser shall pay to ABB the portion of the Agreement price allocable to Equipment completed and any amounts due for Services performed before the effective date of termination.

(c) ABB may terminate the Agreement (or any affected portion thereof) immediately for cause if Purchaser becomes insolvent/bankrupt, or materially breaches the Agreement, including, but not limited to, failure or delay in Purchaser making any payment when due, or fulfilling any payment conditions.

19. Export Control.

(a) The following definitions apply to this Article 19:

"Trade Control Laws" means all applicable trade and economic sanctions laws and regulations, specifically including but not limited to the U.S. International Traffic in Arms Regulations ("ITAR"), 22 C.F.R. 120 et seq.; the Export Administration Regulations ("EAR"), 15 C.F.R. 730-774; the Foreign Assets Control Regulations ("FACR"), 31 C.F.R. 500-598; the Foreign Trade Regulations ("FTR"), 15 C.F.R. 30-199; and, any administrative or regulatory decisions or guidelines adopted pursuant to Trade Control Laws.

"Purchaser Entities" means Purchaser's officers, directors, employees, parent company, subsidiaries and other affiliates, and if the Equipment, Software and/or Services are subject to resale or other distribution, Purchaser's customers and end-users of the same.

(b) Purchaser shall comply in all respects with Trade Control laws and shall not export, re-export, transfer, disclose or otherwise provide or make accessible the Equipment, Software, data or other information provided to Purchaser by ABB hereunder, to any non-U.S. person or entity (including Purchaser's dual and/or third-country national employees or third party contractors) without first complying with all requirements of the applicable Trade Control Laws. If Purchaser is a U.S. entity and is engaged in the business of either exporting or manufacturing (whether exporting or not) Defense Articles or furnishing Defense Services as defined in the ITAR, Purchaser represents that it shall maintain an active registration with the U.S. Department of State's Directorate of Defense Trade Controls ("DDTC"), as required by the ITAR, throughout the performance of this Contract, and that it maintains an effective export and import compliance program in accordance with the ITAR. If Purchaser is a U.S. entity and will export ABB's Equipment, Software, and/or data, Purchaser will be considered an exporter within the meaning of the U.S. export regulations. Therefore, ABB should not be listed as the exporter or U.S. Principal Party in Interest ("USPPI") on any documentation or filings relating to any export. Purchaser acknowledges it's acting on its own behalf and not as ABB's agent for export or any other purposes.

(c) Purchaser represents and warrants that the Equipment, Software and Services provided hereunder, and the "direct product" thereof are intended for civil use only and will not be used, directly or indirectly, for the production of chemical or biological weapons or of precursor chemicals for such weapons, or for any direct or indirect nuclear end use or any other end use prohibited by Trade Control Laws.

(d) Purchaser represents and warrants that: (1) neither Purchaser nor any Purchaser

Entity is included on any of the restricted party lists maintained by the U.S. Government, including the Specially Designated Nationals List administered by the U.S. Treasury Department's Office of Foreign Assets Control ("OFAC"), Denied Parties List, Unverified List or Entity List maintained by the U.S. Commerce Department's Bureau of Industry and Security ("BIS"), or the List of Statutorily Debarred Parties maintained by the U.S. State Department's Directorate of Defense Trade Controls, listed, the ITAR §126.1 Restricted Parties List, or the consolidated list of asset freeze targets designated by the United Nations, European Union, and United States or any similar list maintained by the European Union or European member state (collectively "Restricted Parties List"); and (2) no entity or person listed on the Restricted Parties List (or owned directly or indirectly, in whole or in part, by an entity or person on the Restricted Parties List) has any property, financial or other interest in the Equipment, Software or Services, and that the same shall not be transferred, reexported, disclosed to or otherwise provided to an entity or person on the Restricted Parties List. Purchaser shall notify ABB immediately if Purchaser or a Purchaser Entity becomes listed on the Restricted Party List.

(e) Purchaser shall notify ABB immediately upon awareness of any breach or suspected breach of this Article 19. Any violation of Purchaser's obligations under this Article 19 is a material breach of this Agreement and ABB reserves the right to terminate the Agreement immediately upon written notice for Purchaser's default. Purchaser shall indemnify, defend and hold harmless ABB, its officers, directors, employees, agents, affiliates, successors, and permitted assigns from and against all claims, causes of action, damages, liabilities, and expenses, including attorney's fees arising from Purchaser's breach of this Article 19 and any resulting termination of this Agreement.

(f) If agreed to by the Parties pursuant to a written statement of work or elsewhere in this Agreement, ABB shall file for a U.S. export license, but only after appropriate documentation for the license application has been provided by Purchaser. Purchaser shall furnish such documentation within a reasonable time after purchase order acceptance. Any delay in obtaining such license shall suspend performance of this Agreement by ABB. If an export license is not granted or, if once granted, is thereafter revoked or modified by the appropriate authorities, this Agreement may be canceled by ABB without liability for damages of any kind resulting from such cancellation. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

(g) When applicable, the party considered the exporter of the Equipment, Software, Services and/or data, will apply for the export license in compliance with all applicable Trade Control Laws. If ABB is the applicant of the export license, the Purchaser agrees to immediately provide all the necessary information and documentation (i.e. End-User/End-Use Certificate and Letter of Assurance) required to apply for the license. If an export license is denied or revoked, the applicant must notify the other party immediately and this Agreement may be terminated by ABB without liability for damages of any kind resulting from such termination.

20. Trade Controls

a) The Parties agree to comply with all applicable sanctions and export control laws in connection with this Agreement. Sanctions and export control laws and regulations include any applicable laws, regulations, or administrative or regulatory decisions or guidelines that sanction, prohibit or restrict certain activities including, but not limited to, (i) import, export, re-export, transfer, or transshipment of goods, services, technology, or software; (ii) financing of, in-vestment in, or direct or indirect transactions or dealings with certain countries, territories, regions, governments, projects, or specifically designated persons or entities, including any future amendments to these provisions; or (iii) any other laws, regulations, administrative or regulatory decisions, or guidelines adopted, maintained, or enforced by any Sanctions Agency on or after the date of the [purchase order] (collectively, "Trade Control Laws"). "Sanctions Agency" means any governmental or regulatory body, instrumentality, authority, institution, agency or court that promulgates or administers Trade Control Laws including, but not limited to, the aforementioned governmental and regulatory bodies of (i) the United Nations, (ii) the United States of America (including the U.S. Department of Treasury Office of Foreign Assets Control, U.S. Department of State and U.S. Department of Commerce), (iii) the European Union or (iv) Switzerland.

(b) The Parties confirm that they have not violated, shall not violate, and shall not cause the other Party to violate, any applicable Trade Control Laws. Each Party represents and warrants that, to the best of its knowledge, at the date of the [purchase Order] neither it, nor any of their respective directors or officers are a Restricted Person. Each Party agrees that it shall promptly notify the other Party if it becomes a Restricted Person. "Restricted Person" means any entity or person included on a list (including U.S. and EU lists) of targeted parties, blocked parties, or persons subject to asset-freezing or other restrictions introduced under any applicable Trade Control Laws (and includes any entity that is directly or indirectly owned fifty (50) percent or more, in the aggregate or individually, or otherwise controlled by any Restricted Person).

(c) If, as a result of Trade Control Laws issued or amended after the date of the [purchase order], including, but not limited to, (i) the Purchaser or the end-user is/becomes a Restricted Person, or (ii) any necessary export license or authorization from a Sanctions Agency is not granted, the performance by ABB or any of its affiliates becomes illegal or impracticable, ABB shall be entitled to either immediately suspend the performance of the affected obligation under the [purchase Order] until such time as ABB may lawfully discharge such obligation or unilaterally terminate the [purchase order] in whole or in part. ABB will not be liable to the Purchaser for any costs, expenses or damages associated with such suspension or termination of the [purchase order].

(d) The Parties undertake to obtain all the necessary licenses and/or permits from the competent authorities for the import or export, re-export, or in-country transfer of Equipment and Services, Equipment and Software, and the "direct product" thereof, that originate from the United States are subject to the U.S. Export Administration Regulations ("EAR") and must not be exported, re-exported, or transferred (in-country) without obtaining the necessary valid li-censes/authorizations of the competent US authorities. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

(e) The Purchaser represents and warrants that the Equipment and Services are for civil use only. The Purchaser further represents that it will not directly or indirectly sell, export, re-export, release, transmit or otherwise transfer any items received from ABB to any Restricted Parties, or parties that operate, or whose end use will be, in a jurisdiction/region prohibited by ABB including Belarus, Crimea, Cuba, Iran, North Korea, Russia, Syria, as well as the Donetsk, Luhansk, Kherson, and Zaporizhzhia regions of Ukraine (such list may be amended by ABB at any time).

(f) If the Purchaser infringes any obligations in this Trade Controls clause in connection with the [purchase order], the Purchaser must immediately notify ABB. Failure to comply with these Trade Compliance obligations shall be considered a material breach, and ABB shall have the right to unilaterally terminate the Agreement with immediate effect. Such termination would be without prejudice to all rights of recourse which could be exercised by ABB, and ABB shall not be liable to Purchaser for any claim, losses or damages whatsoever related to its decision to terminate performance under this provision. Further, Purchaser shall indemnify ABB for all liabilities, damages, costs, or expenses incurred as a result of any such violation, breach and/or termination of the Agreement. ABB may report such violations to relevant authorities as required by applicable Trade Control Laws.

(g) For the avoidance of doubt, no provision in this Agreement shall be interpreted or applied in a way that would require any Party to do, or refrain from doing, any act which would constitute a violation of, or result in a loss of economic benefit under, applicable Trade Control Laws.

21. Bribery and Corruption.

(a) Purchaser hereby warrants that it will not, directly or indirectly, and it has no knowledge that other persons will, directly or indirectly, make any payment, gift or other commitment to its customers, to government officials or to agents, directors and employees of ABB or any other party in a manner contrary to applicable laws (including but not limited to the Corruption of Foreign Public Officials Act (Canada), the Foreign Corrupt Practices Act (United States) and, where applicable, legislation enacted by member States and signatories implementing the OECD Convention Combating Bribery of Foreign Officials) and shall comply with all relevant laws, regulations, ordinances and rules regarding bribery and corruption.

(b) Nothing hereunder shall render ABB liable to reimburse Purchaser for any such consideration given or promised.

(c) Purchaser's material violation of any of the obligations contained in Article 20(a) above may be considered by Seller to be a material breach hereunder and shall entitle Seller to terminate this agreement with immediate effect and without prejudice to any further right or remedies on the part of Seller hereunder or applicable law. Purchaser shall indemnify Seller for all liabilities, damages, costs or expenses incurred as a result of any such violation of the above-mentioned obligations and termination of this agreement.

(d) Purchaser understands that Seller's Code of Conduct is available for consultation online at <http://www.abb.com/integrity>. Purchaser agrees to perform its contractual obligations hereunder with substantially similar standards of ethical behavior as those found in Supplier's Code of Conduct.

(e) Seller has established the following reporting channels where Purchaser and its employees may report suspected violations of applicable laws, policies or standards of conduct:

Web portal: www.abb.com/integrity

Telephone: number specified on the above Web portal

Mail: address specified on the above Web portal

22. Assignment.

Any assignment of this Agreement or of any rights or obligations under the Agreement without prior written consent of ABB shall be void.

23. Nuclear.

Equipment and Services sold hereunder are not intended for use in connection with any nuclear facility or activity, and Purchaser warrants that it shall not use or permit others to use Equipment or Services for such purposes, without the advance written consent of ABB. If, in breach of this, any such use occurs, ABB (and its parent, affiliates, suppliers and subcontractors) disclaims all liability for any nuclear or other damage, injury or contamination, including without limitation any physical damage to a nuclear facility itself, resulting from a nuclear incident and, in addition to any other rights of ABB, Purchaser shall indemnify and hold ABB (and its parent, affiliates, suppliers and subcontractors) harmless against all such liability including, but not limited to, any physical damage to the nuclear facility or surrounding properties, if any. Consent of ABB to any such use, if any, will be conditioned upon additional terms and conditions that ABB determines to be acceptable for protection against nuclear liability including but not limited to the requirement that the Purchaser and/or its end user customer shall have complete insurance protection against liability and property damage including without limitation physical damage to a nuclear facility itself or any surrounding properties, if any, resulting from a nuclear incident and shall indemnify ABB, its subcontractors, suppliers and vendors against all claims resulting from a nuclear incident including, but not limited to, any physical damage to the nuclear facility.

24. Resale.

If Purchaser resells any of the Equipment or Services, the sale terms shall limit ABB's liability to the buyer to the same extent that ABB's liability to Purchaser is limited hereunder. Additionally, if the end-user intends to use the Equipment or Services in connection with any nuclear facility or activity, the Purchaser shall require the end-user comply with the financial requirements under Price-Anderson Act (PAA) and secure a written release of liability which flows from the end-user to the benefit of ABB.

25. Environmental, Health and Safety Matters.

(a) Purchaser shall be obligated to maintain safe working conditions at its facility or location (the "Site"), including the implementing of appropriate procedures regarding Hazardous Materials, confined space entry, and energization and de-energization of power systems (electrical, mechanical and hydraulic) using safe and effective lock- out/tag-out ("LOTO") procedures including physical LOTO or a mutually agreed upon alternative method.

(b) Purchaser shall immediately advise ABB in writing of all applicable Site-specific health, safety, security and environmental requirements and procedures. Without limiting Purchaser's responsibilities hereunder, ABB has the right but not the obligation to, from time to time, review, audit and inspect applicable health, safety, security and environmental documentation, procedures and conditions at the Site.

(c) If, in ABB's reasonable opinion, the health, safety, or security of personnel or the Site is, or is likely to be, imperiled by security risks, the presence of or threat of exposure to Hazardous Materials, or unsafe working conditions, ABB may, in addition to other rights or remedies available to it, remove some or all of its personnel from Site, suspend performance of all or any part of the purchase order, and/or remotely perform or supervise work. Any such occurrence shall be considered a Force Majeure event. Purchaser shall reasonably assist in ensuring the safe departure of personnel from the Site.

(d) Purchaser shall not require or permit ABB's personnel to operate Purchaser's equipment at Site.

(e) Purchaser will make its Site medical facilities and resources reasonably available to ABB personnel who need medical attention.

(f) ABB has no responsibility or liability for the pre-existing condition of Purchaser's equipment or the Site, which is the sole responsibility of Purchaser. Prior to ABB starting any work at Site, Purchaser will provide documentation that identifies the presence and condition of any Hazardous Materials existing in or about Purchaser's equipment or the Site that ABB may encounter while performing under this Agreement. The provision of such documentation shall in no way release Purchaser from its responsibility for said conditions. Purchaser shall disclose to ABB industrial hygiene and environmental monitoring data regarding conditions that may affect ABB's work or personnel at the Site. Purchaser shall keep ABB informed of changes in any such conditions.

(g) ABB shall promptly notify Purchaser if ABB becomes aware of: (i) conditions at the Site differing materially from those disclosed by Purchaser, or (ii) previously unknown physical conditions at Site differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Agreement. If any such conditions cause an increase in ABB's cost of, or the time required for, performance of any part of the work under the Agreement, an equitable adjustment in price and schedule shall be made.

(h) If ABB encounters Hazardous Materials in Purchaser's equipment or at the Site that require special handling or disposal, ABB is not obligated to continue work affected by the hazardous conditions. In such an event, Purchaser shall at its sole cost and expense eliminate the hazardous conditions in accordance with applicable laws and regulations so that ABB's work under the Agreement may safely proceed, and ABB shall be entitled to an equitable adjustment of the price and schedule to compensate for any increase in ABB's cost of, or time required for, performance of any part of the work. Purchaser shall properly store, transport and dispose of all Hazardous Materials introduced, produced or generated in the course of ABB's work at the Site. (i) Purchaser shall indemnify ABB for any and all claims, damages, losses, and expenses arising out of or relating to any Hazardous Materials which are or were (i) present in or about Purchaser's equipment or the Site prior to the commencement of ABB's work, (ii) improperly handled or disposed of by Purchaser or Purchaser's employees, agents, contractors or subcontractors, or (iii) brought, generated, produced or released on Site by parties other than ABB.

26. Confidentiality.

a) ABB and Purchaser (as to information disclosed, the "Disclosing Party") may each provide the other party (as to information received, the "Receiving Party") with Confidential Information in connection with this Agreement. "Confidential Information" means (a) information that is designated in writing as "confidential" or "proprietary" by Disclosing Party at the time of written disclosure, and (b) information that is orally designated as "confidential" or "proprietary" by Disclosing Party at the time of oral or visual disclosure and is confirmed to be "confidential" or "proprietary" in writing within fifteen (15) days after the oral or visual disclosure. In addition, prices for Products and Services shall be considered ABB's Confidential Information.

(b) Receiving Party agrees: (i) to use the Confidential Information only in connection with the Agreement and use of Products and Services, (ii) to take reasonable measures to prevent disclosure of the Confidential Information to third parties, and (iii) not to disclose the Confidential Information to a competitor of Disclosing Party. Notwithstanding these restrictions, each party shall permit access to the other's Confidential Information only to its employees who: (i) reasonably require access to Confidential Information for purposes approved by this Agreement, and (ii) have undertaken a binding obligation of confidentiality with respect to the confidential information of others entrusted to him or her, and (iii) have been apprised of the confidentiality obligations hereunder. ABB may disclose Confidential Information to its affiliates and subcontractors in connection with performance of the purchase order. A Receiving Party may only disclose Confidential Information to any other third party with the prior written permission of Disclosing Party, and in each case, only so long as the Receiving Party obtains a non-disclosure commitment from any such third party that prohibits disclosure of the Confidential Information and provided further that the Receiving Party remains responsible for any unauthorized use or disclosure of the Confidential Information. Receiving Party shall upon request return to Disclosing Party or destroy all copies of Confidential Information except to the extent that a specific provision of the Agreement entitles Receiving Party to retain an item of Confidential Information. ABB may also retain one archive copy of Purchaser's Confidential Information.

(c) The obligations under this Article 25 shall not apply to any portion of the Confidential Information that: (i) is or becomes generally available to the public other than as a result of disclosure by Receiving Party, its representatives or its affiliates; (ii) is or becomes available to Receiving Party on a non-confidential basis from a source other than Disclosing Party when the source is not, to the best of Receiving Party's knowledge, subject to a confidentiality obligation to Disclosing Party; (iii) is independently developed by Receiving Party, its representatives or affiliates, without reference to the Confidential Information; (iv) is required to be disclosed by law or valid legal process provided that the Receiving Party intending to make disclosure in response to such requirements or process shall promptly notify the Disclosing Party in advance of such disclosure and reasonably cooperate in attempts to maintain the confidentiality of the Confidential Information.

(d) As to any individual item of Confidential Information, the restrictions under this Article 25 shall expire five (5) years after the date of disclosure. This Article 25 does not supersede any separate confidentiality or nondisclosure agreement signed by the parties.

27. Non-Survival.

The following Articles shall not survive termination or cancellation of this Agreement: 5, 7, 8, 17 and 18. All other Articles shall survive the termination or cancellation of the Agreement.

28. Entire Agreement.

This Agreement constitutes the entire agreement between ABB and Purchaser. There are no agreements, understandings, restrictions, warranties, or representations between ABB and Purchaser other than those set forth herein or herein provided. As stated in Article 1 of this Agreement, ABB's Proposal, policies, addendum(s), if any, submitted to Purchaser, shall control over any conflicting terms. ABB specifically rejects any exceptions to this Agreement, Proposals, policies, and/or addendum(s) on the face of any purchase order. Purchaser shall advise ABB in writing of all conflicts, errors, omissions, or discrepancies among the Proposal, Policies, Addendum(s) and this Agreement immediately upon discovery. This Agreement shall supersede any standard, preprinted terms and conditions that are automatically attached to purchase orders issued by Purchaser.

29. US Government Contracts.

This Article 28 applies only if the Agreement is for the direct or indirect sale, or is funded in whole or in part by, an agency of the U.S. federal government, or a state government, or any other U.S. government instrumentality or political subdivision (collectively "U.S. government entity"). Unless otherwise expressly stated and specifically agreed in ABB's Proposal:

(a) Purchaser agrees that:

(i) all Equipment, Software, and Services provided by ABB meet the definition of "commercial-off-the-shelf" ("COTS") or "commercial product" or "commercial service" or "commercial computer software" as those terms are defined in Federal Acquisition Regulation ("FAR") 2.101.

(ii) ABB technical data and computer software are developed at ABB's private expense and not in performance of the Agreement. ABB retains ownership and proprietary rights in all technical data and computer software provided to Purchaser under the Agreement and under a U.S. Government contract or subcontract. Neither the Purchaser, the U.S. Government nor any higher-tier contractor under a U.S. Government contract will obtain any rights in ABB technical data or computer software beyond the rights provided under ABB's standard commercial licenses consistent with FAR 12.211 and 12.212.

(iii) to the extent the Buy American Act (41 U.S.C. §§ 8301 – 8305, as amended), Trade Agreements Act (19 U.S.C. §§ 2501 – 2581, as amended), Build America, Buy America (Pub. L. 117-58, December 29, 2022, as amended) or other domestic preference requirements are applicable to this Agreement, the country of origin of Equipment or Software is unknown.

(iv) the version of any applicable FAR clause listed in this Article 28 shall be the one in effect on the effective date of this Agreement.

(b) If Purchaser is an agency of the U.S. Government, then as permitted by FAR 12.302, Purchaser agrees that:

(i) all paragraphs of FAR 52.212-4 (except those listed in 12.302(b)) are replaced with these Terms and Conditions.

(ii) only the clauses identified in FAR 52.212-5 apply and only to the extent applicable for sale of COTS and/or commercial products and/or commercial services and as appropriate for the purchase order price.

(iii) any Services offered by ABB are exempt from the Service Contract Act of 1965 (41 U.S.C. §§ 6701 - 6707, as amended).

(iv) all other U.S. Government agency contract provisions are rejected.

(c) If Purchaser is procuring as a contractor, or subcontractor at any tier, on behalf of an agency of a U.S. government entity, then Purchaser agrees that:

(i) only the clauses identified in FAR 52.212-5(e)(1) or 52.244-6(c)(1) (whichever is applicable) apply and only to the extent applicable for sale of COTS and/or commercial products and/or services and as appropriate for the purchase order price.

(ii) Purchaser shall notify ABB prior to transmitting any Controlled Unclassified Information ("CUI") to ABB, and only upon written authorization by ABB may Purchaser transmit CUI to ABB. Purchaser shall transmit CUI to ABB in accordance with applicable CUI safeguarding and/or dissemination authority requirements.

(iii) prevailing wage and related public works labor and employment laws or regulations are not applicable to ABB's services offered in the Proposal.

(iv) Purchaser is solely responsible for its obligations to its customer(s), including validating that ABB's Proposal fulfills Purchaser's U.S. Government contracting obligations, if any. To the extent the terms and conditions of Purchaser's customer contract(s) are different from the terms and conditions of this Agreement, Purchaser shall defend, indemnify and hold ABB harmless from and against all losses, liabilities, cost, expense (including attorney's fees and expenses of litigation and/or settlement), damages, allegations, claims, causes of action and judgments resulting from such difference. In no event will Purchaser withhold payment due to ABB for any dispute or liability incurred between Purchaser and its customer(s).

30. Data Protection.

(a) The parties agree that the protection of Personal Data is very important. If Purchaser discloses Personal Data to ABB, ABB shall comply with all applicable data protection laws and regulations. Purchaser shall comply with all applicable data protection laws and regulations in respect of any Personal Data it receives from ABB in the course of receiving the Equipment or Services.

(b) The parties agree that neither will withhold or delay its consent to any changes to this clause which are required to be made in order to comply with applicable data protection laws and regulations and/or with guidelines and order from any competent supervisory authority, and their application to the Equipment or Services from time to time, and agrees to implement any such changes at no additional cost to the other party.

(c) The parties acknowledge that the processing of Personal Data in accordance with this purchase order may require the conclusion of additional data processing agreements or additional data protection agreements. If and to the extent such additional data processing agreements or additional data protection agreements are not initially concluded as part of the purchase order, the parties shall, and shall ensure that their relevant affiliates or subcontractors shall, upon the other's request promptly enter into any such agreement with an affiliate, as designated by the other party and as required by mandatory law or a competent data protection or other competent authority.

VBE-2
VBE PARTICIPATION SUBMITTAL

Bidder/Offerer: I.B. Abel, Inc. **Solicitation # :** DGS C-0948-0090 P3.4

Solicitation Title: Capitol Complex Central Plant - Building Reno. Chiller System Rep

Discipline: .4 Electrical (.1 GC, .2 HVAC, .3 Plumbing, or .4 Electrical)

Base Bid: 1.00 (identify the corresponding Base Bid for this VBE Participation Submittal)

CHECK ONE, AND ONLY ONE, BOX. FAILURE TO COMPLY WILL RESULT IN REJECTION OF YOUR BID/PROPOSAL.

Click on bold titles to navigate to that specific page.

☐ **I agree to meet the VBE participation goal in full.**
I have completed and am submitting with my bid or proposal a **VBE Utilization Schedule (VBE-3)**, which is required in order to be considered for award.

☐ **I am requesting a partial waiver of the VBE participation goal.**
After making good faith outreach efforts as more fully described in the **Guidance for Documenting Good Faith Efforts to Meet the VBE Participation Goal**, I am unable to achieve the total VBE participation goal for this solicitation and am requesting a partial waiver of the VBE 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. a **VBE Utilization Schedule (VBE-3)** for that portion of the VBE participation goal that I will meet; AND
2. a **Good Faith Efforts Waiver Request** for the portion of the VBE participation goals that I am unable to meet.

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

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

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

VBE-3 VBE UTILIZATION SCHEDULE

Bidder/Offeror: I.B. Abel, Inc.

Solicitation # : DGS C-0948-0090 P3.4 **Solicitation Title:** Capitol Complex Central Plant - Building Reno. Chiller

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

VBE Name SAP Vendor Number (6-digit number provided by VBE) VBE Verification Number (located on DGS VBE verification)	Type of VBE (check all that apply)	Description of Work to be Performed (Statement of Work/Specification reference)	% Commitment (or % of work to be self-performed by VBE bidder/offeror)	Dollar Value of Commitment (after applying any calculation per VBE-1, Section IV, Calculating VBE participation)
Name: <u>Veterans R Us</u> SAP Vendor Number: <u>123456</u> VBE Verification Number: <u>123456-2023-VBE</u>	VBE	staffing resources	%	\$
Name: Schneider SAP Vendor Number: VBE Verification Number:	☒ VBE ☐ SDVBE		%	
Name: Perry County SAP Vendor Number: VBE Verification Number:	☐ VBE ☐ SDVBE		%	
Name: Manna Supply SAP Vendor Number: VBE Verification Number:	☐ VBE ☐ SDVBE		%	
Name: SAP Vendor Number: VBE Verification Number:	☐ VBE ☐ SDVBE		%	
Attach additional sheets if necessary			Total % VBE commitment: <u>0</u>	Total \$ amount: <u>0</u>

VBE-3.1
LETTER OF COMMITMENT

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

Solicitation #: _____ Solicitation Title: _____

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

Services/Supplies and Time Frame. If Bidder/Offeror is the successful vendor, the VBE 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 VBE will provide:	
Specific Time Frame the VBE 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 VBE-3
	(c)	(d)	(c) x (d) = (e)
VBE Subcontractor - performs at least 50% of the value of the subcontract with its own forces		100%	
VBE Manufacturer - produces on premise material, supplies, articles, or equipment required for contract.		100%	
VBE Stocking Suppliers - maintains materials on premises that are bought and stored and required for the contract.		60%	
VBE Non-stocking Supplier - Service Fee Only - Does not carry inventory.		100%	

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

Sincerely,

Acknowledged

Printed name

Printed name

Bidder/Offeror Point of Contact Signature

VBE Point of Contact Signature

** The work performed by a firm that is dually verified as both an SDB and 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. See SDB-1 Instructions, Section II, Paragraph 4 for example of how work performed by a firm that is dually verified is credited.*

VBE-5

GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF VBE PARTICIPATION GOAL

Project Description:	Capitol Complex Central Plant - Building Reno. Chiller System Replacement and Electrical System Upgrades
Commonwealth Agency Name:	DGS
Solicitation #:	DGS C-0948-0090 P3.4
Solicitation Due Date and Time:	1/20/26 2:00 pm

Bidder/Offeror Company Name:	I.B. Abel, Inc.
Bidder/Offeror Contact Name:	Mat Robinson
Bidder/Offeror Contact Email:	mrobinson@ib-abel.com
Bidder/Offeror Contact Phone Number:	(717) 451-6179

Part 1 – Identified Items of Work Offeror Made Available to VBEs

Identify those items of contract work that the Offeror made available to VBEs. This includes, where appropriate, those items the Offeror identified and subdivided into economically feasible units to facilitate the VBE participation. For each item listed, show the anticipated percentage of the total contract cost. Offeror must demonstrate that enough work to meet the VBE participation goal was made available to VBEs, and the total percentage of the items of work identified for VBE participation met or exceeded the VBE 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 VBE Firms? If not, explain why.
Excavating, Rigging, Testing, Equipment	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no

Attach additional sheets if necessary.

VBE-5

GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF VBE PARTICIPATION GOAL

Part 2 – Identified VBEs and Record of Solicitations

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

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

Name of Identified VBE 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
VBE Name: NCE Testing ☐ VBE ☐ SDVBE	Electrical Testing	Date: 12/8/25 ☐ mail ☒ email ☐ fax	Date: 12/17/25 ☐ mail ☒ email ☐ fax	Date and Time of Call: 1/8/26 12:00 am Spoke with: Robert Maceenia Left Message:	☐ yes ☐ no	☐ yes ☐ no	☐ Used other VBE ☐ Used non-VBE ☐ Self performing
VBE Name: Keystone ☐ VBE ☐ SDVBE	Equipment	Date: 12/8/25 ☐ mail ☒ email ☐ fax	Date: 12/17/25 ☐ mail ☒ email ☐ fax	Date and Time of Call: 12/11/25 12:00 am Spoke with: Rob Stern Left Message:	☐ yes ☐ no	☐ yes ☐ no	☐ Used other VBE ☐ Used non-VBE ☐ Self performing

Attach additional sheets as necessary.

VBE-5
GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF
VBE PARTICIPATION GOAL

Part 3 – VBE Outreach Compliance Statement

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

- Stocking supplies for fire alarm parts and smarts
- Stocking suppliers for electrical materials
- Stocking suppliers for electrical equipment
- Excavation
- Rigging

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

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

Emails, phone calls

4. Bonding Requirements (Please Check One):

☐

This project does not involve bonding requirements.

☐

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

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

☐

Offeror did attend the pre-Bid/Proposal conference or Supplier Forum

☐

No pre-Bid/Proposal conference or Supplier Forum was held

☐

Offeror did not attend the pre-Bid/Proposal conference or Supplier Forum

VBE-5

GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF VBE PARTICIPATION GOAL

Part 4 – Additional Information Regarding Rejected VBE Quotes

This form must be completed if Part 2 indicates that a VBE quote was rejected because the Offeror is using a non-VBE or is self-performing the Identified Items of Work. List the Identified Items of Work, state whether the work will be self-performed or performed by a non-VBE, and if applicable, state the name of the non-VBE firm. Also include the names of all VBEs and non-VBE firms that provided a quote and the amount of each quote.

Describe Identified Items of Work not being performed by VBEs (include specific section from bid or proposal)	Self-performing or using non-VBE (provide name of non-VBE if applicable)	Amount of non-VBE quote \$	Name of other firms that provided quotes and whether they are VBE	Amount quoted \$	Reason why VBE quote was rejected along with brief explanation
Electrical Testing	☐ self-performing ☐ using Non-VBE Name: Qualas	\$ 86,625	☐ VBE ☐ Non-VBE Name: Tactical Testing	\$ 184,900	☐ price ☐ capabilities ☐ other Qualas was lower than Tactical Testing. No VBE quotes were received to compare pricing
Security	☐ self-performing ☐ using Non-VBE Name: Schneider	\$ 9,100	☐ VBE ☐ Non-VBE Name: n/a	\$ 0	☐ price ☐ capabilities ☐ other Proprietary as per RFP documents
Fire Alarm	☐ self-performing ☐ using Non-VBE Name: Siemens	\$ 9,850	☐ VBE ☐ Non-VBE Name: n/a	\$ 0	☐ price ☐ capabilities ☐ other Proprietary as per RFP documents
Excavating	☐ self-performing ☐ using Non-VBE Name: Perry County	\$ 79,250	☐ VBE ☐ Non-VBE Name: n/a	\$ 0	☐ price ☐ capabilities ☐ other Received no quotes from VBE excavating
Equipment	☐ self-performing ☐ using Non-VBE Name: Manna Supply	\$ 2,676,240	☐ VBE ☐ Non-VBE Name: Keystone	\$ 8,995,964	☐ price ☐ capabilities ☐ other Price was lower from a different supplier

Attach additional sheets as necessary.

VBE-5
GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF
VBE PARTICIPATION GOAL

Part 5 – VBE Subcontractor Unavailability Certificate

1. It is hereby certified that the firm of _____
(Name of VBE)

located at _____
(Number) (Street)

(City) (State) (Zip)

was offered an opportunity to bid on Solicitation No. _____

by _____
(Name of Bidder/Offeror's Firm)

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

(Signature of VBE's Representative) (Title) (Date)

(DGS VBE Certification #) (Telephone #)

***** 3.
If the VBE does not complete this form, the bidder.offeror must complete the following:

To the best of my knowledge and belief, the above-listed VBE is either unavailable for the work/service
for this project, is unable to prepare a Proposal, or did not respond to a request for a price Proposal and
has not completed the above portion of this submittal.

(Signature of Bidder/Offeror) (Title) (Date)

Arijana Cooper

From: Arijana Cooper
Sent: Monday, December 8, 2025 9:35 AM
Cc: Mathew Robinson; Jason Vansickle
Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

I.B. Abel, Inc. is currently seeking SBD/VBE participation for applicable UNSPSC codes related to the P3.4 scope of electrical work for the DGS C-0948-0090 P3.4 Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

This includes:

- Stocking supplies for fire alarm parts and smarts
- Stocking suppliers for electrical materials
- Stocking suppliers for electrical equipment
- Excavation
- Rigging
- Project Management

Please review the project information provided below, along with the link to the project documents:

<https://ib-abel.sharefile.com/public/share/web-sbd01e338ab6747b3b907b7e83f5b63bc>

Kindly confirm your intent to participate or decline this opportunity by **Friday, December 19, 2025**.

Should you have any questions or require additional information, please don't hesitate to reach out. Mat Robinson is the lead estimator and his contact information is:

MRobinson@ib-abel.com

717-451-6179

Thank you for your time and consideration.

Project: Project No. the **DGS C-0948-0090 P3.4** Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Harrisburg, PA 17110

Bid Opening Date and Time: 12/29/2025

Brief Description: The project consists of upgrades, relocations and replacement of various building, HVAC and electrical systems and components associated with the existing 8,600 ton Central Chiller Plant serving the PA State Capitol Complex. To support the electrical equipment replacement and reconfiguration an underground electrical vault will be constructed and connected to the existing chiller plant, via an underground tunnel.

Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

AC

Arijana Cooper

To

Cc

Bcc

Mathew Robinson; Jason Vansickle

'tmarenco@battagassoc.com'; 'jennifer.moses@zitomedia.com'; 'mljordan@zoominternet.net'; 'pcep@pa.net'; 'gundyexca@yahoo.com'; Brion Martin - Manna Supply, Inc. (brion.martin@mannasupply.com); Janell Butorac - J Sterling Solutions LLC (janell@sterlingdistr.com); 'amy@allaccessrigging.com'; Kenneth Dupree - Unique Harmony Consultants LLC (kdupree@uniqueharmonyconsultantsllc.com)

Reply

Reply All

Forward

Mon 12/8/2025 9:35 AM

Arijana Cooper

From: Arijana Cooper
Sent: Friday, December 12, 2025 7:31 AM
Cc: Mathew Robinson; Jason Vansickle
Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Good morning,

Please note the bid due date has been extended. Addendum 3 and 4 have been added to the project share folder.

I.B. Abel, Inc. is currently seeking SBD/VBE participation for applicable UNSPSC codes related to the P3.4 scope of electrical work for the DGS C-0948-0090 P3.4 Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

This includes:

- Stocking supplies for fire alarm parts and smarts
- Stocking suppliers for electrical materials
- Stocking suppliers for electrical equipment
- Excavation
- Rigging
- Project Management

Please review the project information provided below, along with the link to the project documents:

<https://ib-abel.sharefile.com/public/share/web-sbd01e338ab6747b3b907b7e83f5b63bc>

Kindly confirm your intent to participate or decline this opportunity by **Friday, December 19, 2025**.

Should you have any questions or require additional information, please don't hesitate to reach out. Mat Robinson is the lead estimator and his contact information is:

MRobinson@ib-abel.com

717-451-6179

Thank you for your time and consideration.

Project: Project No. the **DGS C-0948-0090 P3.4** Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Harrisburg, PA 17110

Bid Opening Date and Time: 01/12/2026

Brief Description: The project consists of upgrades, relocations and replacement of various building, HVAC and electrical systems and components associated with the existing 8,600 ton Central Chiller Plant serving the PA State Capitol Complex. To support the electrical equipment replacement and reconfiguration an underground electrical vault will be constructed and connected to the existing chiller plant, via an underground tunnel.

Arijana Cooper

From: Microsoft Outlook
To: robstern7@aol.com; jennifer.moses@zitomedia.com; mljordan@zoominternet.net; pcep@pa.net; gundyexca@yahoo.com; brion.martin@mannasupply.com; janell@sterlingdistr.com; amy@allaccessrigging.com; kdupree@uniqueharmonyconsultantsllc.com; jgormley@ncetest.com; bjmessina@ncetest.com
Sent: Friday, December 12, 2025 7:32 AM
Subject: Relayed: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

robstern7@aol.com

jennifer.moses@zitomedia.com

mljordan@zoominternet.net

pcep@pa.net

gundyexca@yahoo.com

brion.martin@mannasupply.com

janell@sterlingdistr.com

amy@allaccessrigging.com

kdupree@uniqueharmonyconsultantsllc.com

jgormley@ncetest.com

bjmessina@ncetest.com

Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Arijana Cooper

From: Microsoft Outlook
To: tmarenco@battagassoc.com
Sent: Friday, December 12, 2025 7:31 AM
Subject: Relayed: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

tmarenco@battagassoc.com

Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Arijana Cooper

From: Mathew Robinson
Sent: Friday, January 9, 2026 1:04 PM
To: pcep@pa.net
Cc: Arijana Cooper
Subject: Re: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
Addendum 11 has been uploaded. Our bid is now due on the 20th. Please verify but I see no changes to the project other than due date pertaining to addendums 9-11. Please send your pricing by EOB the 14th.

<https://ib-abel.sharefile.com/public/share/web-s39c36c308ba94e1492b09558f0848215>

Thank you,
Mat

Mathew Robinson
Senior Estimator
Mobile: 717-451-6179
www.ib-abel.com

 **24/7 Service & Support 717-845-1639**

From: Mathew Robinson <mrobinson@ib-abel.com>
Sent: Thursday, January 08, 2026 11:39 AM
To: pcep@pa.net <pcep@pa.net>
Cc: Arijana Cooper <arijana.cooper@ib-abel.com>
Subject: Re: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
Addendum 8 has been uploaded. Our bid is still due on the 13th. Please send your pricing to us as soon as you can.

<https://ib-abel.sharefile.com/public/share/web-s59e439513e364d9982fdbec9f38d6e52>

Thank you,
Mat

Mathew Robinson
Senior Estimator
Mobile: 717-451-6179
www.ib-abel.com

24/7 Service & Support 717-845-1639

From: Mathew Robinson <mrobinson@ib-abel.com>
Sent: Tuesday, December 30, 2025 6:32 AM
To: pcep@pa.net <pcep@pa.net>
Cc: Arijana Cooper <arijana.cooper@ib-abel.com>
Subject: Re: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
Addendum 6 and 7 have been uploaded to the sharefile. Let me know if you plan to attend the additional walk through.

<https://ib-abel.sharefile.com/public/share/web-sb015c2e830bb4b8aa778671c76f83b15>

Thank you,
Mat

Mathew Robinson
Senior Estimator
Mobile: 717-451-6179
www.ib-abel.com

24/7 Service & Support 717-845-1639

From: Mathew Robinson <mrobinson@ib-abel.com>
Sent: Thursday, December 18, 2025 2:15 PM
To: pcep@pa.net <pcep@pa.net>
Cc: Arijana Cooper <arijana.cooper@ib-abel.com>
Subject: Fw: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
We are currently bidding the above referenced project in Harrisburg, PA. We would like to get a quote for the Excavation from you. The attached drawings are for your use. The link below contains the spec's and all bidding information pertaining to the project. This information is for your use. Our pricing is due 1/13/26. We would like your quote by EOB 1/09/26. With the Holidays and company schedules please confirm timing of this quote.

Notes:

Prevailing wage determination is located in the project manual of the link provided.
We will probably build the duct bank as an assembly and lower into the excavation. Including the rebar.
Please provide concrete for the duct bank and reinstalled exterior light poles.
~~Plan to form and pour the light pole bases.~~
Test bores, soil composition, and other information are contained in the project manual and specs through the link below.
Highlighted routing and footages are approx.
The grounding triads scale out to be about 4'6" per side however please plan on 10' per side of excavation.

<https://ib-abel.sharefile.com/public/share/web-sfc805706b3604cf9878bf5c74cb93974>

If you have any questions please contact me directly.

Thank you,

Mat

Mathew Robinson

Senior Estimator

Mobile:717-451-6179

www.ib-abel.com



☎ 24/7 Service & Support 717-845-1639



January 5, 2026

I B Abel Inc.
2745 Black Ridge Road
York, PA 17406-7920

Attention: Mathew Robinson

Subject: 2508324 I.B. Abel - DGS Central Plant Proposal

Reference:

Dear Mathew,

Qualus Services, LLC appreciates this opportunity to be of service to I B Abel Inc. After careful review, it is our pleasure to submit this proposal for your consideration. The execution strategy described in this proposal has been prepared to define the scope of work and overall approach that Qualus intends to follow throughout the execution of this project.

Staffed with experienced engineers, field service technicians, operational professionals, and outfitted with the most up-to-date software and equipment, Qualus prides itself on being at the forefront in terms of industry standards, testing and design capabilities, and quality assurance processes. Our proven business philosophy is to invest in building long-term relationships with our clients based on our strong client-centric culture emphasizing safety, quality, and project execution track record.

We appreciate the opportunity to work with you on this project. If you have any questions or concerns, please contact me at 410-344-0300 or by email at JP.Shoop@QualusCorp.com

Sincerely,

JP Shoop
Account Manager

TABLE OF CONTENTS

PROJECT SUMMARY.....3

HSSE & HUMAN PERFORMANCE.....3

ABOUT QUALUS.....3

EQUIPMENT SCOPE.....4

WORK SCOPE.....6

CLARIFICATIONS 13

CUSTOMER RESPONSIBILITIES 14

PROJECT SCHEDULE 14

PROJECT PRICING 14

PROPOSAL ACCEPTANCE.....15

TERMS & CONDITIONS.....15

PROJECT SUMMARY

NETA Acceptance Testing at Capitol Complex - Central Chiller Plant. 7th Street / Soldier's Grove. Dauphin County. City of Harrisburg.

HSSE & HUMAN PERFORMANCE

Safety First, We All Own It is a core value and a top priority for all projects. Qualus operates with a strict zero-tolerance policy when it comes to non-compliance of safety protocols. In addition to our Corporate Safety Manual and our Life Saving Rules, a site-specific safety plan will be created, tailored, and distributed to meet the specific needs and challenges of the project. Our teams also utilize Job Task Hazard Analyses and HP utilization checklists to ensure that we maintain our heightened state of awareness when it comes to your infrastructure. Any elements of your programs not covered in our standards will be included as a requirement in the working conditions.

ABOUT QUALUS

Qualus is a leading pure-play power services firm and innovator at the forefront of the energy transition and transformation, with differentiated capabilities across grid modernization, resiliency, security, and sustainability. The firm partners with utilities, commercial, industrial, data center, and government clients, and renewable and energy storage developers, offering comprehensive solutions through boutique and integrated advisory, planning, engineering, digital solutions, program management, and specialized field services. Qualus also provides software and technology enabled services and develops breakthrough solutions for critical power industry challenges such as distributed and variable resource integration, emergency management, and secure data exchange. The firm has nearly 1,600 professionals, with offices throughout the U.S. and Canada.

EQUIPMENT SCOPE

Relocated Existing 10MVA Unit Substations (x2)

Relays:

51,51G 2

51 2

81,47,27,59 2

Instrument Transformers

CT 6

PT 2

Meters (Schneider Electric PM8000) 2

MDS15' - 1200A 15KV Switchgear 1

Vacuum Circuit Breakers 7

CT 22

PT 4

Lightning Arresters 2

Relays:

50/51,50G 4

51 2

51,50G 2

87B 2

25 1

81,47,27,59 2

Meters (Schneider Electric ION 9000T) 2

Meters (Schneider Electric PM8000) 4

MDS5' - 2000A 5KV Switchgear 1

5KV Main Disconnects 2

5KV Fused Disconnects 5

Lightning Arresters 2

CT 5

Meters (Schneider Electric PM8000) 5

12.47KV:480/277V Unit Substation XFMR	2
3500kVA 12.47KV-480Y/277V XFMR	2
480V Draw-Out Circuit Breakers	3
Meters (Schneider Electric PM8000)	3
MTM2' 5000A 480V Switchgear	1
480V Draw-Out Circuit Breakers	9
Meters (Schneider Electric PM8000)	8
MTM1' 3200A 480V Switchgear	1
480V Draw-Out Circuit Breakers	5
Meters (Schneider Electric PM8000)	4
CT	2
Cables / Busway	
15KV Cable Set	8
5KV Cable Set	4
2000A 4.16KV Busway	2
LV Cable Sets #3 AWG & Larger	24
LV Busway	4
LV Panels	14
Small Transformers	1
600A Circuit Breaker in 'MDS2'	1
LV Disconnects	4
LV CB > 225 Amp (MDP-NE, PP, LR)	3
Grounding System	1

NOTE: UPS, VFD, Existing and Relocated equipment is not included in this proposal.

WORK SCOPE

Qualus Services (Qualus) will provide the required technical labor, supervision, basic equipment, consumable materials, and engineering services to perform the following scope of work:

CABLES, MEDIUM AND HIGH VOLTAGE CABLE

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage, where visible and safely accessible.
2. Verify tightness of bolted electrical connections with a calibrated torque wrench, where possible.
3. Inspect compression applied connectors for correct cable match and indentation, where visible.
4. Inspect shield grounding, cable supports and terminations. (See note below)
5. Where applicable, verify that visible cable bends meet or exceed ICEA and manufacturer's bending radius, where visible (See note below)
6. If cables are terminated through window type current transformers, inspect to verify that neutral and ground conductors are correctly placed and that shields are correctly terminated for operation of protective devices, where visible.
7. Inspect for correct identification and arrangements, where visible. (See note below)
8. Inspect cable jacket insulation and condition, where visible. (See note below)

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Insulation resistance test on each conductor with all other conductors and shield grounded.
3. Shield continuity test on each cable.
4. Perform very low frequency (VLF) dielectric withstand voltage test.
 - All cables must be outside of manholes for testing. Qualus Services will not enter manholes with energized conductors. Electrical contractors are responsible for disconnecting and re-connection of cables.

CABLES, LOW VOLTAGE, 600-VOLT MAXIMUM (#3AWG and larger)

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Verify tightness of bolted electrical connections with a calibrated torque wrench (where possible).
3. Inspect compression applied connectors for correct cable match and indentation, where visible.
4. Inspect for correct identification and arrangements, where visible.
5. Inspect cable jacket insulation and condition, where visible.

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Insulation resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable for 1 minute.
3. Continuity tests to ensure correct cable connection.
 - Electrical contractor is responsible for disconnecting and re-connection of cables.

DRY TYPE TRANSFORMERS (500KVA and greater)

A. Perform the following mechanical inspections

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment and grounding.
3. Verify that resilient mounts are free and that any shipping brackets have been removed.
4. Verify tightness of bolted electrical connections with a calibrated torque wrench.
5. Verify that as-left tap connections are as specified.
6. Verify that cooling fans operate and that fan motors have correct overcurrent protection.
7. Verify the presence of surge protection.

B. Perform the following electrical testing

1. Resistance measurements through bolted electrical connections.
2. Insulation resistance tests winding to winding and each winding to ground (where possible).
3. Calculate the polarization index.
4. Turns ratio and winding resistance test on all tap positions.
5. Test surge arresters.

MEDIUM VOLTAGE, METAL ENCLOSED AIR SWITCHES

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Inspect anchorage, alignment, grounding, and required clearances.
3. Verify correct blade alignment, blade penetration, travel stops and mechanical operation.
4. Verify that fuses sizes and types are in accordance with drawings, and all engineered studies.
5. Verify that expulsion limiting devices are in place on all holders having expulsion type elements.
6. Verify that each fuse has adequate mechanical support and contact integrity.
7. Verify tightness of bolted electrical connections with a calibrated torque wrench.
8. Verify operation and sequencing of interlocking systems.
9. Verify correct barrier installation.
10. Verify correct operation of all indicating and control devices.
11. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.
12. Verify operation of heaters when safely possible.

B. Perform the following electrical testing

1. Resistance measurements through bolted connections.
2. Measure contact resistance across each switchblade and fuse holders.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. Dielectric withstand voltage test.
5. Measure fuse resistance.

MEDIUM VOLTAGE VACUUM CIRCUIT BREAKERS

A. Perform the following mechanical inspections

1. Visually inspect for signs of physical damage.
2. Inspect anchorage, alignment and grounding.
3. Mechanical operator test in accordance with manufacturer's published data, if applicable.
4. Measure critical distances such as contact gap on the operating mechanism in accordance with
5. manufacturer's published data.
6. Verify tightness of bolted electrical connections with a calibrated torque wrench.
7. Verify cell fit and element alignment.
8. Verify racking mechanism operation.
9. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.
10. Verify operation of heaters.
11. Record as-left operation counter readings.

B. Perform the following electrical testing

1. Resistance measurements through bolted connections.
2. Contact/pole resistance test.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. Minimum pickup voltage tests on trip and close coils.
5. Verify operation of electrical close and trip operations, trip-free and antipump function.
6. Trip breaker via protective relays.
7. Vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the contacts in the open position.
8. Dielectric withstand voltage test.

PANELBOARDS

A. Visual and Mechanical Inspection

1. Inspect and note general condition of each section and document equipment nameplate information.
2. Inspect physical and mechanical condition.
3. Inspect anchorage, alignment, grounding, and required area clearances.

B. Electrical Tests

1. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground.

MICROPROCESSOR BASED RELAYS

A. Perform the following mechanical inspections.

1. Verify operation of light-emitting diodes, display and targets.
2. Record passwords for all access levels.
3. Clean the front panel and remove foreign material from the case.
4. Check tightness of connections.
5. Verify that the frame is grounded in accordance with manufacturer's instructions.
6. Set the relay in accordance with the coordination study.
7. Download settings from the relay. Print a copy of the settings for the report and compare the settings to those of the coordination study.

B. Perform the following electrical testing.

1. Insulation resistance test on each circuit to frame. Procedures for performing this test on solid state relays shall be determined from the manufacturer's published data.
2. Apply voltage or current to all analog inputs and verify correct registration of the relay meter function.
3. Check functional operation of each element used in the protection scheme.
4. Control verification:
 - Check operation of all active digital inputs.
 - Check all output contacts or SCRs, preferably by operating the controlled device such as circuit breaker, auxiliary relay or alarm.
 - Check all internal logic functional used in protection scheme.
 - For pilot schemes, perform a loop-back test to check the receive and transmit communications circuits.
 - For pilot schemes, perform satellite synchronized end to end tests.
 - For pilot schemes with direct transfer trip (DTT), perform communications statistics, fault counters, sequence of events recorder and all event records.
 - Upon completion of testing, reset all min/max recorders, communications statistics, fault counters, sequence of events recorders and all event records.

METERING DEVICE

Visual and Mechanical Inspection

1. Document equipment nameplate data.
2. Inspect physical and mechanical condition.
3. Verify freedom of movement, end play, and alignment of rotating disks.

Electrical Tests

1. Verify accuracy of meters at all cardinal points.
2. Calibrate meters according to manufacturer's recommendations.
3. Verify all instrument multipliers.
4. Verify that current transformer and voltage transformer secondary circuits are intact.

SWITCHGEAR AND SWITCHBOARDS ASSEMBLIES

A. Perform the following mechanical inspections.

1. Inspect switchboard for damage and overall condition.
2. Inspect anchorage, alignment, grounding, and required area clearances.
3. Verify that the unit is clean and that all shipping bracing, loose parts, and documentation shipped inside cubicle have been removed.
4. Verify that fuse and circuit breaker sizes and types correspond to drawings and coordination study (**customer provided**).
5. Verify that current and voltage transformers ratios correspond to drawings.
6. Verify tightness of bolted electrical connections with a calibrated torque wrench.
7. Confirm correct operation and sequencing of electrical and mechanical interlocks.
8. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.
9. Inspect insulators for evidence of damage or contaminated surfaces.
10. Verify barrier and shutter installation and operation.
11. Exercise all active components.
12. Inspect mechanical indicating devices for correct operations.
13. Verify that filters are in place and vents are clear, if applicable.
14. Verify cubicle heater operation, when safely possible.
15. Perform visual and mechanical inspection of instrument transformers.
16. Inspect control power transformers.
17. Inspect for physical damage, cracked insulation, broken leads, tightness of connections and defective wiring.
18. Verify that primary and secondary fuse and circuit breaker ratings match drawings.

B. Perform the following electrical testing.

1. Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.1.A.8.1.
2. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1.
3. Perform a dielectric withstand voltage test on each bus section, each phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If the manufacturer has no recommendation for this test, it shall be in accordance with Table 100.2. The test voltage shall be applied for one minute.
4. Perform current-injection tests on the entire current circuit in each section of switchgear per manufacturers specifications.
5. Control power transformers:
 - a) Insulation resistance test.
 - b) Turns ratio test on all taps.
6. Voltage transformers:
 - a) Verify correct secondary voltage.
 - b) Turns Ratio Test
 - c) Insulation Resistance Test
7. Current transformers:
 - a) Turns Ratio Test
 - b) Insulation Resistance Test

CIRCUIT BREAKERS, AIR, INSULATED-CASE/MOLDED-CASE (LOW VOLTAGE)

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Inspect anchorage and alignment.
3. Operate breaker.
4. Verify tightness of bolted electrical connections with a calibrated torque wrench.
5. Inspect operating mechanism, contacts and arc chutes in unsealed units.
6. Verify operation of charging mechanism where applicable.
7. Perform adjustments for final protective device settings. We have included one (1) input of settings. Additional setting changes would result in additional costs.

B. Perform the following electrical testing

1. Resistance measurements through bolted connections.
2. Contact/pole resistance test.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. High current injection test. (Secondary Injection on temporarily equipment)
 - Electrical testing will be performed only on breakers rated over 225 Amp.
 - Customer must provide 480V, 1P, 100A for our primary injection test set.
 - Customer will remove and reinstall any fixed mounted breakers that require primary injection testing.

TRANSFORMERS, DRY TYPE, AIR COOLED, LOW VOLTAGE, SMALL (<500KVA).

A. Perform the following mechanical inspections.

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment, and grounding.
3. Verify that resilient mounts are free and that any shipping brackets have been removed.
4. Verify tightness of bolted electrical connections with a calibrated torque wrench.
5. Verify that as-left tap connections are as specified.

B. Perform the following electrical testing.

1. Resistance measurements through bolted electrical connections.
2. Insulation resistance tests winding to winding and each winding to ground (where possible). Calculate the polarization index.
3. Perform Turns Ratio on the as found tap.

GROUNDING SYSTEMS

A. Perform the following mechanical inspections.

1. Inspect physical and mechanical condition.
2. Verify tightness of bolted electrical connections with a calibrated torque wrench.
3. Inspect anchorage.

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Fall of potential or alternative test in accordance with ANSI/IEEE 81 on the main grounding electrode or system (if applicable).
3. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and derived neutral points.

LOW VOLTAGE AIR SWITCHES

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Inspect anchorage, alignment, grounding, and required clearances.
3. Verify correct blade alignment, blade penetration, travel stops and mechanical operation.
4. Verify that fuses sizes and types are in accordance with drawings, and all engineered studies.
5. Verify that each fuse has adequate mechanical support and contact integrity.
6. Verify tightness of bolted electrical connections with a calibrated torque wrench.
7. Verify operation and sequencing of interlocking systems.
8. Verify correct barrier installation.
9. Verify correct operation of all indicating and control devices.
10. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Measure contact resistance across each switchblade and fuseholders.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. Measure fuse resistance.
5. Perform ground fault test (if applicable).

INFRARED SCANNING (New equipment only)

In addition to the outlined services, we will perform an infrared survey of the equipment listed in accordance with NETA and project specifications and bid specifications.

Customer will provide a person to assist with removal and reinstallation of panel covers. This person is required to be:

- Qualified as defined under provisions statement in NFPA-70E.
- Must have the appropriate shock and arc flash PPE.

CLARIFICATIONS

1. Qualus is committed to a safe work environment for our personnel and in maintaining our industry leading safety record. In support of this effort, Qualus will “Move at the Speed of Safety”. If site conditions are less than ideal, requiring additional time and effort to meet typical safety standards, Qualus reserves the right to pass on any delay costs to the customer.
2. Testing and/or abatement of hazardous materials including but not limited to PCBs, asbestos, and lead paint, are not included in this proposal.
3. Utility switching fees and/or wiring permit fees, if any, are not included in this proposal and will be additional to the base contract price.
4. This proposal does not include any permitting or inspection fees.
5. Standby time is not included in this proposal. Any non-Qualus caused delays in accessing the required workspace and/or equipment once on site, such as inclement weather, de-energizing/energizing equipment for an outage, equipment malfunction, coordination between trade(s), etc. may be subject to additional charges.
6. Notice of delays or change orders will be brought to your attention before costs are incurred. The customer must provide written authorization to proceed with any additional work.
7. A charge will apply if work is cancelled within 48 hours of the scheduled date.
8. Qualus pricing does not include any work outside the substation yard.
9. Qualus to mobilize to site once all apparatus is set. Any requirement to mobilize early without all equipment in the final position will incur additional costs via Change Order.
10. Qualus pricing does not include any purchasing or transporting of SF6 gas.
11. A written purchase order or signed copy of the Work Authorization/Proposal is required before materials can be ordered and/or before site work can be performed.
12. Certain NETA testing may not be feasible and will not be performed.
13. Pricing is based on performing the scope of work listed in this quotation only. Any equipment or test procedures not explicitly listed will require a change order. Testing will be performed once on all equipment unless otherwise specified. Re-testing failed equipment will be addressed as a change order.
14. Excludes time and cost for badging, safety training, drug testing, or COVID testing.
15. Excludes load testing of any kind unless otherwise specified.
16. No retainage is agreed to or accepted for this project.
17. Ground rods must be made accessible prior to final concealment and or connection.

CUSTOMER RESPONSIBILITIES

- 1. Provide any available existing drawings of the existing switchgear.
- 2. Provide the existing Short Circuit, Coordination, and Arc Flash Study model for incorporation of the new circuit breakers and relays. If an existing study and model is not available, additional charges will apply.
- 3. Perform Isolation and LO/TO activities, witnessed and verified by Qualus personnel.
- 4. Clear and free access to the work location and parking for required vehicles.
- 5. Provide adequate site conditions clear from mud, snow, and ice, as required. This includes removal of debris, snow, or other obstructions for clear and safe access.
- 6. Provide offloading, storage, and site handling of all material delivered from Qualus.
- 7. Provide a safe, secure laydown area for Qualus supplied equipment, and materials.
- 8. Equipment must be deenergized and ready for testing prior to Qualus arriving onsite. Any deviation may require a change order.
- 9. Provide 480V, 100A, 1PH for our test set.

PROJECT SCHEDULE

- 1. The pricing is based on work being performed during normal working hours, Monday through Friday, 7:00AM-3:30PM. Work after normal working hours, Saturdays, Sundays, and Holidays is not included.
- 2. Any specific schedule or time frame offered for accomplishing the scope of work in this proposal is subject to prior sale and the availability of Qualus resources. The schedule for performance of this work scope must be confirmed with Qualus at the time of order placement.

PROJECT PRICING

Qualus proposes completing the Work Scope listed above for the following amounts:

BASE WORK SCOPE:

▪ NETA ATS (New Equipment)	\$65,750.00 Fixed
▪ NETA ATS (Temp. Equipment):	\$11,275.00 Fixed
▪ Infrared Scan (1 Tech X 1 Day X 2 Times):	\$4,900.00 Fixed
▪ Commissioning Support (1 Tech X 2 Days):	\$4,700.00 Fixed

Note:

- 1. Prices quoted are exclusive of any present or future federal or state taxes or local sales, use or excise taxes, or tariffs. If any such present or future sales, use or excise taxes, or tariffs apply, then they shall be added to the invoice as a separate item unless Purchaser has furnished an acceptable tax exemption certificate from such tax prior to shipment.

PROPOSAL ACCEPTANCE

Upon acceptance of this proposal, please send a contract/purchase order to:

Qualus Services LLC

Attn: JP Shoop

11620 Crossroads Circle

Middle River MD 21220

Fax: 410-335-4389

Email: JP.Shoop@QualusCorp.com

This proposal is considered proprietary in nature, intended for the sole use of the entity addressed above, and as such is not intended for general public distribution.

TERMS & CONDITIONS

Qualus Terms & Conditions Apply

AIA Monthly Progress Billing, Net 30 Day Terms

Freight: Prepay and Add

FOB: Factory

This proposal is valid for 45 days.

QUALUS Standard Terms & Conditions

Unless a separate agreement on terms and conditions exist between the Company and the Purchaser, the following terms and conditions shall apply to all sales by Qualus Corp. and its affiliates, including Qualus, LLC, Qualus Services, LLC, Qualus Consulting, LLC, Qualus Solutions, LLC, and Qualus Solutions of FL, LLC (collectively, hereinafter the "Company").

1. Terms of Payment – Payment terms are due thirty (30) days from the date of invoice. Company shall invoice Purchaser monthly. If payment is not made within thirty (30) days of the invoice date, a late payment charge of one and one half percent (1 1/2%) per month shall be imposed on the unpaid balance. With respect to goods purchased, pro rata payments shall become due as partial shipments are made. When shipments are delayed by the Purchaser, payment shall become due from the date the Company is prepared to make shipment. Goods which at Purchaser's request (i) are held for delayed shipment or (ii) are placed in off-site storage, will be invoiced as if shipped when originally scheduled and will be held and stored at the risk and expense of the Purchaser.

2. Payment - If, in the sole opinion of the Company, the financial condition of the Purchaser at the time the equipment is ready for shipment does not justify the terms of payment specified, then as a condition of shipment, Company may require (i) that the Purchaser provide adequate assurances of payment or (ii) payment terms satisfactory to the Company, in its sole discretion.

3. Quotations -

3.1 Quotations are void unless accepted within thirty (30) days from the date thereof, unless otherwise stated and, in the meantime, are subject to change or withdrawal upon notice. Orders made thereon are not binding until and unless accepted by the Company. Shipping dates are approximate and based upon prompt receipt of all necessary information and approved drawings whenever required. Stenographic and clerical errors are subject to correction.

3.2 Unless otherwise specified in writing, all quotes are on a straight time basis, excluding work on Saturdays, Sundays and Holidays.

4. Changes, Deletions and Extra Work – Purchaser, without invalidating the Contract, may order extra work scope and make changes in addition to or deducting from the work, and the Contract sum shall be adjusted accordingly. All such work shall be executed under the conditions of this Contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.

The value of any such extra work or change shall be determined in one or more of the following ways:

- (a) by estimate and acceptance of lump sum.
- (b) by unit prices named in the Contract or subsequently agreed upon.
- (c) by cost and percentage of cost or by cost and a fixed fee.

5. Minimum Billing Charge - The minimum billing charge shall be \$100.00.

6. Delivery - Unless otherwise specified, all products are delivered f.o.b. point of shipment regardless of transportation costs being "allowed", "pre-paid", or "collect".

7. Shipment Delays - The Company shall not be liable for delays in starting work or in shipment or non-shipment due to causes beyond its reasonable control or due to acts of God, acts of the

Purchaser, fires, strikes, labor disturbances, floods, pandemics, epidemics, quarantine restrictions, war, insurrections or riot, civil or military authority, compliance with priority orders or preference ratings issued by the Government, freight embargo's, car shortages, wrecks or delays in transportation, unusually severe weather, or inability to obtain necessary labor, materials or manufacturing facilities due to such causes or any of them. In the event of any such delay, the date of shipment will be extended, at the minimum, for a period equal to the period of the delay. The contract of sale will in no event be subject to cancellation by the Purchaser, whether due to delay in delivery or to any other cause, except by mutual agreement of the parties, nor shall the Company be liable under any circumstances for special or consequential damages on any account of delay.

8. Suspension/Cancellation – In the event Purchaser requests a suspension of work under this Contract, Purchaser shall, in writing, notify Company reasonably in advance of the suspension date; this notification will indicate the anticipated suspension period. Company shall advise Purchaser of the price adjustment resulting from the planned suspension of the work. The price adjustment will be based on Company's ability to reasonably relocate manpower, and any materials, and equipment during the suspension period. Remobilization costs will be priced on the same basis.

Purchaser may cancel this contract upon thirty (30) days written notice to the Company, and upon payment to Company of reasonable and proper cancellation charges; including but not limited to charges for engineering, testing, repair, upgrade and installation work completed, and for materials on order / in manufacture / in storage and lost profits ("Cancellation Charges").

If the financial condition of Purchaser at any time does not, in the judgment of Company, justify continuance of the work to be performed hereunder on the terms of payment agreed upon, Company may require full or partial payment in advance or shall be entitled to cancel the Contract and shall receive reimbursement for its reasonable and proper Cancellation Charges. In the event of bankruptcy or insolvency of Purchaser or in the event any proceeding is brought against the Purchaser, voluntarily or involuntarily, under the bankruptcy or any insolvency laws, Company shall be entitled to cancel the Contract at any time during the period allowed for filing claims against the estate and shall receive reimbursement for its reasonable and proper cancellation charges. Company's rights under this paragraph are in addition to all rights available to it at law or in equity.

9. Limitation of Liability - The Company shall not accept any penalty or liquidated damage clauses of any kind, or any liability arising from such clauses, unless specifically approved in writing by a duly authorized representative of the Company. The Company shall not be liable for any indirect, special, consequential, or punitive damages (including lost profits, loss of use, business interruption, lost productivity, loss of communications) arising out of or relating to this purchase (whether for breach of contract, breach of warranty, tort, negligence, or other form of action) and irrespective of whether Company has been advised of the possibility of any such damage. In no event shall the Company's liability exceed the price the Purchaser paid to the Company for the specific Goods or Services provided by the Company giving rise to the claim or cause of action.

10. Damage and Loss Claims – The Company shall not be responsible for loss, shortage, or damage after receipt of "in good order" receipts from the transportation company. The Company's

responsibility for loss, shortage, or damage ceases with the delivery to a common carrier, at which time title and risk of loss pass to the purchaser, and all claims for loss, shortage, damage, or delay must be made to the carrier by the Purchaser. Concealed damage claims must be reported to the carrier within fifteen (15) days from the date of delivery. The Company will reasonably assist the Purchaser in securing satisfactory adjustment of any claims.

11. Warranty –

11.1 The Company warrants that the (i) goods shall be as provided by the specifications provided by Purchaser and new (unless otherwise directed or permitted), and if new, without apparent damage or defect, (ii) services will be performed in accordance with the specifications provided by Purchaser and performed in a workmanlike manner. In the event Purchaser notifies Company of defective materials or workmanship within the lesser of eighteen (18) calendar months from shipment of materials or completion of the work, or twelve (12) calendar months from installation of the goods, the Company will, (i) at its option either repair or replace defective new materials, and correct the defective workmanship free of charge. Repairs or warranty work shall be performed f.o.b. factory or at a Purchaser's site, at the Company's option.

11.2 Whenever work is performed at Purchaser's site, it will be performed during a normal eight-hour straight-time day. If the Purchaser requests that product warranty work be performed during any other time period, Purchaser will be invoiced for the premium portion of the work; i.e. the difference between the applicable rate and the overtime rate for the services performed.

11.3 This warranty does not apply to, nor is any expense or other damages or liability assumed for, any goods which are used, which have been improperly stored, or installed, or from any accidental or intentional attempts to operate the goods in excess of their rating, or in any abnormal atmosphere or environments, or to which unauthorized repairs have been made whether or not such goods are defective or in accord with the specifications. Any such repairs or modifications must be authorized by the Company in writing.

11.4 This warranty does not apply to, nor is any expense or other damages or liability assumed for work performed on serviced equipment that has been subsequently serviced by another firm without authorization by the Company in writing.

12. Equipment and Materials of Others - The Company's responsibility does not extend to equipment not manufactured by the Company. The Company will reasonably assist Purchaser in making claims under any warranty provided by the supplier or manufacturer of such equipment.

12.1 The Company's responsibility does not extend to used equipment supplied in any other than "fully reconditioned" state.

12.2 THE FORGOING WARRANTY IS EXCLUSIVE AND EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES (EXCEPT TITLE), WHETHER EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE FORGOING REMEDIES OF REPAIR OR REPLACEMENT SHALL CONSTITUTE THE SOLE REMEDY OF THE PURCHASER AND SOLE LIABILITY OF THE COMPANY FOR ANY BREACH OF WARRANTY.

13. Nuclear Insurance – Indemnity - For applications in nuclear projects, the Purchaser/Owner shall have a complete and proper insurance protection against liability and

property damage resulting from a nuclear incident and shall indemnify the Company, its suppliers and subcontractors against all claims resulting from a nuclear incident.

14. Returned Goods – No goods shall be returned without the Purchaser having secured approval and terms of return from the Company. The return of all goods including, but not limited to, returnable shipping materials such as cable reels, end plates or covers, oil drums, gas bottles, etc. will not be permitted under any condition without the Company's properly executed Returned Goods Authorization Form. Goods returned without complete identification in accordance with the Company's instructions or without charges prepaid shall not be accepted. The Company reserves the right to refuse any goods returned for credit.

15. Termination - After acceptance by the Company, an order shall not be terminated, in whole or part by the Purchaser except by agreement in writing from the Company and such agreement shall be contingent upon payment of reasonable Cancellation Charges based upon expenses already incurred and commitments made by the Company plus a charge of 10% of the contract price to compensate the Company for indirect costs resulting from the termination.

16. Rescheduling - Rescheduling of an order by the Purchaser shall require agreement in writing executed by the Company and renegotiation of the price and escalation terms to reasonably cover additional costs and commitments occasioned by the change. Delivery commitments made by the Company are based upon complete specifications and/or information supplied by the Purchaser with the order and upon prompt return of approval drawings (if required by the Purchaser) by the date requested by the Company. Rescheduling of any order by the Company as a result of the Purchaser's delay in returning approval drawings shall require renegotiation of price and escalation terms to reasonably cover additional costs and commitments occasioned by the delay.

17. Drawing Approval and Changes - If at drawing approval, the Company has failed to design the product in accordance with the Purchaser's specifications, the Company shall, at its expense, make appropriate changes. Where Purchaser's specifications are not definitive, the Company reserves the right to design the product in line with, in the Company's judgment, good engineering practice. If at drawing approval, the Purchaser makes changes outside the scope of the design as covered in Purchaser's specifications, the price and delivery terms shall be renegotiated to reasonably cover any additional cost and commitments occasioned by the change. Such change must be in writing executed by the Purchaser and Company. Changes made to an order by the Purchaser after engineering is completed or entry of the order into manufacturing shall result in substantially greater costs and delivery delays.

18. Taxes - Prices quoted are exclusive of any present or future federal or state taxes or local sales, use or excise taxes, or tariffs. If any such present or future sales, use or excise taxes, or tariffs apply, then they shall be added to the invoice as a separate item unless Purchaser has furnished an acceptable tax exemption certificate from such tax prior to shipment.

19. Indemnification – Purchaser shall fully indemnify, defend and hold harmless Company, its affiliates and all of its and their respective co-owners, partners, joint venturers, officers, directors, employees and agents (collectively the "Company Indemnified Parties") from and against all claims directly or indirectly arising out of or resulting from or relating to any of the following:

- (a) Personal injury or death of any person, or damage to the extent in any way directly or indirectly arising out of or related to the negligence (of any type) or willful misconduct of Purchaser or anyone directly or indirectly employed by them or anyone for whose acts they may be liable (other than any Contractor Indemnified Parties")
- (b) Personal injury to or death of any employees of Purchaser, regardless of the cause of such damages, losses, costs, and expenses, including the sole or joint negligence, breach of contract or other basis of liability of any Contractor Indemnified Parties.

20. Dispute Resolution – Any controversy or claim arising out of or relating to this Contract, or the breach thereof, shall be settled by arbitration by the American Arbitration Association under its Commercial Arbitration Rules, and judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof. The arbitration shall be conducted in accordance with the Federal Arbitration Act, 9 U.S.C. 1 *et seq*, and the venue for the arbitration shall be the Circuit Court of Seminole County, Florida.

20.1 Both Company and Purchaser hereby knowingly, voluntarily, and intentionally waive and forever relinquish any and all claims or rights that such party may have to any trial by jury on any issue arising out of any litigation or disputes or claims under this Contract or any order or in any way associated therewith. Both parties intend to waive and forever relinquish any right under the Seventh Amendment of the United States Constitution to trial by jury and any claims or rights to a trial by jury under the constitution of any state or any other constitutional, statutory, or otherwise applicable law providing for a right to trial by jury.

21. General –

21.1 Company shall not be responsible for the acts and workmanship of the employees, contractors, subcontractors or agents of the Purchaser. The Company reserves the right to subcontract any of the work to one or more subcontractors.

21.2 The delegation or assignment by Purchaser of any or all of its duties or rights hereunder without Company's prior written consent shall be void.

21.3 The rights and obligations of the parties under this Contract shall be interpreted and governed in all respects by the laws of the state of Florida. If either party brings against the other party any proceeding arising out of this agreement, that party may bring that proceeding only in the United States District Court for the Middle District of Florida or, only if there is no federal subject matter jurisdiction, in Circuit Court of Seminole County, Florida.

21.4 Any information, suggestions or ideas transmitted by Purchaser to Company in connection with performance hereunder are not to be regarded as secret or submitted in confidence except as may be otherwise provided in a writing signed by a duly authorized representative of Purchaser.

21.5 Company shall comply with all state and federal safety and health laws, including but not limited to the Occupational Safety and Health Act of 1970 (OSHA) and all standards, rules, regulations and orders issued pursuant to such state and federal safety and health laws and laws related to non-segregated facilities and equal employment opportunity.

21.6 This Contract contains the complete agreement between the parties and no modification, amendment, revision, waiver or other change will be binding on Company unless assented to in writing by Company's authorized representative. Any oral or written

representation, warranty, course of dealing or trade usage not contained or referenced herein will not be binding on Company.

21.7 Purchaser shall obtain and pay for all necessary permits for the work to be done and shall hold company harmless from any liability for work done without said permits.

21.8 Should any term or provisions of this Contract be held invalid, illegal, or unenforceable, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby and such provision shall be ineffective only to the extent of such invalidity, illegality, or unenforceability.

INITIALS: COMPANY _____
PURCHASER _____

CL2:459754_v6
Revised February 2, 2025



A Member of the Professional Electrical Services and Management, L.L.C. (PESM) Team

Mathew Robinson

Senior Estimator

Mobile: 717-451-6179

www.ib-abel.com

Date: 12/3/25

Due Date-12/15/25

Proposal #: tjpesmprott dgs hb cap complex cup 12 3 25

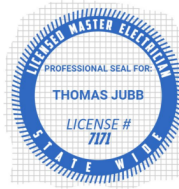
Project: 25-2216 - DGS Central Plant Upgrades

Thank you for allowing us the opportunity to service you and your team. Our team has over 65 years of providing quality electrical related services to commercial, educational, institutional, mission critical data centers, and industrial buildings, in both the private and government sectors.

We will strive to insure that your electrical systems installation and maintenance, will meet the required specifications, electrical industry recommended and or required codes and standards, (such as NETA, NFPA70A, NFPA70B, NFPA70E, NFPA110, IEEE, NEMA, OSHA, ANSI, ASTM, BOCA, JACHO- as well as local jurisdictional and general insurance requirements). Our solutions are tailored to each specific client/facility. This will assist in minimizing the hazards to **life, property, and equipment for the final owners.**

Based on industry insurance reports, hundreds of millions of dollars are lost, as well as many lives lost and injuries reported, as a direct result of property owners, first-not having a properly tested new electrical system installation and second- owners not implementing a form of a recommended or required code/standard compliant Electrical Risk Management Program (ERMP) program in their facilities.

Please see below your supplied specifications and equipment drawings that reflect the 3rd party independent testing/engineering services that are required for this project. PESM has assembled a plan with multiple options for your review. Please contact us to discuss or if changes are needed. Areas **highlighted in yellow** are either comments from PESM or emphasized information. Items ~~crossed out~~ are to be completed by others.



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Were general testing or NETA type testing is noted in the specs, (unless otherwise noted) it was utilized as the bases for this testing plan. As the spec listed testing of devices that are not shown on the supplied drawings- they are excluded.

I) SPECIFICATIONS and information supplied by client: (as applicable)

SECTION 260513

MEDIUM-VOLTAGE CABLES

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.

b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.

2. Test results that comply with requirements.

3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

3.8 FIELD QUALITY CONTROL

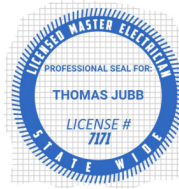
A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal.

a. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of



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reducing natural ground resistance.

b. Perform tests by the fall-of-potential method according to IEEE 81.

4. Provide drawings locating each ground rod/plate and ground rod/plate assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods/plates driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

a. Equipment Rated 500 kVA and Less: 10 ohms.

b. Equipment Rated 500 to 1000 kVA: 5 ohms.

c. Equipment Rated More Than 1000 kVA: 3 ohms.

d. Equipment Rated More Than 600V/GND: 3 ohms.

SECTION 260543

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL AND TELECOMMUNICATION SYSTEMS

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

SECTION 261116

SECONDARY UNIT SUBSTATIONS WITH SWITCHGEAR SECONDARY

3.6 FIELD QUALITY CONTROL

A. General Field Testing Requirements:

1. Comply with provisions of NFPA 70B, "Testing and Test Methods" Chapter.

2. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

3. After installing secondary unit substation but before primary is energized, verify that grounding system at substation is tested at specified value or less.

4. After installing secondary unit substation and after electrical circuitry has been energized, test for compliance with requirements.

5. Visual and Mechanical Inspection:

a. Verify equipment nameplate data complies with Contract Documents.

b. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

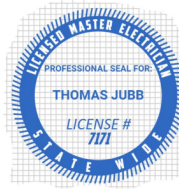
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

7. Prepare test and inspection reports. Record as-left set points of all adjustable devices.

B. Switchgear Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.



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- b. Inspect anchorage, alignment, grounding, and required area clearances.
- c. Verify unit is clean and shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.
- d. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study as well as to address of circuit breaker that is used to identify it in microprocessor-communication software.
- e. Verify that current and voltage-transformer ratios correspond to Drawings.
- f. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
 - 1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
 - 2) Make key exchange with devices operated in off-normal positions.
- g. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- h. Inspect insulators for evidence of physical damage or contaminated surfaces.
- i. Verify correct barrier and shutter installation and operation.
- j. Exercise all active components.
- k. Inspect mechanical indicating devices for correct operation.
- l. Verify that filters are in place and vents are clear.
- m. Inspect control power transformers as follows:
 - 1) Inspect for physical damage, cracked insulation, broken leads, connection tightness, defective wiring, and overall general condition.
 - 2) Verify that primary- and secondary-fuse or circuit-breaker ratings match Drawings and comply with manufacturer's recommendations.
 - 3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.
- 2. Electrical Tests:
 - a. Perform dc voltage insulation-resistance tests on each bus section, phase-to phase and phase-to-ground, for one minute. If temperature of bus is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.
 - 1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.
 - 2) Do not proceed to dielectric-withstand-voltage tests until insulation resistance levels are raised above minimum values.
 - b. Perform a dielectric-withstand-voltage test on each bus section, each phase-to ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.
 - 1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric-withstand-voltage test, test specimen is considered to have passed test.
 - c. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for



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600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's recommendation.

1) Minimum insulation-resistance values of control wiring must not be less than 2 megohms.

d. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at all devices.

2) Verify secondary voltages by energizing primary winding with system voltage.

e. Perform current-injection tests on entire current circuit in each section of switchgear.

1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 A flows in secondary circuit. Verify correct magnitude of current at each device in circuit.

2) Perform current tests by primary injection with magnitudes such that a minimum of 1.0 A flows in secondary circuit. Verify correct magnitude of current at each device in circuit.

f. Verify operation of space heaters.

g. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from each source.

C. Medium-Voltage Surge Arrester Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, grounding, and clearances.

c. Verify arresters are clean.

d. Verify that ground lead on each device is individually attached to a ground bus or ground electrode.

e. Verify that stroke counter is correctly mounted and electrically connected if applicable. Record stroke counter reading.

2. Electrical Test:

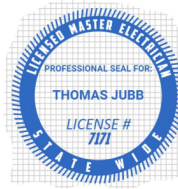
a. Perform an insulation-resistance test on each arrester, phase terminal-to-ground. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to meet recommended minimum insulation resistance listed in table.

b. Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.

3. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than this table or manufacturer's recommendations. Dielectric-withstand-voltage tests must not proceed until insulation-resistance levels are raised above minimum values.

b. Perform a contact/pole-resistance test. Compare bolted connection resistance



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values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of lowest value. Microhm or dc millivolt drop values must not exceed high levels of normal range as indicated in manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

c. Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.

d. Verify correct operation of any auxiliary features, such as electrical close and trip operation, trip-free operation, and anti-pump function. Auxiliary features must operate in accordance with manufacturer's published data.

e. Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators.

f. Perform power-factor or dissipation-factor tests on each pole with breaker open and each phase with breaker closed. Power-factor or dissipation-factor values must meet manufacturer's published data.

g. Perform vacuum bottle integrity (dielectric-withstand-voltage) test across each vacuum bottle, with contacts in "open" position in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by end of total time of voltage application during vacuum bottle integrity test, test specimen is considered to have passed test.

h. Perform a dielectric-withstand-voltage test in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric-withstand-voltage test, test specimen is considered to have passed test.

i. Verify operation of heaters.

D. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Verify correct connection of transformers with system requirements.

c. Verify that adequate clearances exist between primary and secondary circuit wiring.

d. Verify unit is clean.

e. Verify that required grounding and shorting connections provide contact.

f. Verify correct operation of transformer withdrawal mechanism and grounding operation.

g. Verify correct primary- and secondary-fuse sizes for voltage transformers.

h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:

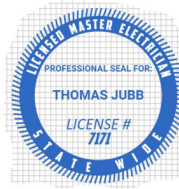
a. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, comply with manufacturer's recommendations. Insulation-resistance values of instrument transformers must not be less than values shown in NETA ATS, Table 100.5.

b. Perform a polarity test of each current transformer in accordance with



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- IEEE C57.13.1. Polarity results must agree with transformer markings.
- c. Perform a ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must comply with IEEE C57.13.
- d. Perform an excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or must comply with IEEE C57.13.1.
- e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. The measured burdens must match instrument transformer Accuracy Class rating.
- f. Perform dielectric-withstand-voltage tests on primary winding with secondary grounded. Test voltages must comply with NETA ATS, Table 100.9. If no evidence of distress or insulation failure is observed by end of total time of voltage application, primary winding is considered to have passed test.
- g. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with test equipment manufacturer's published data.
- h. Verify that current-transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3.
3. Electrical Tests of Voltage and Potential Transformers:
- a. Perform insulation-resistance tests winding-to-winding and each winding-toground. Apply test voltage for one minute in accordance with NETA ATS, Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's recommendations. Insulation-resistance values of instrument transformers must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.5.
- b. Perform insulation-resistance tests winding-to-winding and each winding-toground. Test voltages must be applied for one minute in accordance with NETA ATS, Table 100.5. Insulation-resistance values of transformers must not be less than values shown in NETA ATS, Table 100.5.
- c. Perform a polarity test on each transformer to verify polarity marks or H(1)-X(1) relationship. Polarity results must agree with transformer markings.
- d. Perform a turns-ratio test on all tap positions. Ratio errors must not exceed tolerances specified in IEEE C57.13.
- e. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to instrument transformer ratings. The measured burdens must match instrument transformer Accuracy Class rating.
- f. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with test equipment manufacturer's published data.
- g. Verify that voltage-transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3.
- E. Dry-Type Transformer Section Field Tests:
1. Visual and Mechanical Inspection:
- a. Inspect physical and mechanical condition.
- b. Inspect anchorage, alignment, and grounding.



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- c. Verify that resilient mounts are free and that any shipping brackets have been removed.
- d. Verify unit is clean.
- e. Verify that alarm, control, and trip settings on temperature and level indicators are set and operate within manufacturer's recommended settings.
- f. Verify that cooling fans operate and that fan motors have correct overcurrent protection.
- g. Perform specific inspections and mechanical tests recommended by manufacturer.
- h. Verify that as-left tap connections are as specified.
- i. Verify presence of surge arresters and that their ratings are as specified.
- 2. Electrical Tests:
 - a. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index; value of index must not be less than 1.0.
 - b. Perform power-factor or dissipation-factor tests on windings in accordance with test equipment manufacturer's published data. Investigate and correct power-factor values that exceed:
 - 1) 2.0 percent for power transformers.
 - 2) 5.0 percent for distribution transformers.
 - c. Measure core insulation resistance at 500 V(dc) if core is insulated and core ground strap is removable. Core insulation-resistance values must not be less than 1 megohm at 500 V(dc).
 - d. Perform a power-factor or dissipation-factor tip-up test on windings greater than 2.5 kV. Tip-up test result exceeding 1.0 percent must be investigated.
 - e. Perform turns-ratio tests at all tap positions. The test results must not deviate by more than one-half percent from either adjacent coils or calculated ratio. If test fails, replace transformer.
 - f. Perform an excitation-current test on each phase. The typical excitation-current test data pattern for a three-legged core transformer is two similar current readings and one lower current reading. Investigate and correct if test shows a different pattern.
 - g. Measure resistance of each winding at each tap connection.
 - h. Perform an applied-voltage test on all primary and secondary windings-to-ground. See IEEE C57.12.91, Sections 10.2 and 10.9. The ac dielectric-withstand-voltage test result must not exceed 75 percent of factory test voltage for one-minute duration. The dc dielectric-withstand-voltage test result must not exceed 100 percent of ac RMS test voltage specified in IEEE C57.12.91, Section 10.2, for one minute duration. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric-withstand-voltage test, test specimen is considered to have passed test.
 - i. Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.
- F. Low-Voltage Power Circuit-Breaker Field Tests:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, and grounding.
 - c. Verify that all maintenance devices are available for servicing and operating



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breaker.

d. Verify unit is clean.

e. Verify that arc chutes are intact.

f. Inspect moving and stationary contacts for condition and alignment.

g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.

h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.

i. Verify cell fit and element alignment.

j. Verify racking mechanism operation.

k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

l. Perform adjustments for final protective-device settings in accordance with coordination study provided by end user.

m. Record as-found and as-left operation counter readings.

2. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations must be investigated.

b. Measure contact resistance across each power contact of circuit breaker. Microhm or dc millivolt drop values must not exceed high levels of normal range as indicated in manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic must not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are not available, trip times must not exceed value shown in NETA ATS, Table 100.7.

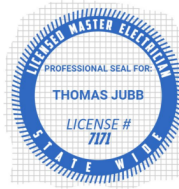
d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic must not exceed manufacturer's published time-current tolerance band.

e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic must not exceed manufacturer's published time-current tolerance band.

f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.

g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.

h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and



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close coils must conform to manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.

i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.

j. Verify correct operation of any auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, anti-pump function, and trip unit battery condition. Reset trip logs and indicators.

Auxiliary features must operate in accordance with manufacturer's published data.

k. Verify operation of charging mechanism. The charging mechanism must operate in accordance with manufacturer's published data.

G. Metering Device Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

c. Verify unit is clean.

d. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.

b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.

c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specification

d. Verify that current-transformer and voltage-transformer secondary circuits are intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

H. Nonconforming Work:

1. Equipment will be considered defective if it does not pass tests and inspections.

2. Remove and replace defective units and retest.

I. Prepare test and inspection reports.

4. Report:

a. Prepare a written report covering monitoring performed and corrective action taken.

b. For each relay and adjustable circuit breaker, tag device with adjusting technician's initials and date of adjustment. Record settings and file with test records specified in "Field Quality Control" Article.

B. Infrared Inspection and Adjusting: Perform survey during periods of maximum possible loading. Remove all necessary covers prior to inspection.

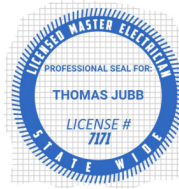
1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of electrical power connections of unit substation.

2. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchgear 11 months after date of Substantial Completion.

3. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1.8 deg F (1 deg C) at 104 deg F (30 deg C).

4. Record of Infrared Inspection: Prepare a certified report that identifies testing technician and equipment used, and lists the following results:

a. Description of equipment to be tested.



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- b. Discrepancies.
- c. Temperature difference between area of concern and reference area.
- d. Probable cause of temperature difference.
- e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
- f. Identify load conditions at time of inspection.
- g. Provide photographs and thermograms of deficient area.
- 5. Act on inspection results in accordance with recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Client Agency's operations permit.

SECTION 261323

MEDIUM-VOLTAGE SWITCHGEAR

3.5 FIELD QUALITY CONTROL

A. General Field Testing Requirements:

- 1. Comply with the provisions of NFPA 70B, "Testing and Test Methods."
- 2. After installing switchgear and after electrical circuitry has been energized, test for compliance with requirements.
- 3. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

B. Medium-Voltage Switchgear Assembly Field Tests:

1. Visual and Mechanical Inspection:

- a. Verify that fuse and switch sizes and types correspond to Drawings and coordination study, as well as to the switch's address in the control network.
- b. Verify that current and voltage transformer ratios correspond to Drawings.
- c. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
- d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
 - 1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
 - 2) Make key exchange with devices operated in off-normal positions.
- e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- f. Inspect insulators for evidence of physical damage or contaminated surfaces.
- g. Verify correct barrier and shutter installation and operation.
- h. Exercise active components.
- i. Inspect mechanical indicating devices for correct operation.
- j. Verify that filters are in place and vents are clear.
- k. Perform visual and mechanical inspection of instrument transformers in accordance with Article "Instrument Transformer Field Tests."
- l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or switch ratings match drawings.



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3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.

2. Electrical Tests:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Perform dc voltage insulation-resistance tests on each bus section, phase to phase and phase to ground, for one minute. If the temperature of the bus is other than plus or minus 20 deg C, adjust the resulting resistance as provided in NETA ATS, Table 100.11.

1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.

2) Do not proceed to the dielectric withstand voltage tests until insulation resistance levels are raised above minimum values.

c. Perform a dielectric withstand voltage test on each bus section, each phase to ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply the test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.

d. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate the applied voltage, follow the manufacturer's recommendation.

1) Minimum insulation-resistance values of control wiring must not be less than two megohms.

e. Control Power Transformers:

1) Perform insulation-resistance tests. Perform measurements from winding to winding and each winding to ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.

2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to a rated secondary voltage source. Verify correct potential at all devices.

3) Verify correct secondary voltage by energizing the primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected.

4) Verify correct function of control transfer relays located in the switchgear with multiple control power sources.



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f. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at all devices.

2) Verify secondary voltages by energizing the primary winding with system voltage.

g. Perform current-injection tests on the entire current circuit in each section of switchgear.

1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.

2) Perform current tests by primary injection with magnitudes such that a minimum of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.

h. Perform system function tests in accordance with "System Function Tests" Article.

i. Verify operation of space heaters.

j. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from each source.

3. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Insulation resistance values must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than this table or manufacturer's recommendations. Dielectric-withstand-voltage tests must not proceed until insulation-resistance levels are raised above minimum values.

b. Perform a contact/pole-resistance test. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value. Microhm or dc millivolt drop values must not exceed the high levels of the normal range in accordance with manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

c. Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the trip and close coils must comply with manufacturer's published data. In the absence of the manufacturer's published data, comply with NETA ATS, Table 100.20.

d. Verify correct operation of any auxiliary features, such as electrical close and trip operation, trip-free operation, and anti-pump function. Auxiliary features must operate in accordance with manufacturer's published data.

e. Trip switch by operation of each protective device. Reset trip logs and indicators.

f. Perform power-factor or dissipation-factor tests on each pole with the switch open and each phase with the switch closed. Power-factor or dissipation-factor values must comply with manufacturer's published data.

g. Perform vacuum bottle integrity (dielectric-withstand-voltage) test across each vacuum bottle, with the contacts in the "open" position in accordance with manufacturer's published data. If no evidence of distress or insulation failure is



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observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.

h. Perform a dielectric-withstand-voltage test in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric-withstand-voltage test, the test specimen is considered to have passed the test.

i. Verify operation of heaters.

C. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.

b. Inspect physical and mechanical condition.

c. Verify correct connection of transformers with system requirements.

d. Verify that adequate clearances exist between primary and secondary circuit wiring.

e. Verify the unit is clean.

f. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.

Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

g. Verify that required grounding and shorting connections provide contact.

h. Verify correct operation of transformer withdrawal mechanism and grounding operation.

i. Verify correct primary and secondary fuse sizes for voltage transformers.

j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000 V(dc) for one minute. For units with solid state components that cannot tolerate the applied voltage, follow manufacturer's written recommendations. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.5.

c. Perform a polarity test of each current transformer in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.

d. Perform a ratio-verification test using the voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.

e. Perform an excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match the curve supplied by the manufacturer or be in accordance with IEEE C57.13.1.

f. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared with and must match instrument transformer ratings.

g. Perform insulation-resistance tests on the primary winding with the secondary



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grounded. Test voltages must be in accordance with Table 100.5.

h. Perform dielectric withstand tests on the primary winding with the secondary grounded. Test voltages must be in accordance with Table 100.9.

i. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.

j. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by the engineer in the project drawings.

3. Electrical Tests of Voltage Transformers:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Perform insulation-resistance tests winding-to-winding and each winding to ground. Test voltages must be applied for one minute in accordance with Table 100.5. For units with solid-state components that cannot tolerate the applied voltage, follow manufacturer's recommendations. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.5.

c. Perform a polarity test on each transformer to verify the polarity marks or H1- X1 relationship as applicable. Polarity results must agree with transformer markings.

d. Perform a turns-ratio test on all tap positions. Ratio errors must be in accordance with IEEE C57.13.

e. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared with and must match instrument transformer ratings.

f. Perform a dielectric withstand test on the primary windings with the secondary windings connected to ground. The dielectric voltage must be in accordance with Table 100.9. The test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the primary windings are considered to have passed the test.

g. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use test equipment manufacturer's published data.

h. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that the circuits are grounded at only one point.

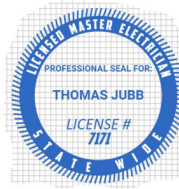
D. Ground Resistance Test:

1. Visual and Mechanical Inspection:

a. Verify ground system complies with the Contract Documents and NFPA 70 Article 250, "Grounding and Bonding."

b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.

c. Inspect bolted electrical connections using a calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.



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Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

d. Inspect anchorage.

2. Electrical Tests:

a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on the main grounding electrode or system. The resistance between the main grounding electrode and ground must be no more than 5 ohms.

b. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 ohms. Compare equipment nameplate data with Contract Documents.

c. Inspect physical and mechanical condition.

d. Inspect bolted electrical connections for high resistance using a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

E. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

d. Verify the unit is clean.

e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Verify accuracy of meters at all cardinal points. Meter accuracy must be in accordance with manufacturer's published data.

c. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.

d. Verify all instrument multipliers. Instrument multipliers must be in accordance with system design specifications.

e. Verify that current transformer and voltage transformer secondary circuits are intact. Test results must confirm the integrity of the secondary circuits of current and voltage transformers.

F. Medium-Voltage Surge Arrester Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.

b. Inspect physical and mechanical condition.

c. Inspect anchorage, alignment, grounding, and clearances.

d. Verify the arresters are clean.

e. Verify that the ground lead on each device is individually attached to a ground bus



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or ground electrode.

f. Verify that the stroke counter is correctly mounted and electrically connected if applicable. Record the stroke counter reading.

2. Electrical Test:

a. Perform an insulation-resistance test on each arrester, phase terminal to ground. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to meet recommended minimum insulation resistance listed in the table.

b. Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.

c. Test grounding connections. Resistance between the arrester ground terminal and the ground system must be less than 0.5 ohm.

G. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.

b. Verify operation of light-emitting diodes, display, and targets.

c. Record passwords for each access level.

d. Clean the front panel and remove foreign material from the case.

e. Check tightness of connections.

f. Verify that the frame is grounded in accordance with manufacturer's instructions.

g. Set the relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."

h. Download settings from the relay. Print a copy of the settings for the report and compare the settings to those specified in the coordination study.

2. Electrical Tests:

a. Perform insulation-resistance tests from each circuit to the grounded frame in accordance with manufacturer's published data.

b. Apply voltage or current to analog inputs, and verify correct registration of the relay meter functions.

c. Functional Operation: Check functional operation of each element used in the protection scheme as follows:

1) Timing Relay:

a) Determine time delay.

b) Verify operation of instantaneous contacts.

2) Volts/Hertz Relay:

a) Determine pickup frequency at rated voltage.

b) Determine pickup frequency at a second voltage level.

c) Determine time delay.

3) Sync Check Relay:

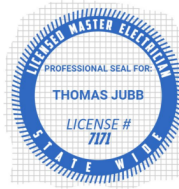
a) Determine closing zone at rated voltage.

b) Determine maximum voltage differential that permits closing at zero degrees.

c) Determine live line, live bus, dead line, and dead bus set points.

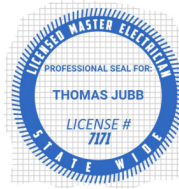
d) Determine time delay.

e) Verify dead bus/live line, dead line/live bus, and dead bus/dead line control functions.



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- 4) Undervoltage Relay:
 - a) Determine dropout voltage.
 - b) Determine time delay.
 - c) Determine time delay at a second point on the timing curve for inverse time relays.
- 5) Directional Power Relay:
 - a) Determine minimum pickup at maximum torque angle.
 - b) Determine closing zone.
 - c) Determine maximum torque angle.
 - d) Determine time delay.
 - e) Verify time delay at a second point on the timing curve for inverse time relays.
 - f) Plot the operating characteristic.
- 6) Current Balance Relay:
 - a) Determine pickup of each unit.
 - b) Determine percent slope.
 - c) Determine time delay.
- 7) Negative Sequence Current Relay:
 - a) Determine negative sequence alarm level.
 - b) Determine negative sequence minimum trip level.
 - c) Determine maximum time delay.
 - d) Verify two points on the I-two-squared-t curve.
- 8) Phase Sequence or Phase Balance Voltage Relay:
 - a) Determine positive sequence voltage to close the NO contact.
 - b) Determine positive sequence voltage to open the NC contact (undervoltage trip).
 - c) Verify negative sequence trip.
 - d) Determine time delay to close the NO contact with sudden application of 120 percent of pickup.
 - e) Determine time delay to close the NC contact upon removal of voltage when previously set to rated system voltage.
- 9) Instantaneous Overcurrent Relay:
 - a) Determine pickup.
 - b) Determine dropout.
 - c) Determine time delay.
- 10) Time Overcurrent:
 - a) Determine minimum pickup.
 - b) Determine time delay at two points on the time current curve.
- 11) Ground Detector Relay:
 - a) Determine maximum impedance to ground causing relay pickup.
- 12) Directional Overcurrent Relay:
 - a) Determine directional unit minimum pickup at maximum torque angle.
 - b) Determine closing zone.
 - c) Determine maximum torque angle.
 - d) Plot operating characteristics.
 - e) Determine overcurrent unit pickup.
 - f) Determine overcurrent unit time delay at two points on the time current curve.



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d. Control Verification:

1) Functional Tests:

- a) Check operation of all active digital inputs.
- b) Check output contacts or silicone-controlled rectifiers (SCRs), preferably by operating the controlled device, such as switch, auxiliary relay, or alarm.
- c) Check internal logic functions used in protection scheme.
- d) Upon completion of testing, reset min/max recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.

2) In-Service Monitoring: After the equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.

H. DC System VRLA Batteries Field Test:

1. Visual and Mechanical Inspection:

- a. Verify that batteries are adequately located.
- b. Verify that battery area ventilation system is operable.
- c. Verify existence of suitable eyewash equipment.
- d. Verify equipment nameplate data complies with Contract Documents.
- e. Inspect physical and mechanical condition.
- f. Verify adequacy of battery support racks, mounting, anchorage, alignment, grounding, and clearances.
- g. Verify the units are clean.
- h. Inspect spill containment installation.
- i. Verify application of an oxide inhibitor on battery terminal connections.

2. Electrical Tests:

- a. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended levels.
- b. Verify charger functions and that alarms comply with system manufacturer's recommendations.
- c. Measure negative post temperature. Negative post temperature must comply with manufacturer's published data or IEEE 1188.
- d. Measure charger float and equalizing voltage levels. Charger float and equalizing voltage levels must be in accordance with the battery manufacturer's published data.
- e. Measure each monoblock/cell voltage and total battery voltage with charger energized and in float mode of operation. Monoblock/cell voltages must be in accordance with manufacturer's published data.
- f. Measure intercell connection resistances.
- g. Perform internal ohmic measurement tests. Cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical cells that are in a fully charged state. Monoblock/cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical monoblocks/cells in a fully charged state.
- h. Perform a load test in accordance with manufacturer's published data or IEEE 1188. Replace units that fail to pass the test.
- i. Measure the battery system voltage from positive to ground and negative to ground. Voltage measured from positive to ground must be equal in magnitude to



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the voltage measured from negative to ground.

I. Nonconforming Work:

1. Switchgear will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.
- J. Prepare test and inspection reports. Record as-left set points of adjustable devices.

1. The contractor shall provide three (3) copies of the manufacturer's representative certification.
2. The contractor shall provide three (3) copies of the manufacturer's field startup report.
3. The contractor shall provide three (3) copies of factory test reports.

3.6 SYSTEM FUNCTION TESTS

A. System function tests must prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and all components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
3. Verify the correct operation of sensing devices, alarms, and indicating devices.

3.7 FOLLOW-UP SERVICE

A. Voltage Monitoring and Adjusting: After acceptance by the Department, but not more than six months after acceptance, if requested by the Department or Client Agency, perform the following voltage monitoring:

1. During a period of normal load cycles as evaluated by Client Agency, perform seven days of three-phase voltage recording at the outgoing section of each switchgear. Use voltmeters with calibration traceable to NIST standards and with a chart speed of not less than 1 inch (25 mm) per hour. Voltage unbalance greater than 1 percent between phases, or deviation of phase voltage from the nominal value by more than plus or minus 5 percent during the test period is unacceptable.
2. Corrective Action: If test results are unacceptable, perform the following corrective action, as appropriate:
 - a. Adjust switchgear taps.
 - b. Prepare written request for voltage adjustment by electric utility.
3. Retests: Repeat monitoring, after corrective action has been performed, until specified results are obtained.
4. Report:
 - a. Prepare a written report covering monitoring performed and corrective action taken.

B. Infrared Inspection: Perform the survey during periods of maximum possible loading. Remove covers prior to the inspection.

1. After acceptance by the Department, but not more than 60 days after acceptance, perform infrared inspection of the electrical power connections of the switchgear.
2. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1deg C at 86 deg F (30 deg C).
3. Record of Infrared Inspection: Prepare a certified report that identifies the testing technician and equipment used and lists the results as follows:
 - a. Description of equipment to be tested.
 - b. Discrepancies.



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- c. Temperature difference between the area of concern and the reference area.
- d. Probable cause of temperature difference.
- e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
- f. Identify load conditions at time of inspection.
- g. Provide photographs and thermograms of the deficient area.
- 4. Act on inspection results in accordance with the recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Client Agency's operations permit

SECTION 262200

LOW VOLTAGE TRANSFORMERS

3.3 FIELD QUALITY CONTROL

- A. Engage a qualified electrical testing and inspecting agency to administer and perform tests and inspections specified within this section, with the assistance of a factory authorized service representative.
- B. Test Objectives: To ensure transformer is operational within industry and manufacturer's tolerances, is installed according to the Contract Documents, and is suitable for energizing.
- C. Test Labeling: On satisfactory completion of tests for each transformer, attach a dated and signed "Satisfactory Test" label to tested component.
- D. Schedule tests and provide notification at least 7 days in advance of test commencement.
- E. Report: Submit a written report of observations and tests. Report defective materials and installation.
- F. Tests: Include the following minimum inspections and tests according to manufacturer's written instructions. Comply with IEEE C57.12.91 for test methods and data correction factors.
 - 1. Inspect accessible components for cleanliness, mechanical and electrical integrity, and damage or deterioration. Verify that temporary shipping bracing has been removed. Include internal inspection through access panels and covers.
 - 2. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, if not available, those specified in UL 486A and UL 486B.
 - 3. Insulation Resistance: Perform megohmmeter tests of primary and secondary winding to winding and winding to ground.
 - a. Minimum Test Voltage: 1000 V, dc.
 - b. Minimum Insulation Resistance: 500 megohms.
 - c. Duration of Each Test: 10 minutes.
 - d. Temperature Correction: Correct results for test temperature deviation from 20 deg C standard.

SECTION 262300

LOW-VOLTAGE SWITCHGEAR

3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Comply with provisions of "Testing and Test Methods" Chapter in NFPA 70B and NETA ATS.
 - 2. After installing switchgear and after electrical circuitry has been energized, test for compliance with requirements.
 - 3. Perform visual and mechanical inspections and electrical tests stated in NETA ATS. Certify compliance with test parameters.
 - 4. Visual and Mechanical Inspection:



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- a. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study, as well as to circuit breakers address in control network.
- b. Verify that current and voltage transformer ratios correspond to Drawings.
- c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.
- d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
 - 1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
 - 2) Make key exchange with devices operated in off-normal positions.
- e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- f. Inspect insulators for evidence of physical damage or contaminated surfaces.
- g. Verify correct barrier and shutter installation and operation.
- h. Exercise active components.
- i. Inspect mechanical indicating devices for correct operation.
- j. Verify that filters are in place and that vents are clear.
- k. Perform visual and mechanical inspection of instrument transformers in accordance with "Instrument Transformer Field Tests" Paragraph.
- l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
 - 3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.
5. Electrical Tests:
 - a. Perform DC voltage insulation-resistance tests on bus sections, phase-to-phase and phase-to-ground, for one minute. If bus temperature is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.
 - 1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.
 - 2) Do not proceed to dielectric withstand voltage tests until insulation resistance levels are raised above minimum values.
 - b. Perform dielectric withstand voltage test on bus sections, phase-to-ground with phases not under test grounded, in accordance with manufacturer's published



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data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, test specimen is considered to have passed test.

c. Perform insulation-resistance tests on control wiring for ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's published instruction.

1) Minimum insulation-resistance values of control wiring may not be less than 2 MΩ.

d. Control Power Transformers:

1) Perform insulation-resistance tests. Perform measurements from winding-to winding and windings-to-ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.

2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to rated secondary voltage source. Verify correct potential at devices.

3) Verify correct secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with secondary wiring disconnected.

4) Verify correct function of control transfer relays located in switchgear with multiple control power sources.

e. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at devices.

2) Verify secondary voltages by energizing primary winding with system voltage.

f. Perform current-injection tests on entire current circuit in switchgear sections.

1) Perform current tests by secondary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.

2) Perform current tests by primary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.

g. Perform system function tests in accordance with "System Function Tests" Paragraph.

h. Verify operation of space heaters.

i. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from sources.

B. Circuit-Breaker Field Tests:

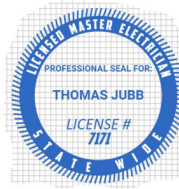
1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, and grounding.

c. Verify that maintenance devices are available for servicing and operating breaker.

d. Verify unit is clean.



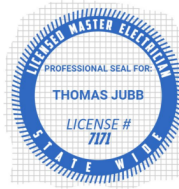
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- e. Verify that arc chutes are intact.
 - f. Inspect moving and stationary contacts for condition and alignment.
 - g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.
 - h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.
 - i. Verify cell fit and element alignment.
 - j. Verify racking mechanism operation.
 - k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - l. Perform adjustments for final protective-device settings in accordance with coordination study provided by Client Agency.
 - m. Record as-found and as-left operation counter readings.
2. Electrical Tests:
- a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across open poles. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than Table 100.1 or manufacturer's published instructions must be investigated.
 - b. Measure contact resistance across power contacts of circuit breakers. Drop values for $\mu\Omega$ or mV(dc) may not exceed high levels of normal range as indicated in manufacturer's published data. In absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
 - c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are unavailable, trip times may not exceed value shown in NETA ATS, Table 100.7.
 - d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
 - e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
 - f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.
 - g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.
 - h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.



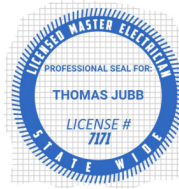
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- i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
 - j. Verify correct operation of auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, ant pump function, and trip-unit battery condition. Reset trip logs and indicators. Auxiliary features must operate in accordance with manufacturer's published data.
 - k. Verify operation of charging mechanism. Charging mechanism must operate in accordance with manufacturer's published data.
- C. Instrument Transformer Field Tests:
- 1. Visual and Mechanical Inspection:
 - a. Verify that equipment nameplate data complies with Contract Documents.
 - b. Inspect physical and mechanical condition.
 - c. Verify correct connection of transformers with system requirements.
 - d. Verify that adequate clearances exist between primary and secondary circuit wiring.
 - e. Verify that unit is clean.
 - f. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.
 - g. Verify that required grounding and shorting connections provide contact.
 - h. Verify correct operation of transformer withdrawal mechanism and grounding operation.
 - i. Verify correct primary and secondary fuse sizes for voltage transformers.
 - j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - 2. Electrical Tests of Current Transformers:
 - a. Perform insulation-resistance test of current transformers and secondary wiring for ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
 - b. Perform polarity test on current transformers in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.
 - c. Perform ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.
 - d. Perform excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or be in accordance with IEEE C57.13.1.
 - e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared to, and must match, instrument transformer ratings.



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- f. Perform insulation-resistance tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.5.
 - g. Perform dielectric withstand tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.9.
 - h. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
 - i. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by Engineer in Project Drawings.
3. Electrical Tests of Voltage Transformers:
- a. Perform insulation-resistance tests, winding-to-winding and windings-to-ground. Test voltages must be applied for one minute in accordance with NETA ATS Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
 - b. Perform polarity test on transformers to verify polarity marks or H1-X1 relationship as applicable. Polarity results must agree with transformer markings.
 - c. Perform turns-ratio test on tap positions. Ratio errors must be in accordance with IEEE C57.13.
 - d. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to, and must match, instrument transformer ratings.
 - e. Perform dielectric withstand test on primary windings with secondary windings connected to ground. Dielectric voltage must be in accordance with NETA ATS, Table 100.9. Test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, primary windings are considered to have passed test.
 - f. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use test equipment manufacturer's published data.
 - g. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that circuits are grounded at only one point.
- D. Ground-Resistance Test:
- 1. Visual and Mechanical Inspection:
 - a. Verify that ground system complies with Contract Documents and with Article 250, "Grounding and Bonding," in NFPA 70.
 - b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.
 - c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or



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NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Inspect anchorage.

2. Electrical Tests:

a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on main grounding electrode or system. Resistance between main grounding electrode and ground must be no more than 5 Ω .

b. Perform point-to-point tests to determine resistance between main grounding system and major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 Ω . Compare equipment nameplate data with the Contract Documents.

c. Inspect physical and mechanical condition.

d. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

E. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

d. Verify that unit is clean.

e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.

b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.

c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specifications.

d. Verify that current transformer and voltage transformer secondary circuits are



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intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

F. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

- a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.
- b. Verify operation of LEDs, display, and targets.
- c. Record passwords for each access level.
- d. Clean front panel and remove foreign material from case.
- e. Check tightness of connections.
- f. Verify that frame is grounded in accordance with manufacturer's published instructions.
- g. Set relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."
- h. Download settings from relay. Print copy of settings for report and compare settings to those specified in coordination study.

2. Electrical Tests:

- a. Perform insulation-resistance tests from circuits to grounded frame in accordance with manufacturer's published data.
- b. Apply voltage or current to analog inputs, and verify correct registration of relay meter functions.
- c. Check functional operation of elements used in protection scheme as follows:
 - 1) ANSI No. 2/62, Timing Relay:
 - a) Determine time delay.
 - b) Verify operation of instantaneous contacts.
 - 2) ANSI No. 24, Volts/Hertz Relay:
 - a) Determine pickup frequency at rated voltage.
 - b) Determine pickup frequency at second voltage level.
 - c) Determine time delay.
 - 3) ANSI No. 25, Sync Check Relay:
 - a) Determine closing zone at rated voltage.
 - b) Determine maximum voltage differential that permits closing at zero degrees.
 - c) Determine set points of live line, live bus, dead line, and dead bus.
 - d) Determine time delay.
 - e) Verify control functions of dead bus/live line, dead line/live bus, and dead bus/dead line.
 - 4) ANSI No. 27, Undervoltage Relay:
 - a) Determine dropout voltage.
 - b) Determine time delay.
 - c) Determine time delay at second point on timing curve for inverse time relays.
 - 5) ANSI No. 32, Directional Power Relay:
 - a) Determine minimum pickup at maximum torque angle.
 - b) Determine closing zone.
 - c) Determine maximum torque angle.
 - d) Determine time delay.
 - e) Verify time delay at second point on timing curve for inverse time



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relays.

f) Plot operating characteristic.

6) ANSI No. 46, Current Balance Relay:

a) Determine pickup of unit.

b) Determine percent slope.

c) Determine time delay.

7) ANSI No. 46N, Negative Sequence Current Relay:

a) Determine negative sequence alarm level.

b) Determine negative sequence minimum trip level.

c) Determine maximum time delay.

d) Verify two points on I_2T curve.

8) ANSI No. 47, Phase Sequence or Phase Balance Voltage Relay:

a) Determine positive sequence voltage to close N.O. contact.

b) Determine positive sequence voltage to open N.C. contact (undervoltage trip).

c) Verify negative sequence trip.

d) Determine time delay to close N.O. contact with sudden application of 120 percent of pickup.

e) Determine time delay to close N.C. contact on removal of voltage when previously set to rated system voltage.

9) ANSI No. 50, Instantaneous Overcurrent Relay:

a) Determine pickup.

b) Determine dropout.

c) Determine time delay.

10) ANSI No. 51, Time Overcurrent:

a) Determine minimum pickup.

b) Determine time delay at two points on time current curve.

11) ANSI No. 64, Ground Detector Relay:

a) Determine maximum impedance to ground causing relay pickup.

12) ANSI No. 67, Directional Overcurrent Relay:

a) Determine directional unit minimum pickup at maximum torque angle.

b) Determine closing zone.

c) Determine maximum torque angle.

d) Plot operating characteristics.

e) Determine overcurrent unit pickup.

f) Determine overcurrent unit time delay at two points on time current curve.

13) ANSI No. 87, Differential Relay:

a) Determine operating unit pickup.

b) Determine operation of restraint unit.

c) Determine slope.

d) Determine harmonic restraint.

e) Determine instantaneous pickup.

d. Control Verification:

1) Functional Tests:

a) Check operation of active digital inputs.

b) Check output contacts or SCRs, preferably by operating controlled device, such as circuit breaker, auxiliary relay, or alarm.



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- c) Check internal logic functions used in protection scheme.
- d) On completion of testing, reset minimum/maximum recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.
- 2) In-Service Monitoring: After equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.
- G. Ground-Fault Protection Field Tests: Evaluate interconnected system in accordance with switchgear manufacturer's published instructions.
 - 1. Determine proper location of sensors around bus of circuit to be protected. This determination may be done visually, with knowledge of which bus is involved.
 - 2. Verify grounding points of system to determine that ground paths do not exist that would bypass sensors. Use high-voltage testers and resistance bridges.
 - 3. Test installed system for correct response by application of full-scale current into equipment to duplicate ground-fault condition, or by equivalent means such as by simulated fault current generated by the following:
 - a. A coil around sensors
 - b. A separate test winding in sensors.
 - 4. Record test results on test form provided with instructions provided by manufacturer.
- H. System Function Tests: Perform system function tests after other field quality-control tests have been completed and components have passed specified tests. Verify correct interaction of sensing, processing, and action devices.
 - 1. Develop test parameters and perform tests for purpose of evaluating performance of integral components and their functioning as complete unit within design requirements and manufacturer's published data.
 - 2. Verify correct operation of interlock safety devices for fail-safe functions in addition to design function.
 - 3. Verify correct operation of sensing devices, alarms, and indicating devices.

SECTION 262413

SWITCHBOARDS

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

- 1. Comply with provisions of "Testing and Test Methods" Chapter in NFPA 70B and NETA ATS.
- 2. After installing switchboard and after electrical circuitry has been energized, test for compliance with requirements.
- 3. Perform visual and mechanical inspections and electrical tests stated in NETA ATS. Certify compliance with test parameters.
- 4. Visual and Mechanical Inspection:
 - a. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study, as well as to circuit breaker's address in control network.
 - b. Verify that current and voltage transformer ratios correspond to Drawings.
 - c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated



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torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.

2) Make key exchange with devices operated in off-normal positions.

e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

f. Inspect insulators for evidence of physical damage or contaminated surfaces.

g. Verify correct barrier and shutter installation and operation.

h. Exercise active components.

i. Inspect mechanical indicating devices for correct operation.

j. Verify that filters are in place and that vents are clear.

k. Perform visual and mechanical inspection of instrument transformers in accordance with "Instrument Transformer Field Tests" Paragraph.

l. Inspect control power transformers.

1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.

2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.

3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.

5. Electrical Tests:

a. Perform DC voltage insulation-resistance tests on bus sections, phase-to-phase and phase-to-ground, for one minute. If bus temperature is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.

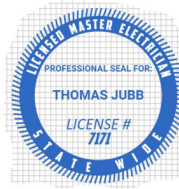
1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.

2) Do not proceed to dielectric withstand voltage tests until insulation-resistance levels are raised above minimum values.

b. Perform dielectric withstand voltage test on bus sections, phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, test specimen is considered to have passed test.

c. Perform insulation-resistance tests on control wiring for ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's published instruction.



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- 1) Minimum insulation-resistance values of control wiring may not be less than 2 MΩ.
- d. Control Power Transformers:
 - 1) Perform insulation-resistance tests. Perform measurements from winding-to winding and windings-to-ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.
 - 2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to rated secondary voltage source. Verify correct potential at devices.
 - 3) Verify correct secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with secondary wiring disconnected.
 - 4) Verify correct function of control transfer relays located in switchboard with multiple control power sources.
- e. Voltage Transformers:
 - 1) Perform secondary wiring integrity test. Verify correct potential at devices.
 - 2) Verify secondary voltages by energizing primary winding with system voltage.
- f. Perform current-injection tests on entire current circuit in switchboard sections.
 - 1) Perform current tests by secondary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.
 - 2) Perform current tests by primary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.
- g. Perform system function tests in accordance with "System Function Tests" Paragraph.
- h. Verify operation of space heaters.
- i. Perform phasing checks on double-ended or dual-source switchboard to ensure correct bus phasing from sources.
- B. Circuit-Breaker Field Tests:
 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, and grounding.
 - c. Verify that maintenance devices are available for servicing and operating breaker.
 - d. Verify unit is clean.
 - e. Verify that arc chutes are intact.
 - f. Inspect moving and stationary contacts for condition and alignment.
 - g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.
 - h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.
 - i. Verify cell fit and element alignment.
 - j. Verify racking mechanism operation.
 - k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - l. Perform adjustments for final protective-device settings in accordance with



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coordination study provided by Client Agency.

m. Record as-found and as-left operation counter readings.

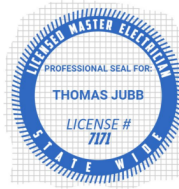
2. Electrical Tests:

- a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across open poles. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than Table 100.1 or manufacturer's published instructions must be investigated.
- b. Measure contact resistance across power contacts of circuit breakers. Drop values for $\mu\Omega$ or mV(dc) may not exceed high levels of normal range as indicated in manufacturer's published data. In absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are unavailable, trip times may not exceed value shown in NETA ATS, Table 100.7.
- d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
- e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
- f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.
- g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.
- h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.
- i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
- j. Verify correct operation of auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, ant pump function, and trip-unit battery condition. Reset trip logs and indicators. Auxiliary features must operate in accordance with manufacturer's published data.
- k. Verify operation of charging mechanism. Charging mechanism must operate in accordance with manufacturer's published data.

C. Instrument Transformer Field Tests:

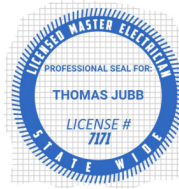
1. Visual and Mechanical Inspection:

- a. Verify that equipment nameplate data complies with Contract Documents.



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- b. Inspect physical and mechanical condition.
- c. Verify correct connection of transformers with system requirements.
- d. Verify that adequate clearances exist between primary and secondary circuit wiring.
- e. Verify that unit is clean.
- f. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.
- g. Verify that required grounding and shorting connections provide contact.
- h. Verify correct operation of transformer withdrawal mechanism and grounding operation.
- i. Verify correct primary and secondary fuse sizes for voltage transformers.
- j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- 2. Electrical Tests of Current Transformers:
 - a. Perform insulation-resistance test of current transformers and secondary wiring for ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
 - b. Perform polarity test on current transformers in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.
 - c. Perform ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.
 - d. Perform excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or be in accordance with IEEE C57.13.1.
 - e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared to, and must match, instrument transformer ratings.
 - f. Perform insulation-resistance tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.5.
 - g. Perform dielectric withstand tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.9.
 - h. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
 - i. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by Engineer in Project Drawings.
- 3. Electrical Tests of Voltage Transformers:
 - a. Perform insulation-resistance tests, winding-to-winding and windings-to-ground. Test voltages must be applied for one minute in accordance with NETA ATS



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Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.

- b. Perform polarity test on transformers to verify polarity marks or H1-X1 relationship as applicable. Polarity results must agree with transformer markings.
- c. Perform turns-ratio test on tap positions. Ratio errors must be in accordance with IEEE C57.13.
- d. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to, and must match, instrument transformer ratings.
- e. Perform dielectric withstand test on primary windings with secondary windings connected to ground. Dielectric voltage must be in accordance with NETA ATS, Table 100.9. Test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, primary windings are considered to have passed test.
- f. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use test equipment manufacturer's published data.
- g. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that circuits are grounded at only one point.

D. Ground-Resistance Test:

1. Visual and Mechanical Inspection:

- a. Verify that ground system complies with Contract Documents and with Article 250, "Grounding and Bonding," in NFPA 70.
- b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.
- c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Inspect anchorage.

2. Electrical Tests:

- a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on main grounding electrode or system. Resistance between main grounding electrode and ground must be no more than 5 Ω .
- b. Perform point-to-point tests to determine resistance between main grounding system and major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 Ω . Compare equipment nameplate data with the Contract Documents.
- c. Inspect physical and mechanical condition.



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d. Inspect bolted electrical connections for high resistance using one of the following two methods:

- 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

E. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

- a. Inspect physical and mechanical condition.
- b. Inspect bolted electrical connections for high resistance using one of the following two methods:

- 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

d. Verify that unit is clean.

e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

- a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.
- b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.
- c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specifications.
- d. Verify that current transformer and voltage transformer secondary circuits are intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

F. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

- a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.
- c. Record passwords for each access level.
- d. Clean front panel and remove foreign material from case.
- e. Check tightness of connections.
- f. Verify that frame is grounded in accordance with manufacturer's published instructions.
- g. Set relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."



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h. Download settings from relay. Print copy of settings for report and compare settings to those specified in coordination study.

2. Electrical Tests:

a. Perform insulation-resistance tests from circuits to grounded frame in accordance with manufacturer's published data.

b. Apply voltage or current to analog inputs, and verify correct registration of relay meter functions.

c. Check functional operation of elements used in protection scheme as follows:

1) ANSI No. 2/62, Timing Relay:

a) Determine time delay.

b) Verify operation of instantaneous contacts.

2) ANSI No. 24, Volts/Hertz Relay:

a) Determine pickup frequency at rated voltage.

b) Determine pickup frequency at second voltage level.

c) Determine time delay.

3) ANSI No. 25, Sync Check Relay:

a) Determine closing zone at rated voltage.

b) Determine maximum voltage differential that permits closing at zero degrees.

c) Determine set points of live line, live bus, dead line, and dead bus.

d) Determine time delay.

e) Verify control functions of dead bus/live line, dead line/live bus, and dead bus/dead line.

4) ANSI No. 27, Undervoltage Relay:

a) Determine dropout voltage.

b) Determine time delay.

c) Determine time delay at second point on timing curve for inverse time relays.

5) ANSI No. 32, Directional Power Relay:

a) Determine minimum pickup at maximum torque angle.

b) Determine closing zone.

c) Determine maximum torque angle.

d) Determine time delay.

e) Verify time delay at second point on timing curve for inverse time relays.

Plot operating characteristic.

6) ANSI No. 46, Current Balance Relay:

a) Determine pickup of unit.

b) Determine percent slope.

c) Determine time delay.

7) ANSI No. 46N, Negative Sequence Current Relay:

a) Determine negative sequence alarm level.

b) Determine negative sequence minimum trip level.

c) Determine maximum time delay.

d) Verify two points on I_2T curve.

8) ANSI No. 47, Phase Sequence or Phase Balance Voltage Relay:

a) Determine positive sequence voltage to close N.O. contact.

b) Determine positive sequence voltage to open N.C. contact



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(undervoltage trip).

c) Verify negative sequence trip.

d) Determine time delay to close N.O. contact with sudden application of 120 percent of pickup.

e) Determine time delay to close N.C. contact on removal of voltage when previously set to rated system voltage.

9) ANSI No. 50, Instantaneous Overcurrent Relay:

a) Determine pickup.

b) Determine dropout.

c) Determine time delay.

10) ANSI No. 51, Time Overcurrent:

a) Determine minimum pickup.

b) Determine time delay at two points on time current curve.

11) ANSI No. 64, Ground Detector Relay:

a) Determine maximum impedance to ground causing relay pickup.

12) ANSI No. 67, Directional Overcurrent Relay:

a) Determine directional unit minimum pickup at maximum torque angle.

b) Determine closing zone.

c) Determine maximum torque angle.

d) Plot operating characteristics.

e) Determine overcurrent unit pickup.

f) Determine overcurrent unit time delay at two points on time current curve.

13) ANSI No. 87, Differential Relay:

a) Determine operating unit pickup.

b) Determine operation of restraint unit.

c) Determine slope.

d) Determine harmonic restraint.

e) Determine instantaneous pickup.

d. Control Verification:

1) Functional Tests:

a) Check operation of active digital inputs.

b) Check output contacts or SCRs, preferably by operating controlled device, such as circuit breaker, auxiliary relay, or alarm.

c) Check internal logic functions used in protection scheme.

d) On completion of testing, reset minimum/maximum recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.

2) In-Service Monitoring: After equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.

G. Ground-Fault Protection Field Tests: Evaluate interconnected system in accordance with switchboard manufacturer's published instructions.

1. Determine proper location of sensors around bus of circuit to be protected. This determination may be done visually, with knowledge of which bus is involved.

2. Verify grounding points of system to determine that ground paths do not exist that would bypass sensors. Use high-voltage testers and resistance bridges.

3. Test installed system for correct response by application of full-scale current into equipment to duplicate ground-fault condition, or by equivalent means such as by



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simulated fault current generated by the following:

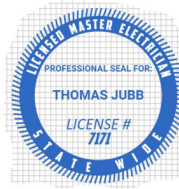
- a. A coil around sensors.
- b. A separate test winding in sensors.
4. Record test results on test form provided with instructions provided by manufacturer.
- H. System Function Tests: Perform system function tests after other field quality-control tests have been completed and components have passed specified tests. Verify correct interaction of sensing, processing, and action devices.
 1. Develop test parameters and perform tests for purpose of evaluating performance of integral components and their functioning as complete unit within design requirements and manufacturer's published data.
 2. Verify correct operation of interlock safety devices for fail-safe functions in addition to design function.
 3. Verify correct operation of sensing devices, alarms, and indicating devices.
- I. Nonconforming Work:
 1. Switchboard components will be considered defective if they do not pass tests and inspections.
 2. Remove and replace defective units and retest.
- J. Collect, assemble, and submit test and inspection reports. Record as-left set points of adjustable devices.
- B. Infrared Inspection: Perform survey during periods of maximum possible loading. Remove covers prior to inspection.
 1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of electrical power connections of switchboard.
 2. Instrument: Inspect distribution systems with imaging equipment capable of detecting minimum temperature difference of 1 deg C at 30 deg C.
 3. Record of Infrared Inspection: Prepare certified report that identifies testing technician and equipment used and that lists results as follows:
 - a. Description of equipment to be tested.
 - b. Discrepancies.
 - c. Temperature difference between area of concern and reference area.
 - d. Probable cause of temperature difference.
 - e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
 - f. Identify load conditions at time of inspection.
 - g. Provide photographs and thermograms of deficient area.
 4. Act on inspection results in accordance with recommendations in NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Client Agency's operations permit. Retest until deficiencies are corrected.
 5. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of switches 11 months after date of Substantial Completion.

SECTION 262416

PANELBOARDS

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.



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C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After acceptance by the Department, but not more than 60 days after acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of acceptance by the Department.
- c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

SECTION 262500

ENCLOSED BUS ASSEMBLIES

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Remove and replace units that do not pass tests and inspections and retest as specified above.
- D. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of bus assembly including joints and plug-in units.
 1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
 2. Perform 2 follow-up infrared scans of bus assembly, one at 4 months and the other at 11 months after Substantial Completion.
 3. Prepare a certified report identifying bus assembly checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.
- E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
 2. Test continuity of each line- and load-side circuit.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated



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in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

SECTION 262913

ENCLOSED CONTROLLERS

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports: Retain first two paragraphs below to describe tests and inspections to be performed.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.

2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.

3. Test continuity of each circuit.

4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Using Agency before starting the motor(s).

5. Test each motor for proper phase rotation.

6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each multi-pole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.

b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multi-pole enclosed controller 11 months after date of Substantial Completion.

c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed controllers will be considered defective if they do not pass tests and inspections.

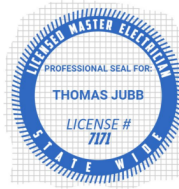
E. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

SECTION 262923

VARIABLE-FREQUENCY MOTOR CONTROLLERS

3.8 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:



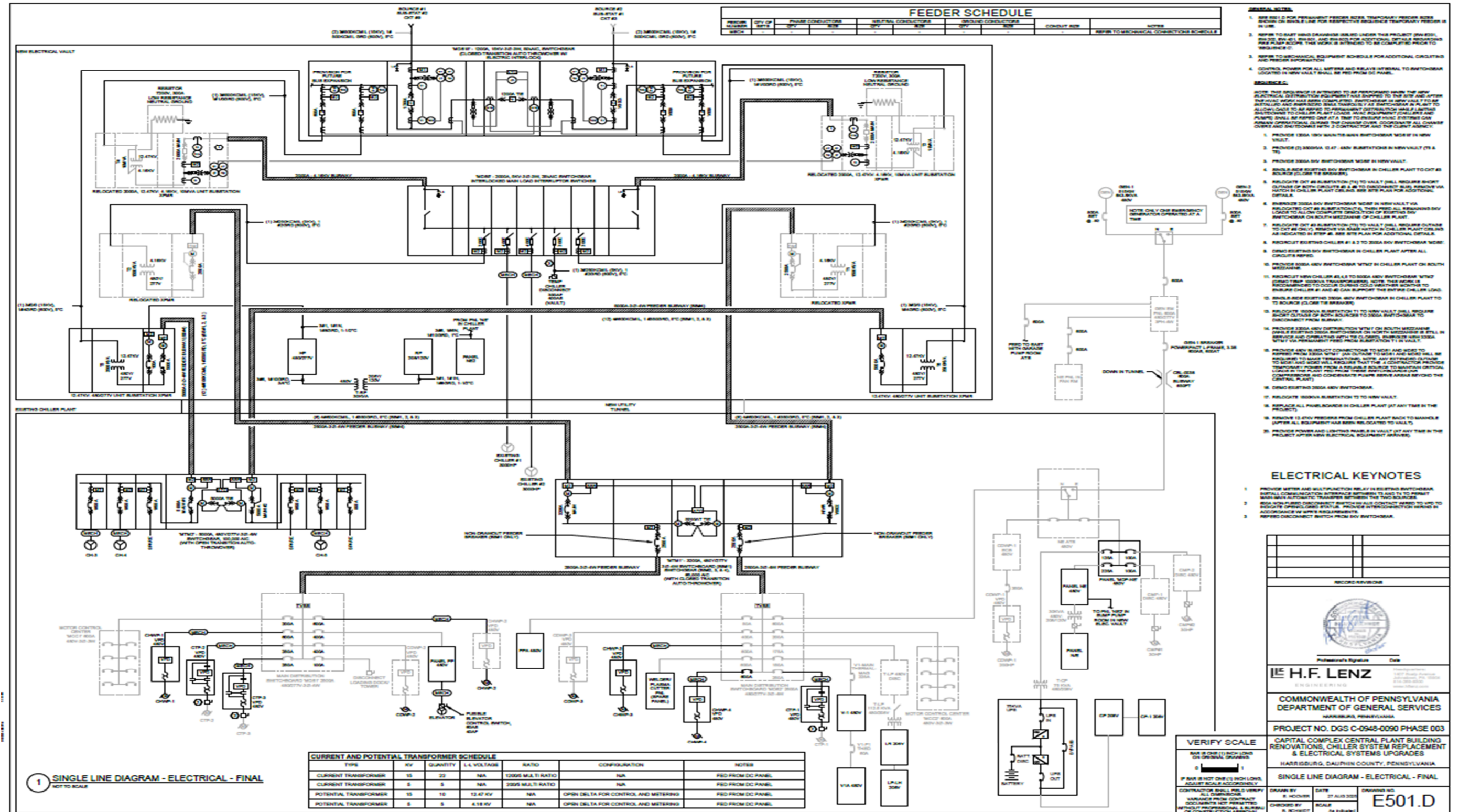
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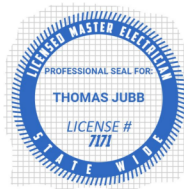
1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
 3. Report results in writing.
- C. Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS. Certify compliance with test parameters.



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DRAWING NEW EQUIPMENT:





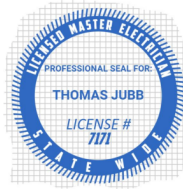
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EQUIPMENT SUPPLIED EQUIPMENT LIST WITH OUR ADDED NOTES HIGHLIGHTED IN YELLOW

es from client:
equipment list below does not include the existing MV transformers and Gear to be altered, relocated and reused.
on testing all transformers for re-installation before removal and after re-installation.
will be testing the Temp 5kV safety switch before and after usage and completion of that phase of work.
on testing the temporary trailer and transformer.
are required to offer two options for the 480V gear...conduit/wire and buss. Plan to test both options. If there is a difference please call that price
in your quote.
specs for further acceptance testing requirements.

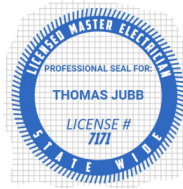
**Equipment List
Panels**

MDP-NE Panelboard Main Lugs Only Surface Mount 600A 480V
LP-LH Panelboard Main Lugs Only Surface Mount 250V 400A
CP Panelboard Main Breaker Surface Mount 250V 175A
V-1 RH Panelboard Main Lugs Only Surface Mount 480V
LR Panelboard Main Breaker Surface Mount 250V 400A
CP-1 Panelboard Main Breaker Surface Mount 250V 100A
V-1 Panelboard Main Breaker Surface Mount 250V 125A
PP Panelboard Main Breaker Only Surface Mount 300A 480V
Welder/Plasma Cutter Panel MLO Surface Mount 480V 250A
V1A Panel MLO Surface Mount 480V 250A
N/E Panelboard Main Lugs Only Surface Mount 250V 225A
NE2 Panelboard Main Breaker Surface Mount 250V 50A
NE Panelboard Main Breaker Surface Mount 250V 225A
RP Panelboard Main Breaker Surface Mount 250V 100A
HP Panel MLO Surface Mount 480V 100A
DC Panelboard Main Breaker Surface Mount 125V DC 50A
Switchgear & relays,ct/pt, cntrl wires



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MTM2 480V 5000A Service Switchgear*
MTM1 480V 3200A Service Switchgear*
MDS15 15KV 1200A Service Switchgear*
MDS5 5KV 2000A Service Switchgear*
Safety Switches
Temp Chiller 5kv Fused Safety Switch- test 2-times
Mechanical Equipment Safety Switches
AHU-6 30AMP 120V Single Phase
EF-1 480V 30Amp 3-phase
EF-2 480V 30Amp 3-phase
EF-3A 480V 30Amp 3-phase
EF-3B 480V 30Amp 3-phase
EF-3C 480V 30Amp 3-phase
EF-3D 480V 30Amp 3-phase
Elevator Power Unit 480V 60Amp 3-phase 40AMP Fuses
Foundation Pump 480V 30Amp 3-phase
TF-1 120V 30Amp 1-phase
TF-2 120V 30Amp 1-phase
Vault Pump 480V 30Amp 3-phase
Transformers
T-RP 30KVA Transformer Wall Mount 480V Primary
T-5 3500KVA New Transformer 15kv to 480v
T-6 3500KVA New Transformer 15kv to 480v
UPS System
75KVA UPS by OEM
1-Temp trailer-sw brd & transf
2-cable/bus sections:5kv
6-cable/bus sections:600v
4-existing transf/sw gear to be moved & relocated- test 2-times



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8-sets mv cable
20-sets lv cable
1-main grnd 3pt tst
10-equip grnd 2-pt tst
2-vfd's

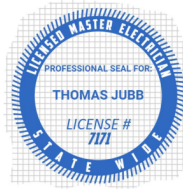
stments:

Acceptance testing-\$159,000

Infrared thermal scans of new equipment per spec- 2 in 11 month window-\$25,900 (client to supply qualified person tto remove/install covers during scans- approx. 14- 8hr days)

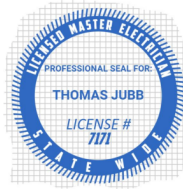
TES: (as applicable the specific project work scope)

1. Customer cancellations &/or rescheduling will be subject to an additional fee; 24 to 48 hours prior to scheduled outage - 10% of contract amount. 24 hours or less prior to scheduled outage – 25% of contract amount.
2. Equipment not shown on supplied drawings
3. Equipment excluded-motors, lv riser panels/br panels-or related breakers or branch cables, vfd's, ups, sw/pnl brds/brkrs
4. Retesting, parts, repairs, man hole entry,
5. Client to remove/install covers during IR scans



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6. Unless there is an emergency situation , we request a minimum of 48 hours' notice for the scheduling of non-emergency/normal services.
7. Site specific training, access, and/or security requirements, commissioning, as well as costs for testing for illnesses and/or disease are not included in this proposal.
8. Applicable taxes are not included in this proposal.
9. Credit card payments will be assessed a 3% processing fee (2/1/19 Implementation Date) accepted: Visa, Mastercard, American Express (4%).
10. If applicable: the cost of developing test plans is excluded from this proposal.
11. We require a minimum of 8 hours of ready work per day.
12. Provide reasonable parking and sanitary facilities for our technicians.
13. Provide test plans/procedures to us if applicable.
- 14. Client to supply all information for the Engineering studies**
15. Excluded: voltage/current recordings, power quality meters, static ups, engineering studies/device settings, commissioning, retests, -IR may be used in lieu of torquing main connections,
All investments are based on trained TT technicians.
All investments are based upon all work performed during normal business hours, Monday through Friday, 7am-3:30pm
All investments include 1- service vehicle.



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Information is shared with the receiving party. The information contained therein, nor any proprietary information furnished pursuant thereto, shall be disclosed to others or used for any purpose other than set forth above without approval. We sincerely appreciate the opportunity of submitting this proposal and hope that we may have the pleasure of serving you.

Respectfully,

Thomas Jubb

Professional Electrical Services and Management, L.L.C. (PESM)

Victory Gallop Court

Frederick, MD 21078

Contact: Thomas Jubb, ME, SE, FM

tjubbpesm@outlook.com

Phone: 443-417-6265

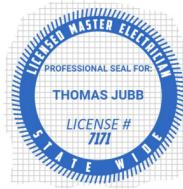
Please assign all purchase orders to Team Member:

Matthew McDermott

410-992-5980

Matthew McDermott <tacticaltestingllc@outlook.com>

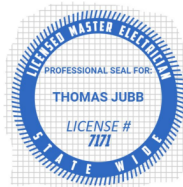
tactical-testing.com -619 Waterside Ct., Balto., MD 21220



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Terms and Conditions:

- **Terms of payment: 1:** Terms are net thirty (30) days. If invoice payment is not received within thirty (30) days, a service charge of 1.5% will be added to the outstanding balance. Based on project work scope, partial invoicing may be implemented.
- **Cancellations:** Cancellations of agreed services must be received twenty-four (24) hours prior to the agreed date and time. Professional Electrical Services and Management's costs plus ten percent (10%), and any rental fee charges will be incurred.
- **Delays:** Professional Electrical Services and Management shall be made aware of delays twenty-four (24) hours prior to site visit or charges will be incurred. Our employees are entitled to a minimum of four (4) hours for time missed to no fault of their own, acts of God, terrorism.
- **Standby time:** Service charges will be incurred if Professional Electrical Services and Management employees cannot perform the services requested due to no fault of their own. Overtime rates will be charged, if necessary, to complete services scheduled for that day.
- **Safety:** Professional Electrical Services and Management employees agree to follow all job specific, state, federal, rules and regulations. Professional Electrical Services and Management employees reserve the right not to perform work that in their trained opinion violates standard safety rules of the trade.
- **Disclaimer:** Professional Electrical Services and Management assumes no responsibility for any damage or injury to any property caused directly or indirectly as a result of Professional Electrical Services and Management performing its duties under this agreement except such damage or injury that may be held to result solely and directly from or out of: Any grossly negligent performance by Professional Electrical Services and Management its obligations under this Agreement or any willful misconduct on the part of Professional Electrical Services and Management, its agents or employees.
- **Responsibility:** All services are performed in accordance with industry standards, project specifications and/or NETA specifications. Where remediation is beyond the scope of normal reliability testing, and where corrective action is required, such services will be quoted separately.
- **Scheduling:** PESM requires a minimum of 48 hours of non-emergency/normal work scheduling notice.



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AUTHORIZATION TO PROCEED

Project: _____

Site Address: _____

Site Contact/Phone: _____ Office Contact/Phone: _____

We instruct TT to proceed with scheduling and performing the work described in the attached proposal.

Proposed date to be begin work: _____

Alternate date: _____

Investment reimbursement will be by: (check one)

Company Name: _____

A) Company check before project start date ☐

Number/\$Amount: _____

B) Purchase ☐ or Service ☐ order

Number/\$Amount: _____

C) Charge card: Visa ☐ Master ☐ Other ☐

Number/\$Amount: _____

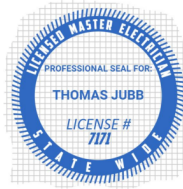
Billing/Company Address: _____

Authorization Signature: _____

Printed Name: _____

Title (Please Print): _____

Date: _____ Phone: _____ Email: _____



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Professional Electrical Services and Management, L.L.C.

(PESM)



(Master Licensed services for Private/Governmental, Industrial, Commercial, Contractor and Residential Client's)



I) PESM- "ELECTRICAL PROJECT SERVICES and MANAGEMENT": All project services will be reviewed and stamped by a "Licensed Master Electrical Manager"

- *Commissioning/Management – testing-new electrical systems, EV charging systems, solar/wind power projects, maintenance
- *Development/Interpretation of specifications — electrical related projects, maintenance, engineering, equipment evaluation
- *Project Management — all electrical related services and projects
- *Estimating/ Project Procurement Services— electrical services, maintenance, procurement development and reviews
- *Proposal Development — electrical services, maintenance, engineering, equipment verifications
- *Electrical System Inspections/ Assessments- Insurance requirements, real estate transactions, new construction, existing systems
- *Consulting - Codes/Standards compliance, training, specifications, RFP's, OSHA safety programs, new and existing system's

II) PESM- "ELECTRICAL SALES, MARKETING and CLIENT RETENTION SERVICES":

- *Sales assistance with perspective/existing clients— estimating, proposal development, client site visits, agreement negotiations, client retention services
- *Sales Training, Marketing Support-customer relationship management (CRM programs)- information input and management
- *Marketing Plan Development, Client Retention and Management— growing new client base, fostering relationships with client's, creating client retention and referral programs to assist in growing your business

III) PESM- "ELECTRICAL PRODUCTS" and "TEAM MEMBERS"

- *Power Quality Meters
- *Electrical Equipment Replacement, Retrofit, Retro Fills
- *Custom Code/Standards Compliant Field Labels
- *NRTL Labeling (UL)



MISSION STATEMENT:

To ensure our professional licensed electrical, technical, management, and marketing services, assist with the growth and continued success of your business, while protecting your assets.

Providing client assurance that their electrical systems will meet the current industry codes and standards while operating safely and efficiently, thus minimizing their liabilities.

Phone: 443-502-2380
Cell: 443-417-6265



SCHNEIDER ELECTRIC

Philadelphia Branch
125 Rock Rd.
Horsham, PA 19044
Phone: (215) 443-0442
Fax: (215) 443-0995

January 20, 2026

Attention: Mathew Robinson

C/O: IB Abel

Project: State Capitol Central Plant Upgrades – Security

General Scope of the Project:

Schneider Electric will provide material and labor to install the new access control equipment for the above-referenced project.

Scope of Work:

- Schneider Electric will provide and install one (1) access control dual reader module to support two (2) new door locations.
 - This proposal assumes that this reader module will connect to an existing intelligent controller and be installed within an existing enclosure.
- Schneider Electric will provide the card readers, door contacts, request-to-exit buttons and miscellaneous material.
- Schneider Electric will program and test the system to make sure it is in working condition.
- Schneider Electric will provide the appropriate Open Options subcontroller license.
- Schneider Electric will provide the appropriate Verint PSIM system licenses.

Exclusions:

- The electrical installation including cable pathway, cable and cable pulling, as well as any supporting devices are excluded from this proposal.
- Device installation will be executed by others and is excluded from this proposal.
- Electronic lock procurement and installation is excluded this proposal.
- 2026 Prevailing wage and certified payroll are excluded from this proposal.
- Taxes are excluded from this proposal.
- Overtime or premium labor is excluded.
- Patching, painting and all general construction will be done by others.

Investment Pricing:

Base Price.....\$9,100.00

Pricing is valid for thirty (30) days.

Please feel free to contact me at any time with questions or concerns regarding this proposal. I can be reached by phone at 215-469-0078

Respectfully,
Steven Palme
Service Account Manager
Schneider Electric – Philadelphia Branch



State Capitol Central Plant Upgrades - Security

Labor				
	Hours	listed \$/hr		
Installation Technician	16	\$	147.00	\$ 2,352.00
Project Management	8	\$	186.00	\$ 1,488.00
Solutions Engineer	4	\$	171.00	\$ 684.00
As-Built Documentation	4	\$	147.00	\$ 588.00
Software Programming	2	\$	171.00	\$ 342.00
Total:				\$ 5,454.00

Material				
	Quantity	Listed \$		
Open Options Two-Door Module (MR52-S3B)	1	\$	966.70	\$ 966.70
HID Signo20 Card Reader (20NKS-00-000000)	2	\$	366.97	\$ 733.94
Alarm Controls Pneumatic Exit Button (TS-14)	2	\$	368.52	\$ 737.04
Edwards Surface Contact with Armor Cable (2505A-L)	2	\$	93.65	\$ 187.30
Open Options Subcontroller License	1	\$	101.67	\$ 101.67
Verint PSIM License	2	\$	92.50	\$ 185.00
Misc Installation Material (Conduit, Fittings, Back Boxes, Etc.)	1	\$	322.16	\$ 322.16
Total:				\$ 3,233.81

Additional Costs				
Tax	1	\$	-	\$ -
Warranty	1	\$	347.51	\$ 347.51
Freight	1	\$	64.68	\$ 64.68
Total:				\$ 412.19

Sale Price:	\$	9,100.00

TERMS AND CONDITIONS OF SALE

900512PITC R07/15/21

This quotation and any exhibits and attachments hereto (collectively, "Agreement") and any information contained herein, is the property of Schneider Electric Buildings Americas Inc. ("Company") and shall constitute proprietary and confidential information unless given to a public entity and required by law to be public information. The party to whom this quotation is addressed ("Customer") acknowledges the confidential nature of this Agreement and agrees to take all commercially reasonable and necessary precautions to ensure the confidential treatment of this Agreement and all information contained herein. This Agreement will not be used, copied, reproduced, disclosed or otherwise disseminated or made available, directly or indirectly, to any third party for any purpose whatsoever without the prior written consent of Company. The parties agree to be bound by the following terms and conditions.

1. **Quotations and Acceptance.** The quotation is based solely on the bid documents, which consist of the project drawings, specifications and/or instructions of the Customer only modified by written agreement or Company objection. Significant deviations between the actual conditions and circumstances of the work and those specified in the bid documents shall be cause for an adjustment in work scope, price and time allowed for performance. Written quotations shall be valid for no more than thirty (30) days from the date of issue, unless specifically stated otherwise herein. Customer may accept the quotation by signing and returning a copy to Company or by returning Customer's own written instrument or order expressly acknowledging the quotation and terms set forth herein, provided, however, Company hereby gives notice of its objection to any different or additional terms or conditions contained or referenced in Customer's order, which will be of no force or effect except as may be expressly agreed to by Company in writing. It is the intent of the parties that these Terms and Conditions of Sale shall govern the sale of goods delivered and services performed. Upon acceptance, this Agreement constitutes the entire understanding between the parties respecting the goods or services delineated herein and supersede all prior oral or written understandings or representations relating to such goods or services. This Agreement may not be discharged, extended, amended or modified in any way except by a written instrument signed by a duly authorized representative of each party. Company assumes that the Subcontract Agreement offered will contain terms that are substantively similar to the AIA provisions that are in accordance with the provisions of the prime contract, including any supplements. Upon award, Company assumes that contract provisions will be reviewed and negotiated in good faith to reach a mutual acceptance of both parties.
2. **Payment.** Absent a contrary provision herein, Customer will pay Company monthly progress payments on a net thirty (30) days basis from date of invoice for materials delivered (or stored at an off-site storage facility) and services performed, less any retained reserve which will be mutually agreed upon in writing by the parties. The aggregate amount of any such retained reserves shall be paid by Customer to Company within thirty (30) days after the date of substantial completion. If Company provides a Certificate of Substantial Completion, such certificate shall conclusively establish such date. All invoices due and payable to Company, less any applicable retained reserve, shall accrue interest at a compounded per annum rate not to exceed 1½% per month (18% per annum) or the maximum rate permitted by law. Acceptance and endorsement by Company of an instrument for less than the full amount which Company claims to be due shall not be deemed to be an admission of payment in full and any conditions to the contrary which are noted on such an instrument shall not be binding on Company. If Customer does not pay Company, through no fault of Company, within seven (7) days from the time payment was due, Company may, without prejudice to any other remedy it may have, upon seven (7) additional days' written notice to Customer, stop its work until payment of the amount owing has been received and the contract sum shall be equitably adjusted for reasonable costs of shutdown, delay and startup or in the alternative Company may terminate this contract for material breach and all monies due Company for services performed and materials delivered shall be paid upon demand. Company shall be entitled to recover from Customer all costs for collection, including reasonable attorneys' and professionals' fees. To the extent payments are received and as required by law, and upon Customer's request, Company will furnish lien waivers as the work progresses.

Company reserves a security interest in any goods sold to the extent of the invoiced amount to secure payment of Customer's obligation. In event of payment default, Company may repossess such goods and a copy of the invoice may be filed with appropriate authorities as a financing statement to event or perfect Company's security interest in the goods. At Company's request, Customer will execute any necessary instrument to perfect Company's security interest.
3. **Price and Taxes.** The price for the goods and services hereunder are those shown on the face of this Agreement. The price of this Agreement does not include sales, use, excise, duties or other similar taxes, unless otherwise expressly provided herein. Any taxes (other than taxes due on Company's net income) that are payable hereunder shall be the responsibility of Customer. If applicable, Customer shall provide Company a copy of any appropriate tax exemption certificate for the state(s) into which the goods are to be shipped.
4. **Changes and Claims.** All materials and labor furnished hereunder shall be in accordance with shop drawings submitted by Company and approved by Customer. Any changes in the work as set forth in approved shop drawings, or from the scope of work as described herein, will require a written change order submitted to Company by Customer. An equitable adjustment will be made in the contract price or delivery dates or both, and this Agreement will be modified accordingly in writing. The cost or credit to Customer for performance of such change order shall be determined by mutual written agreement prior to the commencement of any work under such change order. Customer shall notify Company promptly in writing of any circumstances arising from the performance of the work herein described which reasonably may be anticipated to result in a claim or back charge to Company. Upon Company's receipt of such notification, Company shall have five (5) working days in which to remedy such circumstances and to avoid the imposition of such claim or back charge. Company will not be liable for any claim or back charge where Company has not been notified in the manner as set forth above.
5. **Access and Overtime.** This Agreement is based upon the use of straight time labor only during regular working hours (8:00 a.m. to 5:00 p.m., Monday through Friday, excluding Company's holidays). If Customer requests Company to perform any work outside of regular working hours, overtime and other additional expense occasioned thereby will be charged to and paid by Customer. If Company's work is to be performed on the project site, Customer will afford unrestricted access to Company and its employees and agents to all work areas.
6. **Damage or Loss to Equipment.** In the case of equipment not to be installed by or under supervision of Company, Company shall not be liable for damage to or loss of equipment after delivery of such equipment to the point of shipment. In the case of equipment to be installed by or under supervision of Company, Company shall not be liable for damage or loss after delivery by the carrier to the site of installation; if thereafter, pending installation or completion of installation or full performance by

Company, any such equipment is damaged or destroyed by any cause whatsoever, other than by the fault of Company, Customer agrees to promptly pay or reimburse Company an amount equal to the damage or loss which Company incurs as a result thereof, in addition to or apart from, any and all other sums due or to become due hereunder.

7. **Delays.** Customer shall prepare all work areas so as to be acceptable for Company's work required hereunder. Customer acknowledges that the contract sum is based upon Company being able to perform the work in an orderly and sequential manner, as Company so determines. If Company's performance is delayed, interfered with, suspended, or otherwise interrupted, in whole or in part, by Customer, other contractors on the project site, or by any other third party or by any act within the power and/or duty of Customer to control, then Customer agrees that it will be liable to Company for all increased costs and damages which Company incurs as a result thereof. Furthermore, if Company is delayed at any time in the progress of the work by any act or neglect of Customer, or by any separate contractor employed by Customer, or by changes ordered in the work or by labor disputes, fire, delay in transportation, adverse weather conditions, casualties, or any other causes beyond Company's control, then the time for completion of the work shall be extended for a period equal to the time lost by reason of such delay.
8. **Warranty.** Company warrants to Customer that all tangible articles manufactured by Company will be free of defects in workmanship and material and that the work performed will be of good quality and will conform to the requirements of the bid documents. If the article is installed by Company, Company's sole obligation under this warranty shall be to provide, without charge, parts and labor necessary to remedy defects which appear within twelve (12) months from the date of beneficial use or occupancy, as applicable. If Company provides a Certificate of Substantial Completion, such certificate shall conclusively establish such date. If article is not installed by Company, the warranty period shall be within twelve (12) months of shipment of said article. Warranty claim must be made to Company in writing within such twelve (12) month period. All transportation charges incurred in connection with the warranty for equipment not installed by Company shall be borne by Customer. Company warrants that for equipment furnished and or installed, but not manufactured by Company, Company will extend the same warranty terms and conditions which Company receives from the manufacturer of said equipment.

This warranty is the sole and exclusive warranty given with respect to any articles delivered or services performed by Company. THE WARRANTIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED (EXCEPT WARRANTIES OF TITLE), INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. This warranty is subject to proper installation of the articles (if installation is not performed by Company or authorized subcontractors of the Company) and maintenance and storage of the articles in accordance with the specifications and directions supplied by Company. This warranty does not apply to any defect, malfunction or failure caused by repairs made by other than or without the consent of Company or the article has been subject to abuse, misuse, neglect, tampering, accident or damage by circumstances beyond Company's control, including without limitation, acts of God, war, acts of government, corrosion, power fluctuations, freeze-ups, labor disputes, differences with workmen, riots, explosions, vandalism, or malicious mischief, nor to defective associated equipment or use of the articles with equipment for which they were not sold. All of Company's obligations under this warranty will immediately terminate and be of no further force or effect if all or any part of the purchase price (including any installment payment) with respect to any article covered by this warranty is not paid to Company when due. If cause of defect is found not to be Company's responsibility, standard rates for repair or replacement and labor shall apply.
9. **Limitation of Liability.** In no event will Company's total aggregate liability in warranty or contract exceed the contract price paid for the specific product or service that gives rise to the claim excluding third party claims for personal injury, death or as may be required by law. IN NO EVENT SHALL COMPANY BE LIABLE FOR ANY LOST PROFITS, LOSS OF USE, DATA, LOSS OF GOODWILL, BUSINESS INTERRUPTION OR ANY OTHER SPECIAL, INDIRECT, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES OF ANY KIND EVEN IF COMPANY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.
10. **Laws and Permits.** Company shall comply with all applicable federal, state, and local laws and regulation and shall obtain all temporary licenses and permits required for the prosecution of the work. Licenses and permits of a permanent nature shall be procured and paid for by the Customer. This contract shall be interpreted and governed under and in accordance with the laws of the jurisdiction in which the goods are delivered or services are performed without regard to its choice of law provisions.
11. **Disputes.** Any controversy or claim arising out of or relating to this Contract, or the breach thereof, shall be settled by good faith consultation and negotiation. If those attempts fail, either party shall provide written notice within thirty (30) days to the other to mutually agree on an arbitration process. If a process is not agreed upon within thirty (30) days, final and binding arbitration in accordance with the then current Construction Industry Arbitration Rules of the American Arbitration Association shall commence and judgment upon the award rendered may be entered in any court having jurisdiction thereof. The arbitration shall be held in the federal, state or municipal courts serving the county in which the project is located unless the parties mutually agree otherwise. The prevailing party shall recover all reasonable legal costs and attorney's fees incurred as a result, which shall be promptly paid by the non-prevailing party. Any dispute or demand for arbitration must be commenced within one (1) year after the cause of action has accrued. Nothing herein shall limit any rights Company may have under construction mechanic or materialmen lien laws. Company shall have the right to suspend affected services pending resolution of disputes.
12. **Insurance.** The parties shall each maintain insurance coverage including without limitation, Workers' Compensation and Employer's Liability at statutory limits, Automobile Liability covering all owned, hired and other non-owned vehicles, and Commercial General Liability covering public liability and property damage with limits generally required for its respective industry with not less than \$1,000,000 minimum coverage per occurrence. Such insurance shall be with reputable and financially responsible carriers authorized to transact business in the jurisdiction in which the project and services are being performed. No credit will be given or premium paid by Company for insurance afforded by others.
13. **Clean Up.** Company agrees to keep the job site clean of debris arising out of its operations. Customer shall not back charge Company for any costs or expenses for clean up or otherwise without prior written notice and Company's written consent.
14. **Severability.** The invalidity or unenforceability of any provision herein shall in no way affect the validity or enforceability of any other provision.
15. **Disclaimer.** Company reserves the right to amend, withdraw or otherwise alter this submission without penalty or charge as a result of any event beyond its control arising from or due to the current COVID-19 epidemic or events subsequent to this epidemic / pandemic including changes in laws, regulations, by laws or direction from a competent authority. The Customer

acknowledges that the products or part thereof are produced in, or otherwise sourced from, or will be installed areas already affected by, or that may be affected in the future by, the prevailing COVID-19 epidemics/pandemic and that the situation may trigger stoppage, hindrance or delays in Company's (or its subcontractors) capacity to produce, deliver, install or service the products, irrespective of whether such stoppage, hindrance or delays are due to measures imposed by authorities or deliberately implemented by the Company (or its subcontractors) as preventive or curative measures to avoid harmful contamination exposure of Company's (or its subcontractors') employees. The Customer therefore recognizes that such circumstances shall be considered as a cause for excusable delay not exposing the Company to contractual sanctions including without limitation delay penalties, liquidated or other damages or termination for default.

16. **Ethics and Compliance with Laws.** Each party shall comply in all respects with all applicable legal requirements governing the duties, obligations, and business practices of that party. Neither party shall take any action in violation of any applicable legal requirement that could result in liability being imposed on the other party. In the event Customer has concerns related to ethics, compliance, or Company's Principles of Responsibility, and/or any potential violations of these policies, Customer is welcome to make use of Company's GreenLine. The GreenLine is Company's global helpline for external stakeholders. It is a confidential channel through which Customers can ask questions and raise concerns. Reports can be made using the link: <https://secure.ethicspoint.eu/domain/media/en/gui/104677/index.html>.

17. **Cybersecurity.**

- 17.1. Customer's Obligations for Its Systems: Customer is solely responsible for the implementation and maintenance of a comprehensive security program ("Security Program") that contains reasonable and appropriate security measures and safeguards to protect its computer network, systems, machines, and data (collectively, "Systems"), including those Systems on which it runs the Products or Services provided by Company, against Cyber Threats. "Cyber Threat" means any circumstance or event with the potential to adversely impact, compromise, damage, or disrupt Customer's Systems or that may result in any unauthorized access, acquisition, loss, misuse, destruction, disclosure, and/or modification of Customer's Systems, including any data, including through malware, hacking, or similar attacks.

- 17.2. Without limiting the foregoing, Customer shall at a minimum:

- (a) have qualified and experienced personnel with appropriate expertise in cybersecurity maintain Customer's Security Program, and have such personnel regularly monitor cyber intelligence feeds and security advisories applicable to Customer's Systems or Customer's industry;
- (b) promptly update or patch its Systems or implement other appropriate measures based on any reported Cyber Threats and in compliance with any security notifications or bulletins, whether publicly disclosed on Company's security notification webpage at <https://www.se.com/ww/en/work/support/cybersecurity/security-notifications.jsp> or otherwise provided to Customer;
- (c) regularly monitor its Systems for possible Cyber Threats;
- (d) regularly conduct vulnerability scanning, penetration testing, intrusion scanning, and other cybersecurity testing on its Systems; and
- (e) meet the recommendations of Company's Recommended Cybersecurity Best Practices, available at <https://www.se.com/us/en/download/document/7EN52-0390/>, as may be updated by Company from time to time, and then-current industry standards.

- 17.3. Customer's Use of the Products, Software, and Services: Company may release Updates and Patches for its Products, Software, and Services from time to time. Customer shall promptly install any Updates and Patches for such Products, Software, or Services as soon as they are available in accordance with Company's installation instructions and using the latest version of the Products or Software, where applicable. An "Update" means any software that contains a correction of errors in a Product, Software, or Service and/or minor enhancements or improvements for a Product, Software, or Service, but does not contain significant new features. A "Patch" is an Update that fixes a vulnerability in a Product, Software, or Service. Customer understands that failing to promptly and properly install Updates or Patches for the Products, Software, or Services may result in the Products, Software, or Services or Customer's Systems becoming vulnerable to certain Cyber Threats or result in impaired functionality, and Company shall not be liable or responsible for any losses or damages that may result.

- 17.4. Identification of Cyber Threats: If Customer identifies or otherwise becomes aware of any vulnerabilities or other Cyber Threats relating to the Products, Software, or Services for which Company has not released a Patch, Customer shall promptly notify Company of such vulnerability or other Cyber Threat(s) via the Company's Report a Vulnerability page (<https://www.se.com/ww/en/work/support/cybersecurity/report-a-vulnerability.jsp#Customers>) and further provide Company with any reasonably requested information relating to such vulnerability (collectively, "Feedback"). Company shall have a non-exclusive, perpetual and irrevocable right to use, display, reproduce, modify, and distribute the Feedback (including any confidential information or intellectual property contained therein) in whole or part, including to analyze and fix the vulnerability, to create Patches or Updates for its customers, and to otherwise modify its Products, Software, or Services, in any manner without restrictions, and without any obligation of attribution or compensation to Customer; provided, however, Company shall not publicly disclose Customer's name in connection with such use or the Feedback (unless Customer consents otherwise). By submitting Feedback, Customer represents and warrants to Company that Customer has all necessary rights in and to such Feedback and all information it contains, including to grant the rights to Company described herein, and that such Feedback does not infringe any proprietary or other rights of third parties or contain any unlawful information.

18. **Import and Export.**

- 18.1. The Products and Services provided by Company under this Contract contain or may contain components and/or technologies from the United States of America ("US"), the European Union ("EU") and/or other nations. Customer acknowledges and agrees that the Products, assignment and/or usage of the Products, Software, Services, information, other deliverables and/or the embedded technologies (hereinafter referred to as "Deliverables") under these Terms and

Conditions of Sale shall fully comply with related applicable US, EU and other national and international export control laws and/or regulations.

- 18.2. Unless applicable export license/s has been obtained from the relevant authority and Company has approved, the Deliverables shall not (i) be exported and/or re-exported to any destination and party (may include but not limited to an individual, group and/or legal entity) restricted by the applicable export control laws and/or regulations; or (ii) be used for those purposes and fields restricted by the applicable export control laws and/or regulations. Customer also agrees that the Deliverables will not be used either directly or indirectly in any rocket systems or unmanned air vehicles; nor be used in any nuclear weapons delivery systems; and will not be used in any design, development, production or use for any weapons which may include but not limited to chemical, biological or nuclear weapons.
- 18.3. If any necessary or advisable licenses, authorizations or approvals are not obtained, whether arising from inaction by any relevant government authority or otherwise, or if any such licenses, authorizations or approvals are denied or revoked, or if the applicable export control laws and/or regulations would prohibit Company from fulfilling any order, or would in Company's judgment otherwise expose Company to a risk of liability under the applicable export control laws and/or regulations if it fulfilled the order, Company shall be excused from all obligations under such order and/or these Terms and Conditions of Sale.

PROPOSAL

PA DGS Central Plant - Fire Alarm

PREPARED BY

Siemens Industry, Inc. ("Siemens")

PREPARED FOR

Bidding Contractors

DELIVERED ON

January 05, 2026

SMART BUILDINGS

Transforming the Everyday



Table of Contents

SIEMENS PROPOSAL 3

 Contact Information 3

 Scope of Work 11-26-25.docx 4

 Equipment List 5

 Sell Price..... 6

 Payment Terms..... 7

TERMS OF SALE 8

 Siemens Terms of Sale (STS) 8

Signature Page 9

 Signature Page 9

Contact Information

Proposal #:	10281483
Date:	January 05, 2026

Sales Executive:	Kevin Hayden
Branch Address:	5095 Ritter Road Mechanicsburg, PA 17055
Telephone:	717-329-9514
Email Address:	kevin.hayden@siemens.com

Customer Contact:	
Customer:	Bidding Contractors
Address:	
Services shall be provided at:	
	Harrisburg, PA

PA Capitol Complex Central Plant – Fire Alarm Scope of Work

Siemens Industry is pleased to present the following scope of work for the PA Capitol Complex Central Plant project. Please note, Siemens scope of work is based on drawings dated 8-27-2025.

This proposal is based on approximate start date of February 2026 and approximate completion of June 2026.

Please be aware that the following proposal and device quantities are per plans and specifications and are to provide complete and operational systems. However, due to necessary design and/or engineering changes, final submittal quantities are subject to change.

Scope of Work:

1. Siemens to provide new fire alarm devices per plans
2. Siemens to provide device terminations
3. Includes device testing
4. Includes engineered drawings
5. Includes project supervision
6. Includes one year warranty

Electrical Contractor Responsibilities:

1. Provide and install necessary wiring and conduit to new device locations
2. Per State of PA requirements, leave 6' excess whip in flex cable at each device

Clarifications:

1. Professional engineer stamped or sealed drawings are not included
2. Pricing does not include providing or installing cabling and/or back boxes
3. Pricing includes project management for the duration of the tentative project schedule.
4. Materials pricing is for the extent of the tentative project schedule.
5. Work is assumed to be completed during normal business hours Monday – Friday (8am-5pm).
6. Pricing includes standard ground shipping.
7. Painting and Patching are excluded.
8. PA Sales Tax is excluded and a current tax exemption form will need to be provided or the applicable taxes will be added to the invoiced amount.
9. Any and all permits are the customers responsibility
10. Unless otherwise stated, this proposal is based on one phase for commissioning, testing and AHJ inspection. Should additional phases, testing and/or inspections be required, they will be provided at additional cost.
11. Prevailing wage labor IS INCLUDED

Equipment List

Fire Alarm Additions

Fire Alarm Additions

Qty	Ref #	Description
3	S54320-F7-A1	Multi-Crit. Fire Det.
3	500-094151	DETECTOR BASE ASSY
5	S54361-F3-A2	Spkr/Str (Wall,Wht,Fire)
5	S54370-F59-A1	SS Surface Mount Box Wht Wall
5	S54370-F44-A1	Wall (square) white standard cover alert text.

Sell Price

Total Quote Price	\$9,850.00*

This price is firm for 30 days from the date of this proposal.

**Siemens reserves the right to adjust prices to reflect the impact of any new or modified taxes, duties, tariffs, or equivalent measures, whether direct or indirect, imposed by any U.S. or foreign governmental authority that are applicable to our offering, including any hardware, software, or service components contained therein.*

Payment Terms

Payment Terms Acceptance Agreement

The total price of: \$9,850.00 and the estimated return on investment are based on the items outlined in this proposal. ANY STATEMENTS MADE HEREIN REGARDING SAVINGS THAT MAY BE ACHIEVED BY IMPLEMENTING THE SERVICES OFFERED IN THIS PROPOSAL ARE ESTIMATES ONLY. NO WARRANTY, EITHER EXPRESSED OR IMPLIED, SHALL BE CONSTRUED TO ARISE FROM SUCH STATEMENTS, NOR SHALL SUCH STATEMENTS BE CONSTRUED AS CONSTITUTING A GUARANTEE BY SIEMENS THAT SUCH SAVINGS WILL OCCUR IF THE SERVICES ARE IMPLEMENTED.

The Buyer acknowledges that when accepted by the Buyer as proposed by Siemens Industry, Inc., this Proposal and the Siemens Buildings Projects Business Standard Terms and Conditions, (together with any other documents incorporated into the forgoing) shall constitute the entire agreement of the parties with respect to its subject matter. BY EXECUTION HEREOF, THE SIGNER CERTIFIES THAT (S)HE HAS READ ALL OF THE TERMS AND CONDITIONS AND DOCUMENTS, THAT SIEMENS OR ITS REPRESENTATIVES HAVE MADE NO AGREEMENTS OR REPRESENTATIONS EXCEPT AS SET FORTH THEREIN, AND THAT (S)HE IS DULY AUTHORIZED TO EXECUTE THE SIGNATURE PAGE ON BEHALF OF THE BUYER.

Proposal is valid for thirty (30) days from the delivery date of January 05, 2026. Payment is due within 30 days of invoice date.

Payment Terms: 25% mobilization in advance, progress payments

Total: \$9,850.00

Siemens Industry, Inc. invoices paid by credit card may be subject to a surcharge of up to 2%.

Siemens Terms of Sale (STS)

Terms of Sale (Click to download)

[Base Terms \(United States\)](#)

Price Escalation. If, during the term of this Contract, the price of various materials or labor or logistics are increased as reflected by CRU/IHS Markit/CMAI/COMEX market index, then Siemens may increase the Contract Sum or apply a surcharge to Customer accordingly.

To the extent applicable, the following Supplements are incorporated and made part of the Siemens Terms of Sale:

Click on supplement(s) below to read/download

[Solutions Supplemental Terms](#)

[Hardware Supplemental Terms](#)

The order of precedence is stated in the Base Terms (United States).

To the extent the Offerings are purchased through an existing master or frame agreement, the terms and conditions of that agreement shall apply instead of the Siemens Terms of Sale.

Siemens reserves the right to adjust prices to reflect the impact of any new or modified taxes, duties, tariffs, or equivalent measures, whether direct or indirect, imposed by any U.S. or foreign governmental authority that are applicable to the Offerings, including any hardware, software, or service components contained therein.

Siemens is entitled to amend these terms and conditions at any time without prior notice. Previous and Retired versions of Base Terms & Supplemental Terms can be found here: www.siemens.com/terms-of-sale

Signature Page

Proposed by:

Siemens Industry, Inc.

Company

Kevin Hayden

Name

10281483

Proposal #

\$9,850.00

Proposal Amount

January 05, 2026

Date

Accepted by:

Bidding Contractors

Company

Name (Printed)

Signature

Title

Date

Purchase Order # ☐ PO for billing/pmnt only ☐ PO not required



Quote for IB Abel 2745 Black Bridge Road York, PA 17406 Re: DGS Central Plant Upgrades January 11, 2026

Electric Line Excavation

Excavating electric line trenches, triads, and box totaling approx.

740' L x 49" D x 36" W.

Disposal of all excavated spoils.

Bring in and pour 20" of concrete in trenches (not the 12' x 10' x 4' D box)
after contractor installs lines and rebar.

Bring in and place 4" of Aashto #57 over concrete. Sidewalk locations will be
backfilled with Aashto #57 to ground level.

Bring in fill and backfill trenches to ground level.

\$74,975.00 _____

or

Backfill trenches with Aashto #57 instead of fill.

\$79,250.00 _____

- *Hauling of Hazmat materials is not included. Certain Hazmat materials can be hauled for an additional cost.*
- *Compaction is not included in price, but can be done for an additional cost.*
- *Does not include cutting/removing sidewalks or replacing/repairing them.*

We try to make our estimates as accurate as possible. Unfortunately, there are times when unforeseen issues making the job more difficult or more expensive than originally estimated. Fluctuating prices in fuel, aggregates, black top and other products can cause changes in the original estimated amount too. Prior to any price change we will contact you to discuss options or alternatives.

- All permits, inspections and other owner, county and township requirements are the responsibility of the IB Abel or acting agent for corporate, state, or federal owners or agent handling bids.
- General Contractor or IB Abel is responsible for calling PA One call prior to start of work.
- All measurements are estimates.
- Delays in job (not the result of PCEP) for engineering delays, inspections, testing, spec changes, etc. will result in additional costs.
- The discovery of limestone or any stone/rock that our on-site equipment is unable to move which requires supplementary equipment and/or contracting a blasting company, will result in additional costs.

- Payment is due within thirty (30) days of the date invoiced. All payments, not made by the agreed upon date, will incur late fees of 18% per month or maximum amount permitted by law.
- All legal fees, filing fees, and any other costs incurred to collect amounts due will be the responsibility of the IB Abel.

Concrete Supplier rules and fees

- The concrete included herein does not include any admixtures, ice or special aggregates.
- The quoted concrete prices do not include the testing of cement, aggregates, trial mixes, test cores, or cylinders.
- Concrete price allows unloading time for 1st cu. yd. - 15Min. Unloading time for each additional cu. yd. - 5 Min. Extended unloading time charge \$3.00/minute
- HOLD TIME CHARGES: Orders that deviate from their scheduled time will be subject to a hold time charge. If an order is placed for a specified time and is not released within 45 minutes of that scheduled time, a hold charge will be billed. The hold time charge is \$175.00 per hour per truck. There will also be a plant charge, if no other orders are scheduled at that specific plant while in a hold status. The plant charge is \$150.00 per hour.
- If an order is cancelled less than 2 hours of the scheduled order time, a cancellation charge will be billed in the amount of \$500.00.

Value Added Charges per CY.			
Non-Chloride per %	\$8.00	Front Discharge	\$5.00
Chloride Accel per %	\$6.00	Ice per 40 lbs. Bag	\$30.00
Retarder per %	\$4.00	#8 Stone	\$6.00
Pump Mix 6"-8" slump	\$6.00	Environmental S/C	\$25.00
Microfiber	\$9.00	Test Cylinders	\$25.00 ea.
Exposed Agg ½" or ¾"	\$130.00	Cylinder Breaks	\$35.00
River Jack	\$130.00	Dye Clean Out	\$85.00 per load
Winter Concrete	\$9.00	Fuel S/C	\$50.00 per load
Straight Cement	\$6.00		

Tara Dawn Hazen

Tara Dawn Hazen/ President - Hauler

Tara-Dawn Hazen

Printed Name

January 11, 2026

Date

Authorized Signature – Contractor

Printed Name of Authorized Signer

Date



Manna Supply, Inc
PO Box 4601
Lancaster, PA 17604
+16102224775
billing@mannasupply.com
www.mannasupply.com

MBE and WBE Certified Small Business

Quote

ADDRESS

Abel, I.B., Inc.
I.B. Abel, Inc.
2745 Black Bridge Rd
York, PA 17406

SHIP TO

Abel, I.B., Inc.
I.B. Abel, Inc.
2745 Black Bridge Rd
York, PA 17406

QUOTE #	DATE	
10796	01/19/2026	

SHIP VIA
Best Way

PRODUCT/VENDOR
Gear Update

PROJECT NAME
DGS Capitol Complex Central Pla

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
MBE/WBE/DBE	Manna Supply, Inc. is a certified Minority Business Enterprise (MBE), Women Business Enterprise (WBE) and Disadvantaged Business Enterprise (DBE). See attached certificates.	0	0.00	0.00T
Space		0	0.00	0.00
Gear (26)	Lot Electrical Distribution Equipment - BASE BID #1 Note: See below breakouts for UPS and VFD's	1	4,069,500.00	4,069,500.00T
Gear (26)	Lot Electrical Distribution Equipment - BASE BID #2/#3	0	4,430,500.00	0.00T
Gear (26)	Lot Electrical Distribution Equipment - BASE BID #4	0	5,166,300.00	0.00T
Space		0	0.00	0.00
Space		1	0.00	0.00
MV Swgr	MV Switchgear (MDS15) - Base Bid #1- #4 Siemens (1) 15kV Main-Tie-Main, 1200A Metal Clad Swgr, N1, 15kV, 50kA, N1, with ATO, Meters and Relays Lead Time: 38-40 weeks	1	0.00	0.00T
MV Swgr	MV Switchgear (MDS5) - Base Bid #1- #4 Siemens (1) 5kV, Main-Main, Metal Clad/Metal, 2000A Enclosed Swgr, 5kV, 25kA, with Key Interlocked Vacuum Main Breakers and Fused Feeder Switches, and meters and relays Lead Time: 38-40 weeks	1	0.00	0.00T
Busway	Non-Segregated Busway (MV) - Existing T3/T4 to new MDS5 - Base Bid #1- #4 Siemens OEM COPPER BUSBAR WITH TIN PLATING AT CONNECTION PARTS & EXTRUDED ALUMINUM	135	0.00	0.00T

THANK YOU FOR YOUR ORDER!

Please pay from this invoice; no other statement will be sent. Thank you!
A 2% finance charge must be applied to all balances over 30 days.

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Battery Sys (26)	HOUSING (60ft) T3 to MDS5: 2000A (2) Horizontal Elbow (2) Vertical Elbow (2) Flange End Box (2) Wall Flange (75ft) T4 to MDS5: 2000A (2) Horizontal Elbow (2) Vertical Elbow (2) Flange End Box (2) Wall Flange Lead Time: 20-22 weeks			
	Lot Station Battery System - For MDS15 and MDS5 - Base Bid #1- #4 Hoppecke (1) 48VDC Battery Cells to support both 15kV and 5kV Swgr (1) Battery Rack (1) Battery Rack Spill Kit (1) Battery Charger (1) Battery Isolation Switch (1) DC Panel (1) Freight (1) Installation Inspection Lead Time: 8-10 weeks	1	0.00	0.00T
Trans-Sub	Substation Transformer (T5 and T6) - Base Bid #1- #4 Hitachi (2) 3500kVA, VPI Transformers, 80 Dg C Rise, Copper Windings, 12.47kV to 480/277V, N1 3 Phase 60 Hertz, 80/80 Degree C Rise, AN/Future AF HIGH VOLTAGE 12470 Delta 95 kV BIL Copper Conductor Termination in ANSI segment 2 Primary Cable Connection - HV 15 kV 12.7 MCOV Distribution Class Polymer Surge Arresters (Set of 3) - HV LOW VOLTAGE 480Y/277 Copper Conductor Braided Flex Connectors - LV Lead Time: 20-22 weeks	2	0.00	0.00T
Switchgear	Switchgear (T5 and T6) - Base Bid #1- #4 Siemens (1) 5000A DO Main Breakers, 480/277V, N1 (1) 5000A/100A DO Main Breakers, 480/277V, N1 Lead Time: 30-32 weeks	2	0.00	0.00T
Switchboard	Switchboard (MTM1) - Base Bid #1 Siemens (1) 3200A Main-Tie-Main, 480/277V, 65kA, N1, Fixed Breakers, UL891, with PQ Metering Lead Time: 20-24 weeks	1	0.00	0.00T
Switchgear	Switchgear (MTM1) - Base Bid #2- #4 Siemens (1) 3200A Main-Tie-Main, 480/277V, 65kA, N1, DO	1	0.00	0.00T

THANK YOU FOR YOUR ORDER!

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Switchgear	Breakers, UL1558, with PQ Metering Lead Time: 30-32 weeks Switchgear (MTM2) - Base Bid #1- #4 Siemens (1) 5000A Main-Tie-Main, 480/277V, 100kA, N1, DO Breakers, UL1558, with PQ Metering Lead Time: 30-32 weeks	1	0.00	0.00T
Busway	Busway (LV) - Base Bid #1- #4 Siemens (140ft) MTM1 to MDS1: 2500A (120ft) MTM1 to MDS2: 2500A 19 - Elbow: SX425C14ES 26 - Trapeze Hanger: SXTH2 2 - Flanged End: SX425C14FRND Lead Time: 34-40 weeks	260	0.00	0.00T
Busway	Busway (LV) - Base Bid #4 Siemens (170ft) T1 to MTM1: 2500A (180ft) T2 to MTM1: 2500A 20 - Elbow: SX425C14ES 70 - Trapeze Hanger: SXTH2 2 - Flanged End: SX425C14FRND Lead Time: 34-40 weeks	350	0.00	0.00T
Busway	Busway (LV) - Base Bid #4 Siemens (210ft) T5 to MTM2: 5000A (200ft) T6 to MTM2: 5000A 15 - Elbow: SX450C14ES 2 - Flanged End: SX450C14FRND 82 - Trapeze Hanger: SXTH1 Lead Time: 34-40 weeks	410	0.00	0.00T
UPS	Uninterruptible Power Supply (UPS) - Base Bid #1- #4 Named Mfg (1) 75kVA/kW UPS with 3-Breaker Main ByPass and 8-min battery system Includes: - Start-up - Extended Warranty - Load Bank Test - PM Note: We have excluded "Additional Battery Monitoring" called out in 263353-1 section 2.15 as this is not applicable/appropriate to this small size UPS Lead Time: 18-20 weeks	1	107,500.00	107,500.00T
VFD	Variable Frequency Drives (VFD's) - Base Bid #1- #4 (8) ABB VFD's Tags: CHWP-1, 3, 4 Model: (3) ACH580-3PCR-302A-4 Ultra Low Harmonic (ULH) Input Voltage: 480 VAC Three Phase Rated Output Current: 302A Enclosure: UL (NEMA) Type 1 Nominal Horsepower: 250 HP	1	390,900.00	390,900.00T

THANK YOU FOR YOUR ORDER!

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A 2% finance charge must be applied to all balances over 30 days.

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
	Frame Size: R11 Input Disconnecting Means: Circuit Breaker Bypass: None Input Impedance: 10% LCL High Frequency Filter Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP) Includes freight and start-up Tags: CTF-1, 2, 3 Model: (3) ACH580-3BCR-180A-4+F267+G390 Ultra Low Harmonic (ULH) Input Voltage: 480 VAC Three Phase Rated Output Current: 180A Enclosure: UL (NEMA) Type 1 Nominal Horsepower: 150 HP Frame Size: R8 Input Disconnecting Means: Circuit Breaker Bypass: E-Clipse Soft Start Bypass (Box) Input Impedance: 10% LCL High Frequency Filter Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP) Other Options: Service Switch Tags: EF-1, 2 Model: (2) ACH580-BCR-04A8-4+F267 Six Pulse Input Voltage: 480 VAC Three Phase Rated Output Current: 4.8A Enclosure: UL (NEMA) Type 1 Nominal Horsepower: 3 HP Frame Size: R1 Input Disconnecting Means: Circuit Breaker Bypass: E-Clipse Bypass (Box) Input Impedance: 5% equivalent impedance Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP) Other Options: Service Switch Includes: Start-up and 30 month warranty Lead Time: 18-20 weeks			
Panel	Panelboard - (HP, RP, NE2, MDP-NE, NE, N/E, CP, CP-1, V-1, V1A, LR, LP-LH, PPA, PP & Welder) Base Bid #1- #4 Siemens	15	0.00	0.00T
Trans-LV	LV Distribution Transformer - Base Bid #1- #4 Siemens (1) 30kVA, 480V to 208/120V, Cu, N1	1	0.00	0.00T
Study	Base Bid #1- #4 Electrical Engineering Study to include: 1) Short Circuit Study, 2) Coordination Study and 3) Arc Fault Analysis in a Study Report, including providing Arc Flash Labels for field installation. Existing Construction: Back to two levels prior to new equipment, unless previous study can be provided New Equipment: Back to the incoming normal and emergency service	1	0.00	0.00

THANK YOU FOR YOUR ORDER!

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Gear Start-up	Data Collection: By others Mfg Start-up for MV Swgr and LV Swgr	1	0.00	0.00
Comments	Comments and Notes - Gear BOM does not include any temporary equipment for the Chiller plant including: - 5kV LIS - 1500kVA Transformer - 2000A Swbd	0	0.00	0.00
Comments	Comments and Notes - VFD Comments: Not Included Items and Clarifications: Harmonic analysis Field harmonic testing Additional harmonic filtration beyond what is mentioned above Passive filter / Output filter AC Line reactor - 6 Pulse VFDs come with 5% DC Bus Choke as standard LonWorks or BACnet IP communication cards Digital input interface Hauling, rigging, piping, wiring and installation Emergency service or regular maintenance Manual service switch provided in place of 3rd contactor in bypass configurations 18 Pulse Architecture - ULH Provided as Modern Solution (See Technical Note 032) VFDs come standard with built in overcurrent and overload protection (no external MPR), as well as motor I ² t (See Technical Note 072)	1	0.00	0.00
Prog Bill	Progress billing schedule: 20% - Receipt of approved submittals 30% - Equipment released to factory 50% - Shipment from factory	0	0.00	0.00
Space		0	0.00	0.00
Space		1	0.00	0.00
Optional	Optional Equipment/Services	0	0.00	0.00
Gear (26)	OPTIONAL ADDER TO BASE QUOTES Modifications to existing substation transformers T1/T2 and T3/T4: Bill of Material (BOM) and summary work scope for modifications to Transformers T1, T2, T3, and T4 based on the provided one-line diagrams and project specifications for relays and metering. Engineering and Design: • A short outage will be required in order to gather all information related to providing these modifications. After completion of this site visit, Vendor to design and integrate new relay and metering cubicles for T3 and T4. • We will develop updated one-line and three-line drawings reflecting added sections. • Relay settings for T3 and T4 (overcurrent, ground, voltage, frequency, negative sequence), to be	0	619,990.00	0.00T

THANK YOU FOR YOUR ORDER!

Please pay from this invoice; no other statement will be sent. Thank you!
A 2% finance charge must be applied to all balances over 30 days.

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Trans-MV	provided by others. RESA Power will provide programming based on provided settings. • Configure meter scaling, CT/PT ratios, and communication protocols. Lead Time: 10-12 weeks after approvals. MV Transformer (T1 and T2) (2) Add Meter to vacuum breaker per notes on dwgs Transformers T1 and T2 (1500 kVA Substations) Bill of Material (BOM): 1. LV Power Meter Schneider Electric PM8000 (Type M2) or ION8650 2. 480 V Metering CT's 3. CT Shorting Terminal Block & Fusing 4. Communications Interface Module Material Summary Totals: • MV Relay & Metering Cubicles: 2 (T3, T4) • Protective Relays: 2 required (T3, T4). • Meters: 4 total (T1–T4) • CT Sets: 6 total (4 MV for T3/T4, 2 LV for T1/T2) • PT/VT Sets: 2 total (T3, T4) • Communications Interfaces: 4 total Field Installation - T1 and T2: • Install LV power meters on 2500 A mains. • Install CTs, voltage references, and communication wiring. Testing and Commissioning: • Perform ratio, polarity, and insulation testing of new CTs and PTs. • Verify metering accuracy, phase rotation, and demand functions. • Confirm SCADA/monitoring communications. Actual SCADA set up and testing by others. Documentation: • Provide as-left settings, test reports, and updated one-line diagrams. • Label all new cubicles and devices and update equipment records.	2	0.00	0.00T
Trans-MV	MV Transformer (T3 and T4) (2) Add Meters, Relays and PT's per note 1 on the dwg This scope includes an additional medium-voltage cubicle that will be added to Transformers T3 and T4 to house protective relays, metering, CTs, and PTs. T3 and T4 will be equipped with multifunction protective relays providing the following functions: • 51 / 51G – Phase and Ground Overcurrent • 27 / 59 – Under/Overtension • 47 – Negative Sequence / Phase Loss • 81 – Under/Over Frequency • Metering (M2) Bill of Material (BOM): Transformers T3 and T4 (10 MVA Unit Substations – With Added Cubicles) Item Description: 1. Medium-Voltage Relay & Metering Cubicle, Custom	2	0.00	0.00T

THANK YOU FOR YOUR ORDER!

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
	auxiliary section includes structure, bus extension, barriers 2. Feeder/Main Protective Relay Eaton EDR-5000 (or equal) 1 2 51, 51G, 27, 59, 47, 81, metering 3. MV Power Quality / Revenue Meter Schneider Electric ION9000 or PM8000 1 2 Ethernet-enabled 4. MV CT Set (Protection + Metering) Mounted in added cubicle 5. MV PT/VT 12.47 kV / 120 V Fused, drawout or fixed 6. Relay Test Switch & Terminal Hardware Various FT-style or equivalent 7. Communications Interface / Cabling for SCADA/monitoring Field Installation - T3 and T4: • De-energize and implement lockout/tagout procedures. • Provide assistance to contractor to remove end plates and extend lineup to install new cubicles. • Install CTs, PTs, protective relays, meters, and terminal blocks within new sections. • Extend bus, control wiring, and grounding to new cubicles. Testing and Commissioning: • Perform secondary injection testing on T3 and T4 protective relays. • Perform ratio, polarity, and insulation testing of new CTs and PTs. • Verify metering accuracy, phase rotation, and demand functions. • Confirm SCADA/monitoring communications. Actual SCADA set up and testing by others. Documentation: • Provide as-left settings, test reports, and updated one-line diagrams. • Label all new cubicles and devices and update equipment records.			
Space		0	0.00	0.00
Space		0	0.00	0.00
Price-30	Price valid for 30 days only due to changing market conditions and fluctuations, including both commodities and Tariffs. Equipment must also be released in a timely manner in accordance with each manufacturers requirements. Tariff increases may be assessed by mfgs at the time of shipment without prior notification or acceptance. Siemens has an announced price increase effective 1/1/2026, so all quotes must be executed prior to that date to be effective.	0	0.00	0.00
Tariff	Tariffs and Surcharges: Prices quoted include only current tariffs, duties, or government-imposed surcharges. If any such tariffs, duties, or surcharges are imposed or modified after the issuance of a quote, purchase order, or agreement, the additional costs will be the responsibility of the purchaser and will be	0	0.00	0.00

THANK YOU FOR YOUR ORDER!

Please pay from this invoice; no other statement will be sent. Thank you!
 A 2% finance charge must be applied to all balances over 30 days.

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
	added to the final invoice. Manna Supply reserves the right to adjust pricing accordingly to reflect these costs. This policy applies to all products and services offered and will remain in effect unless explicitly stated otherwise in writing by an authorized representative of Company.			

Thank you for your business! If you would like to pay by card, please note there will be an additional fee (outlined in your invoice).	SUBTOTAL	4,567,900.00
Thank you for the opportunity to support you on this project.	TAX	0.00
	TOTAL	\$4,567,900.00

Manna Supply, Inc. Terms:

- 1) Payments will be due 30 days after shipment of products or completion of services on all Invoices
- 2) Standard Freight is FOB Factory
- 3) Retainages will not be accepted
- 4) No payment discounts, unless agreed to in writing
- 5) Complete Manna Supply Terms and Conditions of Sales are available to review and download at www.mannasupply.com.
- 6) Sales and Use Tax to be determined upon acceptance of order.
- 7) All Quotes are valid for 30 days only, due to volatile market conditions.
- 8) Tariffs, known and unknown, may impact mfg's prices up to including at time of shipment, which may differ than what was quoted previously.

Accepted By

Accepted Date

THANK YOU FOR YOUR ORDER!

Please pay from this invoice; no other statement will be sent. Thank you!
A 2% finance charge must be applied to all balances over 30 days.

Keystone Electrical Supply
237 Pillow St.
Butler, PA 16001
Robstern7@aol.com
PH# 724-822-3508



Brian DeCesare
305 Gregson Drive
Cary, North Carolina 27511
Brian.DeCesare@us.abb.com
+1 215-384-6999

ABB

January 07, 2026

Quote No.: UAP-00000560

Doc Rev. 0

Project: Capital Complex Central Plant Chiller

Quote Version: Field quote with temporary

Quote Expiration: 02/07/2026

Dear Valued Customer,

Thank you for your inquiry for **Capital Complex Central Plant Chiller**. We are pleased to respond with our proposal based on the requirements of your inquiry. Please contact us with any questions. We look forward to working with you on this opportunity.

Best Regards,

Brian DeCesare
ABB

Notes

Project Level

a. Referenced Document(s)

Commonwealth of Pennsylvania
Department of General Services
Project No. DGS C-0948-0090 Phase 003
Drawings dated 27 August 2025...
E001, E100, E200, E201.D, E202.D, E401, E601, E604, E703, E704, E706,

Addendum 5 Drawings dated December 15, 2025...
E501.A, E501.D, E705

DGS-C-1101-0055 PHASE 1 specifications...
262200, 262816

DGS C-0948-0090 PHASE 3 specifications...
261116, 261323, 262300, 262413, 262416, 262500, 262713, 264313, 262813

b. Comment(s)

IMPORTANT NOTICE:

Any contract to sell the subject matter of the proposal shall be subject to prior mutual agreement as to price (which may be different than that shown herein), schedule, scope of work and terms.

Due to confusion on the drawings and specifications, we are quoting per this scope only.
As changes are requested, or as the design progresses, we are happy to revise our proposal and pricing.

Standard GE by ABB Design & Construction
GE/ABB to provide standard one-line nameplates.

Standard ABB lug size and quantities are provided based on amperage of the breaker(s) & equipment as shown in this proposal.

Cable length & voltage drop has not been considered.

Modifications may incur an adder/change order.

Only Standard Test Reports Provided, unless noted otherwise in this Bill of Material

Quoting standard GE by ABB Warranty - 1 year from energization or 18 months whichever occurs first.

For Extended Warranty see information at the end of the BOM.

Standard Terms and Conditions apply, including but not limited to FCA Factory, Progress Payments. (See terms at end of proposal)

ABB does not and will not represent, certify, or warrant that the products proposed herein satisfy any U.S. domestic preference requirement such as the Pennsylvania Steel Products Procurement Act. Purchaser agrees it is solely responsible for its obligations to its customer, such as adherence to any U.S. domestic preference requirement or requesting and obtaining an agency waiver, providing an equitable adjustment in scope, schedule, price, and other provisions to change ABB manufacturing location, manufacturing processes, and acquisition of components if mutually agreed to by ABB and Purchaser, or the supply and replacement of substitution products, and will defend and indemnify ABB from and against all liability resulting from any variance between the terms of this proposal and any of its contract terms with its customer. In no event shall Purchaser withhold payment due to ABB for any dispute or liability incurred between Purchaser and its customer. ST forms also will not be provided."

Country of Origin for the products in this proposal:

- Lighting panelboards=USA and Mexico
- Lighting panelboard outdoor enclosures=Mexico
- Power panelboards=Mexico
- Switchboards=Mexico
- LV Transformers=Mexico
- Tranquell Surge Protective devices=Mexico
- Disconnects and fuses = Mexico
- MV Switchgear Load Interrupter Switches = Mexico
- Breakmaster Load Interrupter Switches = Mexico
- Liquid filled substation Transformers = USA and Mexico
- Dry Type substation Transformers = USA
- Low Voltage Switchgear = USA
- Medium Voltage Switchgear = USA
- LV Busway = USA
- MV Busway = USA

Power Systems Studies specifications indicate studies are to be prepared by a PE who is a full time employee of the equipment manufacturer.

Specifications also indicate the study preparer is to provide Arc Flash Training certified for continuing education units.

Exception: We are including Power System Studies by a third party, who is a PE. (Not a Full Time Employee of ABB)

Exception: We are NOT including Training.

Any changes required as a result of Power Studies, may require revision of our proposal and pricing.

MV Switchgear specifications indicate to provide Arc-Resistant construction.

However, the room layouts do not appear to allow for venting to the outside.

We suspect that the specifications need to be edited.

We are quoting Fusible Load Interrupter SWGR as NON-Arc-Resistant.

We are quoting Primary and Secondary Unit Substation Breakers as NON-Arc-Resistant.

The 12.4kV Switchgear MDS15 is quoted with arc-resistant design features at the exterior (front, rear, and sides) and arc protection to the low voltage compartment (Type 2B). This means arcing does not cause holes in the walls isolating the low voltage instrument compartments.

Switchboard specifications call for Pull Boxes and Cable Supports.

Since all connections are via Busway, we are not providing either of these features.

Switchboard specifications call for Key Interlocks, and Mechanical Interlocks.
Since we are providing an Automatic Throw Over, we are not providing these features.

Panelboard specifications call for Main lug interiors up to 400A to be field convertible to Main Breaker (Not offered)

Panelboard specifications call for Interior Phase bus to be pre-drilled to accomodate field installable options (Sub-feed lugs, Sub-feed breakers, Thru-Feed Lugs) (Not offered)

Panelboard specifications call for Mono-Flat Front. (Not offered)

We take exception to these requirements.

Panelboard specification for Breakers appears to be un-edited.

We are only quoting breaker features as indicated on the plans.

c. Exclusion(s)

1. Programming of Schneider PM8000 meters, Programming of existing Power Monitoring System, Battery System for LV SWGR, UPS, VFD's, SPD for Panel "DC", Spare Fuses, Spare Fuse Cabinet, Starters, Temporary Trailer, Modifications to existing equipment. ****Quoting HV & LV Swgr on transformers T3 & T4 as New.****

Disconnects are included only if they are shown on the One-line drawings.

Busway Product Family - Notes

a. Comment(s)

1. The quoted Bill of Material (BOM) is based on estimates at the time of quote configuration. The actual footage/fitting quantities will be determined when the fully dimensioned ABB drawings are available. As a result, if there is a change in actual quantities verses quoted quantities the adder will be provided for the additional material released on the project at this time. The Change Order PO must be issued before ABB will proceed with completion of the busway project.

Low Voltage Switchgear Product Family - Notes

a. Comment(s)

1. This job is planned to be built in Mebane, North Carolina, USA. Please verify that this will be acceptable to end user.
2. ABB Low Voltage Switchgear It is designed and tested in conformance with applicable standards of UL 1558 , CSA C22.2 NO 31 , ANSI/IEEE 37.20.1, ANSI C37.51. Any equipment requiring a UL 1558 or CSA labeling will be provided with a cUL us label. The switchgear is manufactured in an ISO 9001-certified facility.
3. Unless negotiated differently Drawings (Submittals), Testing, Quality, Warranty, Delivery and Transportation are as outlined below.
4. OPTIONAL MAINTENANCE & SAFETY FEATURES:
 - Ekip T&P - Programming and Test Unit \$2,904.00 net each
 - Breaker Remote Racker \$13,957.00 net each
 - Breaker Remote Racker Plate (Reliagear)..... \$966.00 net each
 - Portable Breaker Hoist (Crane) \$1,792.00 net each
 - Breaker Transfer Cart \$978.00 net each
 - Electrically Operated Breaker Test Box \$5,789.00 net each
5. TYPICAL ADDERS:
 - Visual Inspection of Equipment \$3,500.00 net (per 8 hr day)
 - Customer Witness Tests \$5,500.00 net (per 8 hr day)(adds 1 week To ship cycle) Please note, If the customer does Not purchase Witness Test at time of equipment order placement, price must be negotiated with Project Management Team and a revised ship schedule will be established based on current factory capacity/loading.
 - Open Top Truck(NYC & Chicago) \$1,750.00 per truck

(maximum of 10 vertical sections per truck)

6. SPARE PARTS:

Spare parts are not included in current quote. A list can be made available after order is released from engineering to manufacturing. Seller takes exception to any non-standard format or requirements for this list.

7. TYPICAL START UP SPARE PACKAGE:

Startup package includes the following items for a single ended substation. If line-up should have multiple sources, buyer may choose to add one package for each source of incoming power.

=> Typical start up package \$1,750.00 net each

- 100% replacement fuses for primary of CPT and PT circuits
- 20% replacement secondary control fuses
- Qty 5 interconnect terminal blocks/plugs
- Qty 5 customer access terminal blocks
- 100 ft of SIS control wire
- Qty 10 spare lamps for indicating lights (5 for red, 5 for green)
- Qty 20 control wiring terminals

8. Factory equipment quotation does not provide programming of customer settings for protective devices (relay/trip unit) Or communication mapping. These items, selective coordination, And all system studies should be quoted And provided by ABB Lifecycle Solutions (Engineering Services) Or the installing contractor. Items mentioned above are Not included In quotation BOM Or pricing.

9. FACTORY TESTS:

Contact Low Voltage Proposals Group for prices on special tests not listed below.

Standard tests performed during factory testing and Witness Test (optional):

- Device check
- Control lead check
- Stationary instrument transformer ground test
- Meter check (3-phase) & polarity check
- Control power check (sequence tests)
- Heater, lights, receptacle, and fan check
- Bus check - visual check of phases, neutral, and ground per drawing.
- Clearance check - inspection of bus, neutral, and devices for proper clearance
- Connection tightness
- Nameplate check
- Current/voltage transformer polarity check (visual)

The following tests are also performed during standard factory testing.

- Secondary hi-pot of control wiring (1500vac for 1 minute)
- Primary hi-pot of primary bus (2200v, 19kv or 36kv as required)

An adder Is required If hi-pot tests are required To be performed during Customer Witness tests.

ABB does not allow for witness or hold points in the manufacturing process. Should the customer like to inspect the equipment at any point during the manufacturing cycle, the factory will advise within five working days in advance when those milestone dates are approached. Customer will have responsibility to make necessary arrangements to attend inspection dates as communicated. Customer inspection(CI) requirements must be established at the time Of the order, Or through a formal change order process If CI requirements arise later In the execution Of the order.

10. The ABB Standard Documentation Package includes:

** For Approval (when required)

- a) Front View/Floor Plan - Arrangement with basic dimensions, device locations, 1-line, cable space, shipping sections, etc. This Is Not certified For construction.
- b) Summary (Bill of Material) - Breaker, device and nameplates.
- c) Elementary Drawing - 3-line schematic of current, potential and control circuits. Preliminary - no terminal numbers.

** Final Drawings

- a) Front View/Floor Plan - Final dimensions for construction.
- b) Summary - Final breaker, device and nameplate list.
- c) Final Elementary Drawing - 3-line schematic of all circuits with terminal numbers.
- d) Connection Diagram - Internal unit wiring diagrams.
- e) Interconnect Drawings - External and inter-unit connections.
- f) Instruction Books - For switchgear and all major items.

(Relay instruction books include time curves.)

g) Installation Drawings - Foundation requirements, loading/unloading And installation methods.

h) Certified Test Reports (If ordered)

If changes are made during factory testing, the affected sheets of the final drawings are reissued.

11. For Low voltage switchgear, the standard practice for LV breakers is for them to arrive after the gear ships from the factory. This is to allow customers to have time to set the gear, pull cables, make inter-unit connections, and not have breakers in the way where they may get damaged. If breakers are required on site at the same time of the switchgear, they will be shipped external to the switchgear, and an adder will be required.
12. Clarification to job scope, many assumptions were made with this specification provided. This quote is only limited to the attached BOM. If any deviation is required, then Seller reserves the right to update BOM and price accordingly.
13. In the event of conflicting information in the documents provided, seller is using the following order: DATA SHEET, DRAWING, SPECIFICATION.
14. Proposed switchgear is in conformance with applicable standards of ANSI, IEEE, NEMA & UL. Exception is taken to all other codes & standards. Note that NEC & NFPA refer to the actual installation, operation & maintenance of the equipment, not the design of the equipment. Seller has reviewed the NFPA standards, only NFPA 70 (the NEC Code), NFPA 70B (Recommended Practice for Electrical Equipment Maintenance) and NFPA 70E (Standard for Electrical Safety Requirements for Employee Workplaces) have any relevance to our product. 70B and 70E both apply directly to the safety and use of electrical equip. NFPA 70, is commonly called the NEC Code.
15. Seller is quoting Switchgear which is provided with Trip Units and/or solid state relays. Most relay functions such as Ammeter, Ammeter Switch, Voltmeter, Voltmeter Switch and Demand are performed by the trip unit integrated into the front of each Breaker. Seller is taking exception to providing a dedicated device for these functions if they are required.
16. Seller is quoting standard factory lead times. If customer requires lead times sooner than these estimates field sales will need to prenegotiate with factory.
17. Seller is quoting standard factory Switchgear submittals which will be per the SHIPMENT AND DRAWING SCHEDULE section below. If customer requires a shipment sooner than these estimates field sales will need to prenegotiate with factory. Optional price adders have been provided below and can be added at order entry.
18. Switchgear will be shipped per the DELIVERY AND TRANSPORTATION section below. All exception is taken to any shipping methods. Optional price adders have been provided below and can be added at order entry. Any STORAGE AND HANDLING is to be quoted and provided by others.
19. Seller is quoting standard ABB Terms and Conditions per section below. All exception is taken to any other T&C's and Liquidated Damages. If buyer finds seller's proposal competitive, seller will be glad to negotiate, in good faith, a mutually agreeable set of terms & conditions before the order is placed.
20. Any possible execution of field services, site coordination between switchgear and other products/devices, performance bonding, testing & training, short circuit studies or preliminary trip unit/relay settings are to be quoted and provided by others.
21. If required, any DC voltage to be quoted and provided by others.
22. Seller has provided an option for remote racking. The remote racking device for Emax2 breaker requires a plate to be mounted on the face of the breaker for operation. Seller has provided one plate for each main and tie breaker and an additional plate that can be utilized for the feeders and moved from breaker to breaker. If a mounting plate is required for each feeder, seller would gladly revise the bill of material and price accordingly.

23. TPHE Series SPD

Providing an ABB TPHE Series SPD per the BOM in our bid. The TPHE Series SPD is engineered for reliability, flexibility, and long surge life in the most extreme transient surge environments. The true maximum single surge current ratings are not limited by fusing or other serial components within the

surge discharge path like some other manufacturer's SPD devices.

The full TPHE assembly, including all fusing and components, is 3rd party tested to confirm that it is capable of surviving a single IEEE 8x20us surge current impulse per each mode, up to *200kA. The TPHE protects all available modes of the power system (L-N, L-G, L-L and N-G) and is offered in per mode ratings of 125kA, 150kA, 200kA or 300kA per mode (equal to 250kA, 300kA, 400kA And 600kA per phase). Per phase ratings are the aggregate sum of the combined L-N and L-G tested modes and are provided for comparison only since per phase ratings are not specifically endorsed by standards organizations within the SPD industry.

ABB has not included a circuit breaker to feed the SPD device due to its additional impedance. The provided SPD comes with a surge rated 4-pole disconnect which allows the SPD to be 'turned off'.

b. Deviation(s)

1. The Project Specification Review attachment references important clarifications and deviations to customer's specifications and/or drawings that shall be applied in the equipment to be manufactured and offered in this quote. In case of discrepancy and/or clarification, notify and review with your sales representative.

Uploading in Empower saves a record of your original CDE file on the quote version for reference as needed. File attachment in empower cannot be edited or deleted by anyone but the file creator!

Medium Voltage Switchgear Product Family - Notes

a. Comment(s)

1. Material shortage clause

"The Parties are aware of the shortage of raw materials, electronic components worldwide which is likely to last for the foreseeable future, as well as of market fluctuations in the availability and cost of other raw materials, commodities, other critical components and transportation capacities. Notwithstanding anything to the contrary in the contract/terms and conditions/purchase order, if after the date of ABB's proposal / offer or during the term of the performance of the contract/purchase order there are any changes to availability and / or market conditions for electronic components, raw materials, commodities and transportation capabilities directly or indirectly affecting ABB's performance, ABB shall be entitled to relief in the schedule of the performance or delivery of the directly or indirectly affected scope of work under the contract/purchase order. In such circumstances, the Parties shall meet without delay and discuss in good faith to find a mutually agreeable solution, with equitable adjustment to the contract/purchase order date of delivery or completion. Customer hereby acknowledges and agrees that in said circumstances ABB may not be able to comply with the originally agreed delivery or completion schedule and that ABB shall not be liable for any liquidated or actual damages in connection thereto."

Transportation cost clause

"The offer is based on [CPT (Carriage Paid To) Destination: Switchgear is loaded onto truck and shipped to named destination. Offer does not include offloading of switchgear. ABB Standard inland packing applies]. Due to current fluctuations in transportation cost, the transportation cost is given as a separate line item and is to be considered a non-binding estimate based on current market prices. At the time of delivery, ABB will use reasonable efforts to get optimum transport arrangements, and the actual cost will be invoiced by ABB to the Purchaser. In no case will ABB be liable for any increase in transportation cost at the time of delivery."

Price escalation clause

Prices are firm until [30 days] except they are subject to adjustment as follows: On the day the Purchase Order is received, the prices are subject to adjustment if the cost of labor, copper and/or steel has increased by more than 2% since the date of bid submission or last price adjustment based on local labor index from the country of manufacture, London Metal Exchange (www.lme.com) LME Copper rates for copper and CRU Group (<https://cruonline.crugroup.com>) for steel. In such case ABB reserves the right to adjust the price to include the respective increase.

Standard Price Adjustment Clause 7A

The prices stated herein are subject to adjustment to reflect changes in the Producer Price Index, PPI, and the date of release for manufacture. The adjustment hereunder shall be determined from Bureau of Labor Statistics data.

1. Definitions

For the purpose of this provision the following definitions apply:

- a. The "Switchgear and Switchboard Apparatus Manufacturer Index" (Series Id: pcu335313335313) as determined and published monthly by the Bureau of Labor Statistics of the U.S. Department of Labor

in "Producer Prices and Price Indexes" will be applied to all products.

b. The "Base Switchgear and Switchboard Apparatus Manufacturer Index" shall be the latest final Switchgear and Switchboard Apparatus Manufacturer Index that is published on the date 12/17/2025. An index is "published" when it appears in an issue of "Monthly Labor Review" or "Producer Prices and Price Indexes", as applicable, which can be obtained from the Washington office of the Bureau of Labor Statistics.

c. An index is "final" when it appears in the appropriate publication given in (c) above, without a superscript "p" which identifies it as preliminary.

2. Adjustment for Increased of Index Costs:

a. Each payment shall be adjusted for any change relevant Index. The adjustment shall be equal to the percent by which the latest final Index, which is published at the time of release, is greater than the Baseline Index (Outlined above in 1 b), subject to the following bounds.

MV SWGR

Escalation Bounds: (Based on Standard Lead Time release to manufacturing date/drawing approval date when a PO is received by Planned Order Date - TBD)

Approval occurs:

1. Planned Order Date through Required Drawing Approval Date; Fixed Price

2. Required Drawing approval date through 30 days after required drawing approval date; the greater of the following:

- 2% increase over base price or;
 - Adjustment as defined in (a) above
3. Greater than 30 days from required drawing approval date;
- Remaining unreleased material to be repriced at market value

3. General

a. The Base Switchgear and Switchboard Apparatus Manufacturer Index shall be determined to the nearest first decimal place. In either case, if the next succeeding place is five or more, the preceding decimal place shall be raised to the next highest figure.

b. Should the indexes specified in the above paragraphs be discontinued, or should the basis of their calculation be modified, the Company shall substitute equivalent indexes.

c. Above Price Adjustment clause does not negate the need for schedule adjustments. Any delay in drawing approval can impact delivery schedule.

Reference Links

Producer Price Index SWGR - https://data.bls.gov/timeseries/PCU335313335313?data_tool=XGtable

Base Switchgear and Switchboard Apparatus Manufacturer Index

Series Id: pcu335313335313

Tarif Price Adjustment

Seller shall have the right to adjust the Agreement Price in the event of a Change in Law affecting the cost of materials, labor, or other contributory costs that are put into effect after the Effective Date of this Agreement which are beyond the reasonable control of the Seller. Such Change in Law events shall include, but not limited to, a change in national tariffs, tax treaties, or trade agreements. In the event of a Change in Law, Seller shall be entitled to a Change Order, in accordance with the terms of this Agreement, with an equitable adjustment to the Agreement Price and/or the schedule for performance.

Hyperinflation

In the event of unusual and significant changes in the raw material costs of produced products, due to hyperinflationary circumstances not captured by the Switchgear and Switchboard Apparatus Manufacturer Index, the Power and Distribution Transformers Manufacturer Index, or the Comex CU Spot Price, the Seller may adjust the discount multipliers by a factor other than the index as described in 1A above.

Unusual Market Volatility

The Parties are aware of the challenges related to outbreaks, epidemics, government regulations and acts of governmental authorities (including sanctions), civil unrest, and general shortages of electronic components and elements, market volatility, availability and cost of raw materials, commodities, costs and capacities that may impact the normal business activity and the delivery dates and/or the execution of the scope, the impacts of which are currently unknown. Notwithstanding anything in the proposal to the contrary, if as a result of any of the above aforementioned events, the costs of ABB's performance

increase or ABB's performance obligations are materially adversely affected or delayed, the Parties in the spirit of cooperation, will work together in good faith and within a reasonable time after the invocation of this Clause, to negotiate alternative contractual terms in terms of equitable adjustments to delivery and/or possible reductions of the contractually owed quantity of the Goods to be delivered to the Buyer. The aforementioned shall be performed with a view to employing reasonable efforts to ensure that the PO can be at least fulfilled in part.

Delivery Schedule:

Contract drawings, information submittals, manufacturing, and shipment schedules will follow the outline below and are contingent on customer approval in the timeframe indicated:

Approval Drawings – Class I & II: 10 - 12 weeks after receipt of purchase order.

Customer drawing approval time: 2 weeks to keep order timeline on schedule.

Switchgear Ready for Shipment: 28 weeks after return of approved drawings and release to manufacture.

TOTAL Typical LEAD TIME: 40– 42 weeks** (with 2 weeks customer approval)

**Lead time shall be confirmed at the time of Order acknowledgement.

If the approval drawings and all necessary information are not returned approved and released for manufacture within the timeframe specified above, this project becomes subject to delay.

Timeline is based on current production and engineering and shop loading at time of order placement and is subject to change based on loading at the time of order receipt.

Date span from "release for manufacturing" to "shipment" is determined by the lead time on that date.

The scheduled delivery dates shall be presented in the order acknowledgement letter provided by the project manager. If the approval drawings are not returned within the time frame listed above, the time of delay shall be given by the project manager.

To expedite order acceptance, please provide the following information on your purchase order documents:

- Reference to ABB Quote number and date of submittal.
- List items numbers included in the quotation by copying the item list & pricing information.
- Reference to the agreed terms and conditions, delivery terms and payment terms (Net 30). If order amount is greater than \$500,000.00, please include the following milestone payments on the PO
 - o 20% upon delivery of drawings
 - o 30% upon release of equipment
 - o 50% upon shipment
- Freight terms (CPT), "Ship To" address and required delivery date.
- E-mail address for the transmittal of drawings, and file.
- Agreed warranty period (months/years).
- Taxable status – if Tax Exempt, please send certificate with PO documents.
- P. O. must include multiple line items as defined per the ABB offering.
- Requested delivery date.

***For MV SWITCHGEAR COMMENTS and / or CLARIFICATIONS to Customer's Specification (s) and/or Drawing (s) please refer to "CDE-R0_UAP-00000560_MVSWGR.pdf" document attached at Empower quote Tab "Attachments". ***

PROPRIETARY AND CONFIDENTIAL INFORMATION

This document contains confidential and proprietary information. By accepting this document, the recipient agrees not to disclose its contents except to individuals within their organization who are directly involved in evaluating this proposal. No copies may be made without prior written permission. Upon written request, this document must be returned.

Summarized Bill of Material(s)

Quantity	Description	Item(s)	Mark(s)
5	Medium Voltage Switchgear	1	15KV SWGR 'MDS15'
		2	PLENUM
		3	ACCESSORIES
		4	SPARE PARTS
		5	FREIGHT
4	Low Voltage Switchgear	10	MTM1
		11	MTM2 - OPEN
		12	MAIN 1
		13	MAIN 2
2	Secondary Substation Transformer	15	3500 KVA
16	Panelboard	16	MDP-NE
		17	LP-LH
		18	CP
		19	LR
		20	CP-1
		21	V-1 RH
		22	V-1
		23	V1A
		24	PP
		25	WELDER/PLASMA CUTTER
		26	N/E
		27	NE
		28	NE2
		29	RP
		30	HP
		31	DC
1	Transformer	32	T-RP
15	Switches and Disconnects	33	VFD DISCONNECT
		34	ELEVATOR CONTROL SW
		50	450A FUSIBLE DISC
		51	500A FUSIBLE DISC
6	Busway	52	650A FUSIBLE DISC
		35	BUS MTM1-T1
		36	BUS MTM1-T2
		37	BUS MTM1-MDS1
		38	BUS MTM1-MDS2
2	Bus Duct	39	BUS MTM2-T5
		40	BUS MTM2-T6
2	Bus Duct	41	4160V 2000A NSB RUN1
		42	4160V 2000A NSB RUN2
1	Switchboard	49	TEMP SWBD
1	Load Interrupter Switch	53	TEMP CHILLER DISC
2	5kV Drawout Breaker 2000A Close Couple to XFMR with PM8240 Meter	6	
2	5kV Drawout Breaker 2000A Close Couple to LIS7 with PM8240 Meter	7	
2	12.4kV Drawout Breaker 600A Close Couple to XFMR	8	

Quantity	Description	Item(s)	Mark(s)
1	Switchgear "MDS5" - (2) 2000 Drawout Main Breakers, (5) Fusible Branch Switches with Fuses- PM8214	9	
4	Battery System for LV Switchgear	14	BATTERY SYSTEM
1	Power Study - Base Study	43	
1	Power Study - Load Flow Study Adder	44	
1	Power Study - Harmonic Study Adder	45	
1	Startup Assistance - SWGR and SWBD's		
1	Temporary Equipment	47	
1	Temporary 4160V-480V 1500kva XFMR	48	

Total Net Price

The total net price for the item(s) defined in this quotation is:

\$8,995,964. Net Contractor Cost

Quote includes Temporary Chiller 5kV Disconnect, Temporary 4160V Transformer, Temporary Switchboard, or Temporary Chiller Disconnects.

This version includes "MTM1" as LV Switchgear (BB#2, 3, & 4)

Note: They want BB#1 to have MTM1 as a SWBD. (I'm sure they expect the SWBD to be cheaper than the LV SWGR... it is not)

ADDER to Provide "MTM1" as Switchboard \$ 17,850

Includes Power Studies by third party (Not ABB as spec'd)

Does NOT include Arc Flash Training

Includes estimated line items for Substation T3 & T4 Primary and Secondary MV Breakers (Metal-Clad)(I have sent RFQ to Advance SWGR to quote these)

Includes MDS5 with Metal Clad Main Breakers, and Metal Enclosed LIS fused branches with PM8240 on each branch

This includes MV Busway (Contractor to verify lengths)

This includes LV Busway (Contractor to verify lengths).

Does not include VFD's, UPS's, PMCS System, Programming of PM8000's to communicate with PMCS, Loose PM8000's for other existing equipment, SPD for DC Panel (Not offered).

See the attached Marked Up One-Lines for your customer to review Green Items included in proposal, and Red items not included.

Summary of Proposal

Estimated Lead Time

The lead times contained in this proposal are for estimating purposes only and do not include approval drawing cycle, factory holidays/shutdowns, witness testing, or transit time. Lead-times are subject to change and may require staggered shipments beyond stated lead times. Please contact ABB if firm or alternate lead times are required.

Item No.	Product Description	Mark(s)	Estimated Lead Time (Weeks)	Quantity
1	Medium Voltage Switchgear, SafeGear, T2B/15kV/50kA/1200A (A01)	15KV SWGR 'MDS15'	42	1
2	Medium Voltage Switchgear, Plenum, (A02)	PLENUM	42	1
3	Medium Voltage Switchgear, Accessories, (A03)	ACCESSORIES	42	1
4	Medium Voltage Switchgear, Spare Parts, (A04)	SPARE PARTS	42	1
5	Medium Voltage Switchgear, Freight, (A05)	FREIGHT	42	1
6	5kV Drawout Breaker 2000A Close Couple to XFMR with PM8240 Meter		CONTACT ABB SALES	2
7	5kV Drawout Breaker 2000A Close Couple to LIS with PM8240 Meter		CONTACT ABB SALES	2
8	12.4kV Drawout Breaker 600A Close Couple to XFMR		CONTACT ABB SALES	2
9	Switchgear "MDS5" - (2) 2000 Drawout Main Breakers, (5) Fusible Branch Switches with Fuses- PM8214		CONTACT ABB SALES	1
10	Low Voltage Switchgear, Reliagear	MTM1	CONTACT ABB SALES	1
11	Low Voltage Switchgear, Reliagear	MTM2 - OPEN	CONTACT ABB SALES	1
12	Low Voltage Switchgear, Reliagear	MAIN 1	CONTACT ABB SALES	1
13	Low Voltage Switchgear, Reliagear	MAIN 2	CONTACT ABB SALES	1
14	Battery System for LV Switchgear	BATTERY SYSTEM	CONTACT ABB SALES	4
15	SEPS Secondary Substation Transformer, Vent Dry	3500 KVA	CONTACT ABB SALES	2
16	Power Panelboard, ReliaGear neXT	MDP-NE	8	1
17	Lighting Panelboard, ReliaGear RQ	LP-LH	8	1
18	Lighting Panelboard, ReliaGear RQ	CP	8	1
19	Lighting Panelboard, ReliaGear RQ	LR	8	1
20	Lighting Panelboard, ReliaGear RQ	CP-1	8	1
21	Lighting Panelboard, ReliaGear RS	V-1 RH	16	1
22	Lighting Panelboard, ReliaGear RS	V-1	16	1
23	Lighting Panelboard, ReliaGear RS	V1A	16	1
24	Lighting Panelboard, ReliaGear RS	PP	16	1
25	Lighting Panelboard, ReliaGear RS	WELDER/PLASMA CUTTER	16	1
26	Lighting Panelboard, ReliaGear RQ	N/E	8	1
27	Lighting Panelboard, ReliaGear RS	NE	16	1
28	Lighting Panelboard, ReliaGear RS	NE2	16	1
29	Lighting Panelboard, ReliaGear RQ	RP	8	1
30	Lighting Panelboard, ReliaGear RS	HP	16	1
31	Lighting Panelboard, ReliaGear RE	DC	6	1
32	Transformer, Copper, 9T10C1002G32	T-RP	6	1
33	Switches and Disconnects, Heavy Duty Safety Switch, THN3366A1	VFD DISCONNECT	CHECK AVAILABILITY	3
34	Switches and Disconnects, Elevator Disconnect, ES6T48R1KGN1A	ELEVATOR CONTROL SW	8	1
35	Busway, ReliaGear Series Busway	BUS MTM1-T1	28	1
36	Busway, ReliaGear Series Busway	BUS MTM1-T2	28	1
37	Busway, ReliaGear Series Busway	BUS MTM1-MDS1	28	1
38	Busway, ReliaGear Series Busway	BUS MTM1-MDS2	28	1
39	Busway, ReliaGear Series Busway	BUS MTM2-T5	28	1
40	Busway, ReliaGear Series Busway	BUS MTM2-T6	28	1
41	SEPS Bus Duct	4160V 2000A NSB RUN1	CONTACT ABB SALES	1
42	SEPS Bus Duct	4160V 2000A NSB RUN2	CONTACT ABB SALES	1
43	Power Study - Base Study		CONTACT ABB SALES	1
44	Power Study - Load Flow Study Adder		CONTACT ABB SALES	1

Item No.	Product Description	Mark(s)	Estimated Lead Time (Weeks)	Quantity
45	Power Study - Harmonic Study Adder		CONTACT ABB SALES	1
46	Startup Assistance - SWGR and SWBD's		CONTACT ABB SALES	1
47	Temporary Equipment		CONTACT ABB SALES	1
48	Temporary 4160V-480V 1500kva XFMR		CONTACT ABB SALES	1
49	Switchboard, ReliaGear Configured, RG-GM-CBSB-CTO	TEMP SWBD	16	1
50	Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR	450A FUSIBLE DISC	CHECK AVAILABILITY	3
51	Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR	500A FUSIBLE DISC	CHECK AVAILABILITY	5
52	Switches and Disconnects, Heavy Duty Safety Switch, TC72367R	650A FUSIBLE DISC	CHECK AVAILABILITY	3
53	Load Interrupter Switch, VersaRupter	TEMP CHILLER DISC	33	1

Bill of Material(s)

Item No.	Quantity	Description
1	1	Medium Voltage Switchgear, SafeGear, T2B/15kV/50kA/1200A (A01) Marks: 15KV SWGR 'MDS15' SafeGear® Arc-Resistant Metal-Clad Switchgear A/R-Rating Type 2B, 10-cycle arc duration per IEEE C37.20.7 Enclosure: Indoor, ANSI # 61 Light Gray enamel Bus System: 15 kV Max Rated Voltage, 60 Hz System Voltage - 13.80 kV Rated Main Bus Current - 1200 A Short-CircuitCurrent-50 kA 1 System, 3-phase, 3-wire Delta System Switchgear shall be designed and manufactured in accordance with the standards of ANSI / IEEE Dimensions and Weight (Estimated) Height: 95 Inches; Width : 252 Inches; Depth: 85 Inches Weight: 18711 lbs. Bus Insulation: Main Bus Support: Molded Epoxy Primary Bushings: Molded Epoxy Standoff Insulators: Molded Epoxy Bus Material is 98% Copper with silver-plated joints Bus Insulation is fluidized bed baked-on epoxy with vinyl boots over joints Ground Bus, ¼ in x 2 in, solid copper, tin plated, continuous throughout lineup and extended to the rear of the frame Wiring: AC Control Bus is 40 A, 1-ph, 3-wire circuit with #8 AWG connected to power terminal blocks DC Control Bus is 40 A, 2-wire circuit with #8 AWG connected to power terminal blocks Breaker Charging Motor Voltage 125 V dc Breaker Closing Voltage 125 V dc Breaker Opening Voltage 125 V dc All control wire is #14 AWG minimum, multi-stranded extra-flexible, SIS 600 V flame retardant wire gray color for control, green color for ground All CT circuits will be #10 AWG, multi-stranded extra-flexible, SIS 600 V flame retardant, gray wire UL-rated, 600 V, 30 A, 35 mm DIN-rail mount barrier type terminal block For control circuits a maximum of two wires per terminal point 20% additional terminal blocks per frame Ring-tongue, Vinyl pre-insulated Slip-on destination type wire markers, white with black letters Pre-wired harness to terminal block from the following devices: Breaker control secondary, 52TOC switch, CT's & PT's 2 EnRack Plus Pendant Controller, 120/240VAC 2 Cat 5E/6E Ethernet Cable, 50ft, used to connect pendant to cable port on LV door. RJ45 connectors at both ends Additional Features: Circuit breakers will be shipped in bottom breaker compartments. Circuit breakers belonging to top breaker compartments will be shipped separately 1 Breaker Control Transfer Scheme, 3-breaker, close-transition (25 / 27 / 47 / 59) 1 O&M Manuals, via electronic media on compact disc 2 Level 2 - Factory Witness Test (FWT), 3-people for # of days A01 : Frame Sequence 1 (1200A FDRS) 1200A Feeder Breaker - LV Instrument Panel (19") - 1200A Feeder Breaker Breaker A/B: 1 CT Sec Wire Harness, multi ratio, set of (3) 3 CT / PT Production Test Reports 1 CT Sec Wire Harness, multi ratio, set of (3)

Bill of Material(s)

3	CT / PT Production Test Reports
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"A"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Breaker D/E:
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched

Bill of Material(s)

- 1 Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
- 1 EnRack Controller Module, Basic or Plus, 120VAC
- 1 EnRack Plus Relay Module, 120/240VAC
- 1 Racking Motor Overcurrent Relay
- 1 Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
- 1 RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
- 1 Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
- 1 Cable Harness, D-sub connector on top breaker to terminal blocks
- 1 Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
- 1 E90 Class CCFH 2P, 30A, 600V
- 1 Time Delay, 5A, 250V, Type ATDR

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, 2-high, 1.2 kAF Main or Feeder - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R End Panel Assembly - standard depth
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 2 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, End Frame - 1200 A
- 1 Cable Support Assembly
- 1 Cable Support Assembly
- 1 Cable Lug Boot, 3-ph, 1200 A
- 1 Cable Lug Boot, 3-ph, 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V
- 1 Ground Cable Lugs, compression type, #4/0 AWG
- 1 Cable Lugs, compression type, 2-hole, set of (3), up to #4/0 AWG
- 1 Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 19 in high, with MPL Door
- 3 Door Stop Assembly
- 1 DC Control Bus, 40 A 2-wire
- 1 AC Control Bus, 40 A 1ph 3-wire
- 1 DC Control Bus, MCCB, 40 A 250 V dc 2-pole, UL
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 1 Molded Case Circuit Breaker, 40 A 22 kA 480 V 3-pole, UL
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL
- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 2 Indicating Lamp LED
- 2 Indicating Lamp LED
- 4 Test Switch, ABB FT-1, 10-pole
- 2 PM8244 Intermediate Power Meter, DIN rail mount + remote display
- 2 (PM8) Digital I/O Module - 6 digital inputs, 2 relay outputs
- # Note: All Devices for this frame that cannot be fit in the 19" Instrument
- 1 Compartment Door will be mounted on the adjacent 38" or 57" Instrument Compartment Door.
- 2 # P/N: 751001A1A0X0X85B200 (751#MHJB); SEL-751 Feeder Protection Relay

A01 : Frame Sequence 2 (MAIN 1)

LV Instrument Panel (57") - 1200A Main Breaker

Breaker D/E:

- 1 CT Sec Wire Harness, multi ratio, set of (3)

Bill of Material(s)

3	CT / PT Production Test Reports
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Surge Arrester Mounting Assembly, Dist / Intmed Class
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
1	Surge Arrester, Distribution Class, ABB POLIM-D, 18kV, 15.3kV MCOV (set of 3)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for
1	2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector,
1	Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45
1	connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC
1	and 90-300 VDC, Output 24 VDC / 10 A
1	Selector Switch 2-position, Type M2SS1-10B, 2 Position, Maintained, operator only
1	(needs holder & contact block)
1	Contact Block with Holder For Pilot Device, 1 NO & 1 NC, Type MCBH-11, Front
1	Mounting
1	Contact Block For Pilot Device, 1NC, Type MCB-01 (Without Holder)
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Frames:
1	Shipping Base Assembly - Indoor, set per cubicle
1	A/R type 2 Base Frame, 1-high, 1.2 kAF Main or Feeder - std depth
1	Main Bus, 1200 A, 50 kA, 3-phase, polyester support
1	A/R Rear Panels, Split Bolted with handles
1	A/R type 2B Construction, per frame
1	Front Door Adder - SmartRack Assembly (Electric Racking)
1	A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
1	Cable Support Assembly
1	Cable Lug Boot, 3-ph, 1200 A
1	Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
1	Strip Heater Circuit, Total 300 W applied at 1/2 V
2	Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM
	LV Instrument:
1	A/R type 2 Instrument Compartment - 57 in high, with MPL Door
2	Door Stop Assembly
1	DC Control Bus, 40 A 2-wire

Bill of Material(s)

- 1 AC Control Bus, 40 A 1ph 3-wire
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL
- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 2 Indicating Lamp LED
- 3 Test Switch, ABB FT-1, 10-pole
- 1 ION9200, Power Quality Meter, DIN mount, 7.56"-display, B2B adapter, HW kit
- 1 (9200) Remote Display, color touchscreen, 7.56" x 7.56" window
- 1 (9200) I/O Module, 2 relay outputs, 6 digital inputs
- 1 (86) Lockout Relay, ES - LOR, manual-reset, 2-deck (4)NO, (4)NC
- 1 # P/N: 751401ACACA7085A200 (751#F6C7); SEL-751 Feeder Protection Relay
- 1 # P/N: 2730M0ARAX1111CCCCX0 (2730M#28CN); Managed 24-Port Ethernet
- 1 Switch
- 1 # Lot of CAT6 Ethernet Cable and connectors for Relay and Ethernet Switch
- 1 (internal wiring)
- 1 # Senseor Power Supply
- 1 # Senseor HMI with mounting kit

.
A01 : Frame Sequence 3 (LPTs; BPTs)

Line PT - LV Instrument Panel (19") - Bus PT

PT A/B:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

PT D/E:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, Auxiliary, Tie Transition - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 2 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 19 in high, with MPL Door
 - 3 Door Stop Assembly
 - 1 DC Control Bus, 40 A 2-wire
 - 1 AC Control Bus, 40 A 1ph 3-wire
 - 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
 - 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
 - 1 20% Spare Terminal Blocks
 - 1 Wired to Terminal Block, unused relay contacts
 - 1 Wire Markers - SPECIAL
- .

Bill of Material(s)

A01 : Frame Sequence 4 (TIE)

LV Instrument Panel (57") - 1200A Tie Breaker

Breaker D/E:

- 1 CT Sec Wire Harness, single ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, single ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, multi ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 (C) Motorized truck 125VDC with protection
- 1 # 10 AWG, CT Secondary Wiring
- 1 ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
- 1 Breaker Interrupting Time = 3 cycle
- 1 Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
- 1 Breaker Auxiliary Switch, 16-pole (9a, 7b)
- 3 Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
- 3 Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
- 1 Circuit Breaker Production Test Reports
- 1 A/R type 2 Breaker Compartment, Pos "B" - 1200A (40&50kA) Epoxy
- 1 Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
- 1 (52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
- 3 Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
- 1 Padlock Provisions - Hinged Panel
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
- 1 Breaker Door Interlock with Defeat-Reset Features
- 1 Interlock, door with breaker in disconnect position, defeatable
- 1 Interlock, prevent breaker racking unless door is closed and latched
- 1 EnRack Controller Module, Basic or Plus, 120VAC
- 1 Tie and Transition Phase Bus Assembly, 1200 A
- 1 EnRack Plus Relay Module, 120/240VAC
- 1 Racking Motor Overcurrent Relay
- 1 Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
- 1 RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
- 1 Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
- 1 Cable Harness, D-sub connector on top breaker to terminal blocks
- 1 Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
- 1 E90 Class CCFH 2P, 30A, 600V
- 1 Time Delay, 5A, 250V, Type ATDR

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, 1-high, 1.2 kAF Tie Breaker - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 1 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 57 in high, with MPL Door
- 2 Door Stop Assembly
- 1 DC Control Bus, 40 A 2-wire
- 1 AC Control Bus, 40 A 1ph 3-wire
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL

Bill of Material(s)

- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 2 Indicating Lamp LED
- 3 Test Switch, ABB FT-1, 10-pole
- 2 (86) Lockout Relay, ES - LOR, manual-reset, 10-deck (20)NO, (20)NC
- 1 (86) Lockout Relay, ES - LOR, manual-reset, 2-deck (4)NO, (4)NC
- 1 # P/N: 751401AA0CA7085A200 (751#8MHJ); SEL-751 Feeder Protection Relay
- 1 # SEL M-T-M Quickset Design Template Parametrization
- 2 # P/N: 0587Z0X635312XX (587Z#F93X); SEL-587Z High-Impedance Differential Relay

.

A01 : Frame Sequence 5 (LPTs; BPTs)

Line PT - LV Instrument Panel (19") - Bus PT

PT A/B:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

PT D/E:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, Auxiliary - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 2 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 19 in high, with MPL Door
- 3 Door Stop Assembly
- 1 DC Control Bus, 40 A 2-wire
- 1 AC Control Bus, 40 A 1ph 3-wire
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL

.

A01 : Frame Sequence 6 (MAIN 2)

LV Instrument Panel (57") - 1200A Main Breaker

Breaker D/E:

- 1 CT Sec Wire Harness, multi ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, single ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, multi ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 (C) Motorized truck 125VDC with protection
- 1 # 10 AWG, CT Secondary Wiring
- 1 ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA

Bill of Material(s)

1	Surge Arrester Mounting Assembly, Dist / Intmed Class
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
1	Surge Arrester, Distribution Class, ABB POLIM-D, 18kV, 15.3kV MCOV (set of 3)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
1	Selector Switch 2-position, Type M2SS1-10B, 2 Position, Maintained, operator only (needs holder & contact block)
1	Contact Block with Holder For Pilot Device, 1 NO & 1 NC, Type MCBH-11, Front Mounting
1	Contact Block For Pilot Device, 1NC, Type MCB-01 (Without Holder)
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Frames:
1	Shipping Base Assembly - Indoor, set per cubicle
1	A/R type 2 Base Frame, 1-high, 1.2 kAF Main or Feeder - std depth
1	Main Bus, 1200 A, 50 kA, 3-phase, polyester support
1	A/R Rear Panels, Split Bolted with handles
1	A/R type 2B Construction, per frame
1	Front Door Adder - SmartRack Assembly (Electric Racking)
1	A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
1	Cable Support Assembly
1	Cable Lug Boot, 3-ph, 1200 A
1	Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
1	Strip Heater Circuit, Total 300 W applied at 1/2 V
2	Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM
	LV Instrument:
1	A/R type 2 Instrument Compartment - 57 in high, with MPL Door
2	Door Stop Assembly
1	DC Control Bus, 40 A 2-wire
1	AC Control Bus, 40 A 1ph 3-wire
2	Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
1	Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
1	Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
1	20% Spare Terminal Blocks
1	Wired to Terminal Block, unused relay contacts
1	Wire Markers - SPECIAL
1	Breaker Control Switch, pistol, (1)C & (1)T

Bill of Material(s)

2	Indicating Lamp LED
3	Test Switch, ABB FT-1, 10-pole
1	ION9200, Power Quality Meter, DIN mount, 7.56"-display, B2B adapter, HW kit
1	(9200) Remote Display, color touchscreen, 7.56" x 7.56" window
1	(9200) I/O Module, 2 relay outputs, 6 digital inputs
1	(86) Lockout Relay, ES - LOR, manual-reset, 2-deck (4)NO, (4)NC
1	# P/N: 751401ACACA7085A200 (751#F6C7); SEL-751 Feeder Protection Relay
1	# P/N: 2730M0ARAX1111CCCCX0 (2730M#28CN); Managed 24-Port Ethernet
1	Switch
1	# Lot of CAT6 Ethernet Cable and connectors for Relay and Ethernet Switch
1	(internal wiring)
1	# Sensor HMI with mounting kit
	.
	A01 : Frame Sequence 7 (1200A FDRS)
	1200A Feeder Breaker - LV Instrument Panel (19") - 1200A Feeder Breaker
	Breaker A/B:
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"A"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for
1	2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector,
1	Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45
1	connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC
1	and 90-300 VDC, Output 24 VDC / 10 A
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Breaker D/E:
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports

Bill of Material(s)

1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for
1	2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector,
1	Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45
1	connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC
1	and 90-300 VDC, Output 24 VDC / 10 A
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Frames:
1	Shipping Base Assembly - Indoor, set per cubicle
1	A/R type 2 Base Frame, 2-high, 1.2 kAF Main or Feeder - std depth
1	A/R End Panel Assembly - standard depth
1	A/R Rear Panels, Split Bolted with handles
1	A/R type 2B Construction, per frame
2	Front Door Adder - SmartRack Assembly (Electric Racking)
1	A/R External Plenum Assembly, 36 in W, End Frame - 1200 A
1	Cable Support Assembly
1	Cable Support Assembly
1	Cable Lug Boot, 3-ph, 1200 A
1	Cable Lug Boot, 3-ph, 1200 A
1	Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
1	Strip Heater Circuit, Total 300 W applied at 1/2 V
1	Ground Cable Lugs, compression type, #4/0 AWG
1	Cable Lugs, compression type, 2-hole, set of (3), up to #4/0 AWG
1	Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM
	LV Instrument:
1	A/R type 2 Instrument Compartment - 19 in high, with MPL Door
3	Door Stop Assembly
1	DC Control Bus, 40 A 2-wire
1	AC Control Bus, 40 A 1ph 3-wire
2	Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
2	Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
1	Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
1	Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
1	20% Spare Terminal Blocks
1	Wired to Terminal Block, unused relay contacts
1	Wire Markers - SPECIAL

Bill of Material(s)		
	1	Breaker Control Switch, pistol, (1)C & (1)T
	1	Breaker Control Switch, pistol, (1)C & (1)T
	2	Indicating Lamp LED
	2	Indicating Lamp LED
	4	Test Switch, ABB FT-1, 10-pole
	2	PM8244 Intermediate Power Meter, DIN rail mount + remote display
	2	(PM8) Digital I/O Module - 6 digital inputs, 2 relay outputs
		# Note: All Devices for this frame that cannot be fit in the 19" Instrument
	1	Compartment Door will be mounted on the adjacent 38" or 57" Instrument
		Compartment Door.
	2	# P/N: 751001A1A0X0X85B200 (751#MHJB); SEL-751 Feeder Protection Relay
2	1	Medium Voltage Switchgear, Plenum, (A02)
		Marks: PLENUM
	6	A/R External Plenum Assembly, Straight Run, per foot
	1	A/R External Plenum Assembly, Wall Duct
3	1	Medium Voltage Switchgear, Accessories, (A03)
		Marks: ACCESSORIES
	1	Advac Breaker Accessory Kit
	1	CB Test Jumper, dual plug
	1	CB Test Station, dual plug, single trip, wall mounted (Advac, Amvac)
	1	Electric Racking Device, ABB SmartRack, 120V AC w/ 25ft cord
	1	Breaker Lift Truck - hydraulic operated (AD/SFG bolted or turn handle doors)
4	1	Medium Voltage Switchgear, Spare Parts, (A04)
		Marks: SPARE PARTS
	1	Lubricant, NO-OX-ID (1-pint can)
	3	Touch-Up Paint, 12 oz can, ANSI # 61 or ANSI # 70
	1	Test Plug, ABB type FT-1, current circuits
	1	Test Plug, ABB type FT-1, potential circuits
	12	Spare Indicating Lamp Assy w/ LED Bulb & color cap
	12	Spare Lamp Bulb, LED
	1	Spare Fuses, Breaker Control, 250V DC (box of 10)
	1	Spare PT Secondary Fuse, 250V AC (box of 10)
	6	Spare PT Primary Fuse, CLE-PT 8.25kV or 15kV
5	1	Medium Voltage Switchgear, Freight, (A05)
		Marks: FREIGHT
	1	INCO-Terms: CPT (Carriage Paid To) Destination: Switchgear is loaded onto truck and shipped to named destination. The offer does not include offloading of switchgear. Term: Carriage Paid To Place of Destination: Harrisburg, PA
6	2	5kV Drawout Breaker 2000A Close Couple to XFMR with PM8240 Meter
7	2	5kV Drawout Breaker 2000A Close Couple to LIS with PM8240 Meter
8	2	12.4kV Drawout Breaker 600A Close Couple to XFMR
9	1	Switchgear "MDS5" - (2) 2000 Drawout Main Breakers, (5) Fusible Branch Switches with Fuses- PM8214
10	1	Low Voltage Switchgear, Reliagear
		Marks: MTM1

Bill of Material(s)

5 Section(s), NEMA 1 Enclosure
3200 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 65 kA
Breaker Min Withstand Rating: 65 kA
Bus Bracing Rating: 65 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 152 in, Depth: 64.33 in, Weight: 13375 lbs

Main Breaker 1

2 E4.2S-A 3200 Ekip Hi-Touch LSIG
2 AUX 4Q 400 V E2.2...E6.2
2 YC E1.2..E6.2 110-120 V AC/DC
2 M E2.2...E6.2 100-130 V AC/DC
2 YO E1.2..E6.2 110-120 V AC/DC
2 UVR E1.2..E6.2 110-120 V AC/DC
2 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
2 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
2 Disabling Bluetooth
2 PLP Position padlock D=4/6/8mmE2.2..E6.2
2 None - Push Button Locking Options
2 MOC E2.2..E6.2
2 Breaker Compartment
2 Ekip Com Modbus RS-485 E1.2..E6.2
2 RELT
2 E4.2-A W Cradle UL
2 AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
2 RELT Switch

Tie Breaker 2

1 E4.2S-A 3200 Ekip Hi-Touch LSIG
1 AUX 4Q 400 V E2.2...E6.2
1 YC E1.2..E6.2 110-120 V AC/DC
1 M E2.2...E6.2 100-130 V AC/DC
1 YO E1.2..E6.2 110-120 V AC/DC
1 UVR E1.2..E6.2 110-120 V AC/DC
1 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1 Disabling Bluetooth
1 PLP Position padlock D=4/6/8mmE2.2..E6.2
1 None - Push Button Locking Options
1 MOC E2.2..E6.2
1 Breaker Compartment
1 Ekip Com Modbus RS-485 E1.2..E6.2
1 RELT
1 E4.2-A W Cradle UL
1 AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
1 RELT Switch

Feed Breaker 3

2 E4.2S-A 3200 Ekip Hi-Touch LSIG
2 AUX 4Q 400 V E2.2...E6.2
2 YC E1.2..E6.2 110-120 V AC/DC
2 M E2.2...E6.2 100-130 V AC/DC
2 YO E1.2..E6.2 110-120 V AC/DC
2 UVR E1.2..E6.2 110-120 V AC/DC
2 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
2 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
2 Disabling Bluetooth
2 PLP Position padlock D=4/6/8mmE2.2..E6.2
2 None - Push Button Locking Options
2 MOC E2.2..E6.2

Bill of Material(s)

2	Breaker Compartment
2	Ekip Com Modbus RS-485 E1.2..E6.2
2	RELT
2	E4.2-A W Cradle UL
2	None - AUP
2	RELT Switch
	Item Options
10	Wire Tags, Origin and/or Destination
3	Special #16 AWG SIS Control Wire
5	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
5	Shutters (3200A)
5	Bus Plating
5	Cable Supports
5	Rear Door Full Height, Bolted without Key
5	Rear Padlocking
2	Side Barrier Between Sections
5	Rail Padlock
1	UL Service Entrance Label/IL Isolation
1	Pull Box
5	Nameplate -
1	PRINT HOLDER
	Lineup
5	100% Neutral 30 in Stack
1	30 in 1-High Tie Breaker Stack
5	30 in Ground Bus 800A CU
5	Auxiliary Compartment (30 in W x 21 in H)
5	Auxiliary Compartment (30 in W x 42 in H)
5	Bus Construction -Bus Isolation/Insulation
1	GE Busway 30 in Aux Stack
1	GE Busway 30 in Aux Stack
1	GE Busway 30 in Aux Stack
1	GE Busway 30 in Aux Stack
1	Shipping Split
2	SPECTRA Riser 3200A-4W (F)
2	SPECTRA Riser 3200A-4W (R)
	Devices
1	10-Trip Selector Switch 4 POS
1	110V Remote Racker
12	288/120 Singe Phase PT
1	43-Auto/Manual Switch
2	ABB FT-1 Test Plug
6	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
3	Breaker Control Switch ATO
1	Breaker Lifting Spreader E2.2-E4.2
1	Breaker Portable Lift Truck
2	CPT 5KVA
1	CPT T/O Contactor
1	CPT T/O UV Relay
3	CT-3200/5A
12	CT-3200/5A
2	E4.2/E6.2 Neutral Sensor 1% Main/Tie
1	Ekip Programming Kit
1	Emax 2 racking handle E2.2-E6.2
4	Emax 2 Racking Plate
20	Fuse Block - 30A
2	Fuse Block-2P 30A
4	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
2	GE SPD TPHE277Y20SG w/Disc
11	IL-P9 LED (Std)

Bill of Material(s)

4 Infrared Viewport
1 Lifting Plate
1 MOXA-Serial to Ethernet
5 Pilot Light - Green
5 Pilot Light - Red
9 Relay- Aux-Light Duty 4NO
5 RELT Switch-Lighted
2 Schweitzer SEL-751 Relay
4 SCTB-4 pole
3 SP - PM 8214 Meter
1 SP - PM 8214 Meter
1 Spare Fuse Set-Control
1 Spare Fuse Set-Primary
1 Spare Fuse Set-Secondary
1 Spare IL-LED set
1 Spare Paint
2 THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil
1 Three Bkr Transfer (Relay)

11 1 Low Voltage Switchgear, Reliagear
Marks: MTM2 - OPEN

5 Section(s), NEMA 1 Enclosure
5000 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 100 kA
Breaker Min Withstand Rating: 85 kA
Bus Bracing Rating: 100 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 160 in, Depth: 71.33 in, Weight: 15344 lbs

Main Breaker 1

2 E6.2V-A 5000 Ekip Hi-Touch LSIG
2 AUX 4Q 400 V E2.2...E6.2
2 YC E1.2..E6.2 110-120 V AC/DC
2 M E2.2...E6.2 100-130 V AC/DC
2 YO E1.2..E6.2 110-120 V AC/DC
2 UVR E1.2..E6.2 110-120 V AC/DC
2 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
2 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
2 Disabling Bluetooth
2 PLP Position padlock D=4/6/8mmE2.2..E6.2
2 None - Push Button Locking Options
2 MOC E2.2..E6.2
2 Breaker Compartment
2 Ekip Com Modbus RS-485 E1.2..E6.2
2 RELT
2 E6.2-A W Cradle UL
2 AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
2 RELT Switch

Tie Breaker 2

1 E6.2V-A 5000 Ekip Hi-Touch LSIG
1 AUX 4Q 400 V E2.2...E6.2
1 YC E1.2..E6.2 110-120 V AC/DC
1 M E2.2...E6.2 100-130 V AC/DC
1 YO E1.2..E6.2 110-120 V AC/DC
1 UVR E1.2..E6.2 110-120 V AC/DC
1 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1 Disabling Bluetooth
1 PLP Position padlock D=4/6/8mmE2.2..E6.2

Bill of Material(s)

1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E6.2-A W Cradle UL
1	AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
1	RELT Switch
	Feed Breaker 3
4	E2.2V-A 1600 Ekip Hi-Touch LSIG
4	AUX 4Q 400 V E2.2...E6.2
4	YC E1.2..E6.2 110-120 V AC/DC
4	M E2.2...E6.2 100-130 V AC/DC
4	YO E1.2..E6.2 110-120 V AC/DC
4	UVR E1.2..E6.2 110-120 V AC/DC
4	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
4	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
4	Disabling Bluetooth
4	PLP Position padlock D=4/6/8mmE2.2..E6.2
4	None - Push Button Locking Options
4	MOC E2.2..E6.2
4	Breaker Compartment
4	Ekip Com Modbus RS-485 E1.2..E6.2
4	RELT
4	E2.2-A W Cradle UL
4	None - AUP
4	RELT Switch
	Feed Breaker 4
1	E2.2V-A 1600 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	YC E1.2..E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2..E6.2 110-120 V AC/DC
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E2.2-A W Cradle UL
1	None - AUP
1	RELT Switch
	Feed Breaker 5
1	E2.2V-A 800 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	YC E1.2..E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2..E6.2 110-120 V AC/DC
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E2.2-A W Cradle UL

Bill of Material(s)

1	None - AUP
1	RELT Switch
	Item Options
11	Wire Tags, Origin and/or Destination
9	Special #16 AWG SIS Control Wire
9	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
1	Shutters (800A)
5	Shutters (1600A)
3	Shutters (5000A)
5	Bus Plating
5	Cable Supports
5	Rear Door Full Height, Bolted without Key
5	Rear Padlocking
4	Side Barrier Between Sections
9	Rail Padlock
1	UL Service Entrance Label/IL Isolation
3	Pull Box
5	Nameplate -
	Lineup
2	100% Neutral 22 in Stack
3	100% Neutral 38 in Stack
1	22 in 3-High Feeder Stack
1	22 in 3-High Feeder Stack
2	22 in Ground Bus 800A CU
1	38 in 1-High Tie Breaker Stack
3	38 in Ground Bus 800A CU
2	45 in Cable Compartment (22 in Stks)
3	45 in Cable Compartment (38 in Stks)
2	Auxiliary Compartment (22 in W x 21 in H)
3	Auxiliary Compartment (38 in W x 14 in H)
3	Auxiliary Compartment (38 in W x 42 in H)
3	Auxiliary Compartment (38 in W x 7 in H)
5	Bus Bracing 100,000 Amps
5	Bus Construction -Bus Isolation/Insulation
1	GE Busway 38 in Aux Stack
1	GE Busway 38 in Aux Stack
2	Shipping Split
1	SPECTRA Riser 5000A-4W (F)
1	SPECTRA Riser 5000A-4W (R)
	Devices
1	110V Remote Racker
1	25-Sync Check Relay, Basler BE1
2	27 UV Relay, Basler (ES)
12	288/120 Singe Phase PT
1	43-Auto/Manual Switch
2	47-PHASE BALANCE RELAY (ES)
3	5000A Fan Package
2	ABB FT-1 Test Plug
6	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
3	Breaker Control Switch ATO
1	Breaker Lifting Spreader E2.2-E4.2
1	Breaker Lifting Spreader E6.2
1	Breaker Portable Lift Truck
2	CPT 5KVA
1	CPT T/O Contactor
1	CPT T/O UV Relay
15	CT-1600/5A
12	CT-5000/5A
3	CT-5000/5A
3	CT-800/5A

Bill of Material(s)

6	E2.2 Neutral Sensor 1% Feeder
1	Ekip Programming Kit
2	Emax 2 racking handle E2.2-E6.2
4	Emax 2 Racking Plate
36	Fuse Block - 30A
2	Fuse Block-2P 30A
4	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
11	IL-P9 LED (Std)
8	Infrared Viewport
2	Lifting Plate
1	MOXA-Serial to Ethernet
9	Pilot Light - Green
9	Pilot Light - Red
9	Relay- Aux-Light Duty 4NO
9	RELT Switch-Lighted
2	Schweitzer SEL-751 Relay
10	SCTB-4 pole
8	SP - PM 8214 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
2	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil
44	THOMAS&BETTS CRIMP TERM FOR CU Cable 500kcmil
1	Three Bkr Transfer (Relay)
2	Timer-TDDO, Agastat
2	Timer-TDPU, Agastat

12 1 Low Voltage Switchgear, Reliagear Marks: MAIN 1

3 Section(s), NEMA 1 Enclosure
5000 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 100 kA
Breaker Min Withstand Rating: 85 kA
Bus Bracing Rating: 100 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 83 in, Depth: 71.33 in, Weight: 6898 lbs

Main Breaker 1

1	E6.2V-A 5000 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2..E6.2
1	None - Closing Coil (YC) and Redundant Closing Coil (YC2)
1	None - Spring Charging Motor (M) and Ekip Com Actuator
1	None - Opening Coil (YO)
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply 110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and Disabling Bluetooth
1	PLP Position padlock D=4/6/8mm E2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E6.2-A W Cradle UL
1	None - AUP
1	RELT Switch

Bill of Material(s)

Feed Breaker 2

1	E2.2V-A 800 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	YC E1.2...E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2...E6.2 110-120 V AC/DC
1	UVR E1.2...E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E2.2-A W Cradle UL
1	None - AUP
1	RELT Switch

Item Options

7	Wire Tags, Origin and/or Destination
2	Special #16 AWG SIS Control Wire
2	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
1	Shutters (5000A)
1	Shutters (800A)
3	Bus Plating
2	Cable Supports
2	Rear Door Full Height, Bolted without Key
3	Rear Padlocking
1	Side Barrier Between Sections
2	Rail Padlock
1	Pull Box
3	Nameplate -

Lineup

2	100% Neutral 22 in Stack
1	100% Neutral 38 in Stack
1	22 in 1-High Feeder Stack
2	22 in Ground Bus 800A CU
1	38 in Ground Bus 800A CU
1	45 in Cable Compartment (22 in Stks)
1	45 in Cable Compartment (38 in Stks)
1	53 in Transition Rear Compt (22 in Stks)
1	Auxiliary Compartment (22 in W x 21 in H)
3	Auxiliary Compartment (22 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 14 in H)
1	Auxiliary Compartment (38 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 7 in H)
3	Bus Bracing 100,000 Amps
2	Bus Construction -Bus Isolation/Insulation
1	GE Busway 38 in Aux Stack
1	GE/EPO Transformer Transition
1	SPECTRA Riser 5000A-4W (R)

Devices

1	110V Remote Racker
3	288/120 Singe Phase PT
1	5000A Fan Package
2	ABB FT-1 Test Plug
6	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
1	Breaker Lifting Spreader E2.2-E4.2
1	Breaker Lifting Spreader E6.2

Bill of Material(s)

1	Breaker Portable Lift Truck
1	CPT 5KVA
4	CT-5000/5A
3	CT-5000/5A
3	CT-800/5A
1	E2.2 Neutral Sensor 1% Feeder
1	Ekip Programming Kit
2	Emax 2 racking handle E2.2-E6.2
2	Emax 2 Racking Plate
6	Fuse Block - 30A
1	Fuse Block-2P 30A
1	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
3	Infrared Viewport
2	Lifting Plate
1	MOXA-Serial to Ethernet
2	Pilot Light - Green
2	Pilot Light - Red
2	RELT Switch-Lighted
3	SCTB-4 pole
3	SP - PM 8214 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
1	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil
4	THOMAS&BETTS CRIMP TERM FOR CU Cable 500kcmil

13 1 Low Voltage Switchgear, Reliagear
Marks: MAIN 2

2 Section(s), NEMA 1 Enclosure
5000 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 100 kA
Breaker Min Withstand Rating: 85 kA
Bus Bracing Rating: 100 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 61 in, Depth: 71.33 in, Weight: 5283 lbs

Main Breaker 1

1	E6.2V-A 5000 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	None - Closing Coil (YC) and Redundant Closing Coil (YC2)
1	None - Spring Charging Motor (M) and Ekip Com Actuator
1	None - Opening Coil (YO)
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E6.2-A W Cradle UL
1	None - AUP
1	RELT Switch

Item Options

Bill of Material(s)

5	Wire Tags, Origin and/or Destination
1	Special #16 AWG SIS Control Wire
1	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
1	Shutters (5000A)
2	Bus Plating
1	Cable Supports
1	Rear Door Full Height, Bolted without Key
2	Rear Padlocking
	Side Barrier Between Sections
1	Rail Padlock
2	Nameplate -
	Lineup
1	100% Neutral 22 in Stack
1	100% Neutral 38 in Stack
1	22 in Ground Bus 800A CU
1	38 in Ground Bus 800A CU
1	45 in Cable Compartment (38 in Stks)
1	53 in Transition Rear Compt (22 in Stks)
2	Auxiliary Compartment (22 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 14 in H)
1	Auxiliary Compartment (38 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 7 in H)
2	Bus Bracing 100,000 Amps
1	Bus Construction -Bus Isolation/Insulation
1	GE Busway 38 in Aux Stack
1	GE/EPO Transformer Transition
1	SPECTRA Riser 5000A-4W (R)
	Devices
1	110V Remote Racker
3	288/120 Singe Phase PT
1	5000A Fan Package
1	ABB FT-1 Test Plug
1	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
1	Breaker Lifting Spreader E6.2
1	Breaker Portable Lift Truck
1	CPT 5KVA
1	CT-5000/5A
3	CT-5000/5A
1	Ekip Programming Kit
1	Emax 2 racking handle E2.2-E6.2
1	Emax 2 Racking Plate
2	Fuse Block - 30A
1	Fuse Block-2P 30A
1	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
2	Infrared Viewport
1	Lifting Plate
1	MOXA-Serial to Ethernet
1	Pilot Light - Green
1	Pilot Light - Red
1	RELT Switch-Lighted
2	SCTB-4 pole
1	SP - PM 8000 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
1	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil

Bill of Material(s)		
14	4	Battery System for LV Switchgear Marks: BATTERY SYSTEM
15	2	SEPS Secondary Substation Transformer, Vent Dry Marks: 3500 KVA VPI/3500 KVA/12470 HV/480Y LV/CU/80Deg
16	1	Power Panelboard, ReliaGear neXT Marks: MDP-NE 1 Section(s), Nema 1 Enclosure 600 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz Minimum Interrupt Rating: 35kA Fully Rated Incoming Feed: Bottom Surface Mounted UL67 Certified Height: 72 Inches; Width: 40 Inches; Depth: 11 Inches; Est. Weight: 531 lbs 1 600 Amps Main Breaker XT5NU360BBYN000XXX 1 TMA Horiz. XT5 (2) 2/0-500 mcm, No Feed Through Lugs Main Option Details 1 Silver Plated Copper Bus Heat Rated 1 100% Rated Neutral 1 CU Neutral, Mech (CU Cables) 1 NEMA 1 Enclosure Feeders 3 Breaker Device 20 Amps 3 Poles XT1SU3020AYD000XXX 3 TMF 3 (1) 10 - 2/0 AWG 1 Breaker Device 50 Amps 3 Poles XT1SU3050AYD000XXX 1 TMF 1 (1) 10 - 2/0 AWG 1 Breaker Device 125 Amps 3 Poles XT1SU3125AYD000XXX 1 TMF 1 (1) 10 - 2/0 AWG 1 Breaker Device 225 Amps 3 Poles XT4SU3225AYJ000XXX 1 TMF 1 (1) 4 AWG-300 MCM 8 Breaker Space Device 20 Amps 3 Poles XT1SU3020AYD000XXX 8 TMF 8 (1) 10 - 2/0 AWG Modifications 1 Door within Door 1 Nameplates (75C141109P109) 1 Key Lock 1 Ground: GDBG47CU 1 Interior Bus Stack: IN2406NN3H2 1 Neutral: NL12IONSTNDCU 1 Enclosure: ER7240B 1 Interior Frame: IF2440F 1 Door within Door Deadfront: DD4072AHFS 1 Door within Door Filler 1: DDFIL404509SF 1 Door within Door Filler 2: DDFIL404515SF 1 Door within Door Filler Support: DDSUP24 1 Surge Protection: RGPPSP277Y08T2 1 1X Filler & Blank: SR01BF 1 1X Blank only: SR01BB 1 5 XT1 Mtg Kit, Narrow: SR5XBR 1 5 XT1 Mtg Kit, Wide: SR5XBF 1 2 XT1 Mtg Kit, Wide: SR2XBF 1 1 XT1 Mtg Kit, Narrow: SR1XBR

Bill of Material(s)		
	8	XT1 Blank only: SRT1BB
	1	Lifting Bar: IL40F
	1	Circuit Directory Kit, Metal: RGRPCDKM
	1	Nameplates: 75C141109P109
	1	Disconnect for SPD: XT1SU3030AYD000XXX
	1	SPD Disc XT1 Mtg Kit: SR1XBR
	1	PPXT FA INT
	1	PPXT FA BOX
17	1	Lighting Panelboard, ReliaGear RQ Marks: LP-LH
		1 Section(s), Nema 1 Enclosure 400 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz Minimum Interrupt Rating: 22kA Fully Rated Incoming Feed: Bottom Surface Mounted 42 Circuits UL67 / CSA C22.2 No. 29 Certified cULus Certified Height: 64.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	400 Amps Main Lugs 1-lug/phase 1-cable/lug #4 -600 kcmil Or 1-lug/phase 2-cable/lug 1/0 -250 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	4	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	5	Breaker Device 30 Amps 1 Poles THHQB
	1	Breaker Device 30 Amps 3 Poles THHQB
	1	Breaker Device 20 Amps 3 Poles THHQB
	27	Breaker Device 20 Amps 1 Poles THHQB
	4	Breaker Space Device 20 Amps 1 Poles THHQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3424MBX AXT6B7
	1	Box: AB64B
	1	Front: AF64SDUM
18	1	Lighting Panelboard, ReliaGear RQ Marks: CP
		1 Section(s), Nema 1 Enclosure 225 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz Minimum Interrupt Rating: 10kA Fully Rated Incoming Feed: Bottom Surface Mounted 42 Circuits UL67 / CSA C22.2 No. 29 Certified cULus Certified Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	175 Amps Main Breaker A2A225 Al - 1-lug/phase 1-cable/lug 2/0 -300 kcmil Or Cu - 1-lug/phase 1-cable/lug #1 -250 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	4	Ground-Cu box bonded TGC2

Bill of Material(s)		
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	1	Breaker Device 100 Amps 3 Poles THQB
	39	Breaker Device 20 Amps 1 Poles THQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3422ABX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDUM
19	1	Lighting Panelboard, ReliaGear RQ
		Marks: LR
		1 Section(s), Nema 1 Enclosure
		400 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 22kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		60 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 82.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	300 Amps Main Breaker XT5N400
	1	TMA
		1-lug/phase 2-cable/lug 2/0 -500 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	5	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	10	Breaker Device 30 Amps 1 Poles THHQB
	1	Breaker Device 20 Amps 3 Poles THHQB
	47	Breaker Device 20 Amps 1 Poles THHQB
		Modifications
	1	Power Distribution Panel
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Quarter Turn Latch
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3604JBX AXT6B7
	1	Box: AB82B
	1	Front: AF82SDTUM
20	1	Lighting Panelboard, ReliaGear RQ
		Marks: CP-1
		1 Section(s), Nema 1 Enclosure
		250 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 10kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		24 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches

Bill of Material(s)		
	1	100 Amps Main Breaker XT4N250
	1	TMF
		1-lug/phase 1-cable/lug #4 -300 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	2	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	1	Breaker Device 40 Amps 2 Poles THQB
	1	Breaker Device 50 Amps 2 Poles THQB
	20	Breaker Device 20 Amps 1 Poles THQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3242JBX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDUM
21	1	Lighting Panelboard, ReliaGear RS
		Marks: V-1 RH
		1 Section(s), Nema 1 Enclosure
		225 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		48 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	225 Amps Main Lugs
		1-lug/phase 1-cable/lug #6 -350 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	4	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	10	Breaker Device 20 Amps 3 Poles TEYD
	4	Breaker Device 20 Amps 1 Poles TEYD
	14	Breaker Space Device 20 Amps 1 Poles TEYD
		Modifications
	1	Power Distribution Panel
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3482MBX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDLUM
22	1	Lighting Panelboard, ReliaGear RS
		Marks: V-1
		1 Section(s), Nema 1 Enclosure
		125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated

Bill of Material(s)

Incoming Feed: Bottom
Surface Mounted
12 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 31.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
1 125 Amps Main Breaker TEYD
1-lug/phase 1-cable/lug #14 -1/0
Main Option Details
1 Copper Bus Heat Rated
2 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
3 Breaker Device 20 Amps 3 Poles TEYD
1 Breaker Device 60 Amps 3 Poles TEYD
Modifications
1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Corbin Latch Bolt 15767
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3121BBX AXT6B7
1 Box: AB31B
1 Front: AF31SDLUM

23 1 Lighting Panelboard, ReliaGear RS
Marks: V1A

1 Section(s), Nema 1 Enclosure
125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 25kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
30 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 43.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
1 125 Amps Main Lugs
1-lug/phase 1-cable/lug #14 -2/0
Main Option Details
1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
4 Breaker Device 20 Amps 3 Poles TEYD
1 Breaker Device 20 Amps 2 Poles TEYD
16 Breaker Space Device 20 Amps 1 Poles TEYD
Modifications
1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Corbin Latch Bolt 15767
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3301MBX AXT6B7
1 Box: AB43B
1 Front: AF43SDLUM

24 1 Lighting Panelboard, ReliaGear RS
Marks: PP

Bill of Material(s)

1 Section(s), Nema 1 Enclosure
400 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 42kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
48 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 76.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
1 300 Amps Main Breaker XT5S400
1 TMA
1-lug/phase 2-cable/lug 2/0 -500 kcmil
Main Option Details
1 Copper Bus Heat Rated
4 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
3 Breaker Device 20 Amps 3 Poles TEYL
4 Breaker Device 40 Amps 3 Poles TEYL
6 Breaker Space Device 20 Amps 1 Poles TEYL
1 Breaker Device 60 Amps 3 Poles TEYL
14 Breaker Device 20 Amps 1 Poles TEYL
Modifications
1 Power Distribution Panel
1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Quarter Turn Latch
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3484KBX AXT6B7
1 Box: AB76B
1 Front: AF76SDTUM

25 1 Lighting Panelboard, ReliaGear RS
Marks: WELDER/PLASMA CUTTER

1 Section(s), Nema 1 Enclosure
400 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 35kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
30 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
1 400 Amps Main Lugs
1-lug/phase 1-cable/lug #4 -600 kcmil
Or 1-lug/phase 2-cable/lug 1/0 -250 kcmil
Main Option Details
1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
1 Breaker Device 20 Amps 3 Poles TEYH
2 Breaker Device 30 Amps 3 Poles TEYH
12 Breaker Space Device 20 Amps 1 Poles TEYH
1 Breaker Device 60 Amps 3 Poles TEYH
2 Breaker Device 50 Amps 3 Poles TEYH

Bill of Material(s)		
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3304MBX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDLUM
26	1	Lighting Panelboard, ReliaGear RQ
		Marks: N/E
		1 Section(s), Nema 1 Enclosure
		225 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 10kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		30 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 49.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	225 Amps Main Lugs
		1-lug/phase 1-cable/lug #6 -350 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	3	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	1	Breaker Device 25 Amps 2 Poles THQB
	1	Breaker Device 20 Amps 2 Poles THQB
	26	Breaker Device 20 Amps 1 Poles THQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3302MBX AXT6B7
	1	Box: AB49B
	1	Front: AF49SDUM
27	1	Lighting Panelboard, ReliaGear RS
		Marks: NE
		1 Section(s), Nema 1 Enclosure
		250 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		42 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 64.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	225 Amps Main Breaker XT4N250
	1	TMF
		1-lug/phase 1-cable/lug #4 -300 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	4	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral

Bill of Material(s)		
	1	NEMA 1 Enclosure
		Feeders
	2	Breaker Device 30 Amps 3 Poles TEYD
	2	Breaker Device 20 Amps 2 Poles TEYD
	4	Breaker Device 20 Amps 3 Poles TEYD
	1	Breaker Device 50 Amps 3 Poles TEYD
	2	Breaker Device 15 Amps 3 Poles TEYD
	1	Breaker Device 30 Amps 1 Poles TEYD
	10	Breaker Device 20 Amps 1 Poles TEYD
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3422KBX AXT6B7
	1	Box: AB64B
	1	Front: AF64SDLUM
28	1	Lighting Panelboard, ReliaGear RS
		Marks: NE2
		1 Section(s), Nema 1 Enclosure
		125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		24 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 37.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	50 Amps Main Breaker TEYD
		1-lug/phase 1-cable/lug #14 -1/0
		Main Option Details
	1	Copper Bus Heat Rated
	2	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	4	Breaker Device 20 Amps 3 Poles TEYD
	12	Breaker Device 20 Amps 1 Poles TEYD
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3241BBX AXT6B7
	1	Box: AB37B
	1	Front: AF37SDLUM
29	1	Lighting Panelboard, ReliaGear RQ
		Marks: RP
		1 Section(s), Nema 1 Enclosure
		125 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 22kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		30 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified

Bill of Material(s)

- Height: 43.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 100 Amps Main Breaker THHQB
1-lug/phase 1-cable/lug #14 -1/0
- Main Option Details**
- 1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 30 Breaker Device 20 Amps 1 Poles THHQB
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
1 Interior: AQF3301CBX AXT6B7
1 Box: AB43B
1 Front: AF43SDUM

30 1 Lighting Panelboard, ReliaGear RS
Marks: HP

- 1 Section(s), Nema 1 Enclosure
125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 35kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
30 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 43.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 100 Amps Main Breaker TEYH
1-lug/phase 1-cable/lug #14 -1/0
- Main Option Details**
- 1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 8 Breaker Device 20 Amps 3 Poles TEYH
6 Breaker Device 20 Amps 1 Poles TEYH
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Corbin Latch Bolt 15767
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3301BBX AXT6B7
1 Box: AB43B
1 Front: AF43SDLUM

31 1 Lighting Panelboard, ReliaGear RE
Marks: DC

- 1 Section(s), Nema 1 Enclosure
125 Amps, 3 Wire 125/250V DC, 50/60 Hz, 1 & 2 Pole
Minimum Interrupt Rating: 10kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
42 Circuits
UL67 / CSA C22.2 No. 29 Certified

Bill of Material(s)

- 1 cULus Certified
Height: 37.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
125 Amps Main Lugs
1-lug/phase 1-cable/lug #14 -2/0
Main Option Details
1 Copper Bus Heat Rated
4 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
20 Breaker Device 15 Amps 2 Poles TEYF
Modifications
1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Interior: AEF1421MBX AXB7
1 Box: AB37B
1 Front: AF37SDUM

32 1 Transformer, Copper, 9T10C1002G32
Marks: T-RP

- 1 3 Phase, 60 Hz, 30 kVA
Ambient Temperature : 40°C
Coil Material : Copper
Primary Voltage : 480, Primary Connection : Delta
Secondary Voltage : 208Y/120, Secondary Connection : Wye
Temperature Rise : 115
Energy Efficiency : DOE 2016 (Std)
Enclosure : NEMA 1/NEMA 2
Taps(Nominal) : 2 above 4 below 2.5%
Impedance (+/- 7.5%) : 3.7%
K Factor : K1
Sound Level : -3dB(42dB)
UL : Yes, cUL : No, CE : No,
Accessories :
1 9T18Y1072G10 Lug Kit included
1 9T18Y1071G11 Ground Bar Kit included
Factory Individualized Transformer Test Reports :
1 NEMA ST-20 Sound Level Test Report
IEEE std C57.12.91 Electrical Test Performance Report - Not Required

33 3 Switches and Disconnects, Heavy Duty Safety Switch, THN3366A1
Marks: VFD DISCONNECT

- 1 Suitable for use as Service Equipment
Heavy Duty 600 Amps
No Fuse 3 Poles 600VAC/250VDC
NEMA 1 (Indoor)
For Use Size With (2) 4-600* Copper or Size (2) 4-600* Aluminum wire
*600MCM restricted to side entry only
Height1: 49.39, Height2: 49.39, Width1: 23.65, Width2: 24.5, Depth1: 8.51, Depth2: 13.26, Weight: 107
Accessories:
1 TGL6 , Equipment Ground Kit, (3) #2-250MCM CU/AL
1 THAUX66DA , Aux Contact Kit-DPDT

34 1 Switches and Disconnects, Elevator Disconnect, ES6T48R1KGN1A
Marks: ELEVATOR CONTROL SW

- 1 Mersen Elevator Switch 30-100A N1
NEMA 1 Enclosure

Bill of Material(s)

60 A, 480 V ac Primary, 120 V ac Secondary Control Transformer
120 V ac Fire Safety Interface Relay
1 NO/NC Mechanical Interlock Auxiliary Contact
UL98, cULus 508 Listed
Dimensions and Weight (Estimated)
Height: 8.7 in, Width: 16.3 in, Length: 24.39 in
Gross Weight: 58 lb, Net Weight: 51 lb

Options

60 A (2/0-#14) Isolated Neutral Lug
Key to Test Switch
Green Pilot Light

Accessories

3 60 A, 600 V ac, Class J Time Delay, AJT60 Fuse

35 1 Busway, ReliaGear Series Busway
Marks: BUS MTM1-T1

Build America, Buy America (2 CFR Part 184) Compliant
176 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

1 ANSI - 61 Gray, Standard
1 Standard Warranty
176 Ft of Feeder Indoor (IP40)
12 Each 90 Degree Elbow Forming Charge
1 Each Expansion Section Forming Charge
1 Each Unfused Reducer / Phase Transposition Forming Charge
1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
1 Each Non ABB Switchboard Stub Forming Charge
10 Spring Hanger (Pair)

36 1 Busway, ReliaGear Series Busway
Marks: BUS MTM1-T2

Build America, Buy America (2 CFR Part 184) Compliant
181 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

1 ANSI - 61 Gray, Standard
1 Standard Warranty
181 Ft of Feeder Indoor (IP40)
12 Each 90 Degree Elbow Forming Charge
1 Each Expansion Section Forming Charge
1 Each Unfused Reducer / Phase Transposition Forming Charge
1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
1 Each Non ABB Switchboard Stub Forming Charge
10 Spring Hanger (Pair)

37 1 Busway, ReliaGear Series Busway

Bill of Material(s)

Marks: BUS MTM1-MDS1

Build America, Buy America (2 CFR Part 184) Compliant
151 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

- 1 ANSI - 61 Gray, Standard
- 1 Standard Warranty
- 151 Ft of Feeder Indoor (IP40)
- 11 Each 90 Degree Elbow Forming Charge
- 1 Each Expansion Section Forming Charge
- 1 Each Unfused Reducer / Phase Transposition Forming Charge
- 1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
- 1 Each Non ABB Switchboard Stub Forming Charge
- 10 Spring Hanger (Pair)

38 1 Busway, ReliaGear Series Busway**Marks: BUS MTM1-MDS2**

Build America, Buy America (2 CFR Part 184) Compliant
131 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

- 1 ANSI - 61 Gray, Standard
- 1 Standard Warranty
- 131 Ft of Feeder Indoor (IP40)
- 12 Each 90 Degree Elbow Forming Charge
- 1 Each Expansion Section Forming Charge
- 1 Each Unfused Reducer / Phase Transposition Forming Charge
- 1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
- 1 Each Non ABB Switchboard Stub Forming Charge
- 10 Spring Hanger (Pair)

39 1 Busway, ReliaGear Series Busway**Marks: BUS MTM2-T5**

Build America, Buy America (2 CFR Part 184) Compliant
222 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
5000 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 200 kA for 3 Cycles, 200 kA for 1 s, and 200 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

- 1 ANSI - 61 Gray, Standard
- 1 Standard Warranty

Bill of Material(s)		
		222 Ft of Feeder Indoor (IP40) 14 Each 90 Degree Elbow Forming Charge 1 Each Expansion Section Forming Charge 1 Each Unfused Reducer / Phase Transposition Forming Charge 2 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge 10 Spring Hanger (Pair)
40	1	Busway, ReliaGear Series Busway Marks: BUS MTM2-T6 Build America, Buy America (2 CFR Part 184) Compliant 212 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s) 5000 A, 3 Phase 4 Wire, 600 V Maximum, ac Short Circuit Withstand Ratings of 200 kA for 3 Cycles, 200 kA for 1 s, and 200 kA for 3 s Tin Plated Copper Bus 100% Rated Neutral 50% Rated Internal Ground ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA IBC-2021, UBC Zone 4 List of Materials 1 ANSI - 61 Gray, Standard 1 Standard Warranty 212 Ft of Feeder Indoor (IP40) 14 Each 90 Degree Elbow Forming Charge 1 Each Expansion Section Forming Charge 1 Each Unfused Reducer / Phase Transposition Forming Charge 2 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge 10 Spring Hanger (Pair)
41	1	SEPS Bus Duct Marks: 4160V 2000A NSB RUN1 Non-Segregated/5KV/2000Amps
42	1	SEPS Bus Duct Marks: 4160V 2000A NSB RUN2 Non-Segregated/5KV/2000Amps
43	1	Power Study - Base Study
44	1	Power Study - Load Flow Study Adder
45	1	Power Study - Harmonic Study Adder
46	1	Startup Assistance - SWGR and SWBD's
47	1	Temporary Equipment
48	1	Temporary 4160V-480V 1500kva XFMR
49	1	Switchboard, ReliaGear Configured, RG-GM-CBSB-CTO Marks: TEMP SWBD 3 Section(s) Service Entrance Estimated Shipping Weight:2794 lbs

Bill of Material(s)	
1	Service Entrance Labeling 3P4W/480/277V/60Hz 2000A 65 kAIC Fully Rated Incoming Feed: Bottom Incoming Left Feeding Right Type 3R (non-walk-in) Enclosure Front/Rear Lineup Front Only Access Full Height Panel Bus Option
2	Hinged Wire Gutter Cover Configured Switchboard
1	ReliaGear Switchboard Lineup Estimated total factory connected wiring points for the lineup 28
1	Certified Test Reports requested (Per Lineup Item)
1	Evolution Main Section 30W 35D 90H (Est.) lbs 642
1	Group Mounted Feeder ReliaGear Panel Section 40W 35D 90H (Est.) lbs 1082
1	Group Mounted Feeder ReliaGear Panel Section 40W 35D 90H (Est.) lbs 1070
3	Bus Bracing 65000 AIC
3	Evolution - Fully Rated Aluminum Bus 750 A/Sq. in.
3	Ground: Equipment U/L With Lugs
1	Full Height Side Barriers
	Main Breaker
1	2000A 3 Pole E2.2SF 100% Rated (2000A Frame) Indiv. Mtd. Main Manually Operated MAIN Programmer(EKIP Touch) LSIG
1	RELT
1	RELT-EKIP SIGNALLING 2K3
1	(4Q) AUXILIARY CONTACTS - 400V
1	(S51/2) Bell Alarm - 250V
1	PADLOCK IN OPEN POSITION
1	DC SUPPLY - 24V - 48V
16	Mechanical (2 Hole) AL Line Lugs
	Feeders
3	700A 3 Pole XT6H800 (0A Frame)
3	Manually Operated Programmer (EKIP DIP) LSI
9	Mechanical AL Load Lugs
7	500A 3 Pole XT5H600 (600A Frame)
7	Manually Operated Programmer (EKIP DIP) LSI
14	Mechanical AL Load Lugs
3	450A 3 Pole XT5H600 (600A Frame)
3	Manually Operated Programmer (EKIP DIP) LSI
6	Mechanical AL Load Lugs
	Monitoring/Control Devices
1	Power Supply Plate
	Others
14	Engraved Nameplates
14	Screw-On Nameplates
	Others
1	Lifting Brackets
2	Reliagear (C/B feeders only) 40X Bus Stack
29	Neutral Lugs
1	Bonding Jumper
37	Equipment Ground Lugs
1	Ground Lug

50 3 Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR
Marks: 450A FUSIBLE DISC

1 Suitable for use as Service Equipment

Bill of Material(s)		
		Heavy Duty 600 Amps Fusible 3 Poles 600VAC/250VDC NEMA 3R (Outdoor) For Use Size With (2) 4-600* Copper or Size (2) 4-600* Aluminum wire *600MCM restricted to side entry only Height1: 54.49, Height2: 54.49, Width1: 23.65, Width2: 24.5, Depth1: 9.35, Depth2: 13.26, Weight: 117 Switch is NEC 2020 Article 230.62 compliant for service equipment barriers. Accessories: 1 TGL6 , Equipment Ground Kit, (3) #2-250MCM CU/AL 1 TRK66A , Class R Fuse Kit 3 A6D450R, 450 Amps, RK1 - Time Delay
51	5	Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR Marks: 500A FUSIBLE DISC 1 Suitable for use as Service Equipment Heavy Duty 600 Amps Fusible 3 Poles 600VAC/250VDC NEMA 3R (Outdoor) For Use Size With (2) 4-600* Copper or Size (2) 4-600* Aluminum wire *600MCM restricted to side entry only Height1: 54.49, Height2: 54.49, Width1: 23.65, Width2: 24.5, Depth1: 9.35, Depth2: 13.26, Weight: 117 Switch is NEC 2020 Article 230.62 compliant for service equipment barriers. Accessories: 1 TGL6 , Equipment Ground Kit, (3) #2-250MCM CU/AL 1 TRK66A , Class R Fuse Kit 3 A6D500R, 500 Amps, RK1 - Time Delay
52	3	Switches and Disconnects, Heavy Duty Safety Switch, TC72367R Marks: 650A FUSIBLE DISC 1 Suitable for use as Service Equipment Heavy Duty 800 Amps Fusible 3 Poles 600VAC NEMA 3R (Outdoor) For Use Size With (6) 1/0-250 or (3) 2-600 Copper or Size (6) 1/0-250 or (3) 2-600 Aluminum wire Height1: 61.64, Height2: 65.35, Width1: 41.99, Width2: 44.19, Depth1: 11.92, Depth2: 17.71, Weight: 480 Switch is NEC 2017 compliant for service equipment. To make this switch compliant with NEC 2020 Article 230.62 for service equipment barriers, install kit THSHLD8 Accessories: Standard Fuse Clips Supplied 3 A4BY650, 650 Amps, L - Current Limiting Time Delay
53	1	Load Interrupter Switch, VersaRupter Marks: TEMP CHILLER DISC 1 Single Configuration, 1 Section(s), Indoor Enclosure 1200 A Bus, 3 Phase 3 Wire, 5 kV, 60 kV BIL, 50/60 Hz with solidly grounding system 61 kA Momentary, 61 kA Fault Closing, Silver Plated Contacts, Copper-Silver Bus Front and Rear Access Required IEEE C37.20.3 , ANSI C37.57 , IEEE C37.20.4, ANSI C37.58 , CSA C22.2 No. 31, CSA C22.2 No. 193 1 Certified Test Reports Enclosure Paint: ANSI-61 (Light Gray) tested to minimum withstand of 600 hour humidity and salt spray test Dimensions And Weight (Estimated) Section 1 - Single Switch: Width = 35 in; Height = 90 in; Depth = 60 in, Weight = 1200 lb

Bill of Material(s)

Options

- 1 UL Label
- 1 60 in Depth
- 1 Bus Boots
- 1 Fully Insulated Bus
- 1 Horizontal Barrier
- 2 Metal Screen Barriers
- 1 Front and Rear Door Pad Locks
- 1 Rear Door
- 1 Non-Removable Handle
- 1 Full Vertical Barrier

Single Switch

- 1 1200 A Switch Stand Alone, No Transition
- 1 Distribution Class Arrester, 9L20FXX006XHS
- 1 Top Entry, (1) 300 kcmil per Phase, NEMA Drill Only, Without Loop
- 1 Bottom Exit, (1) 300 kcmil per Phase, NEMA Drill Only

Fuses

- 1 Current Limiting Fuse Model, 9F62FCB300
 - 1 Set of 3 Spare Fuses
- Note: Fuses/Spare Fuses could be split from the order for shipment and invoice by separate.
- 1 Double Barrel Fuse Clips
 - 1 Ground Studs, Line Side
 - 1 Run Back Bus

TERMS AND CONDITIONS OF SALE

General Policies and Conditions

1. This Proposal is offered subject to the following: 1) attached TERMS AND CONDITIONS OF SALE, 2) an executed Master Supply Agreement ("MSA"), and 3) ABB Inc.'s current general Terms and Condition of Sale. Any conflict among the documents comprising the terms of this Proposal shall be resolved in accordance with the following order of precedence: (i) an executed MSA incorporating the following Terms and Conditions of Sale (ii) attached TERMS AND CONDITIONS OF SALE incorporating ABB Inc. General Terms and Conditions of Sale (iii) or ABB Inc. General Terms and Conditions of Sale. Non-ABB preprinted PO terms have no force and/or effect and are hereby rejected by ABB.
2. All quoted or agreed prices are subject to revision at any time in the event of: (i) a material increase in component, raw material, or energy costs; or (ii) governmental action such as new or increased tariffs.
3. Buyer represents and warrants that there are no federal, state, or local (collectively "Governmental") contracting provisions, regulations, flow-downs, or requirements that apply to this transaction, including without limitation any Governmental domestic preference or prevailing wage, other than such terms that have been disclosed and agreed to by Seller in writing. Buyer assumes sole responsibility for any costs associated with non-compliance of terms not agreed by Seller in writing. Unless expressly provided in writing, Seller makes no representation that the quoted product(s) or service(s) comply with any Governmental contracting provisions and regulations.
4. This proposal expires in 30 calendar days, unless terminated sooner by notice. This proposal is not inclusive of taxes of any kind, unless explicitly stated.
5. Orders not requiring engineered drawings for approval must be released by Buyer for manufacture within 90 days of PO receipt. If engineered drawings are required, they must be returned and approved by Buyer for release within 60 days of mailing. If not, and/or shipment is delayed for any reason the price will increase by 1.5% for each partial/full month that shipment release is delayed after the 90-day period. If project is delayed 6 months or more after PO receipt, project will be repriced based off current market values.
6. For MV Transformers (including Padmount, Substation, & Power transformers), refer to the factory proposal for applicable terms and conditions including, but not limited to quote validity, price validity, escalation, warranty, cancellation, estimated delivery, and freight terms.

Payment Terms

1. Net 30 days from the date of invoice
2. For projects up to \$1,000,000 net, terms of payment are 100% upon invoicing.
3. If project value exceeds \$1,000,000 net, progress payments are required payable at the following milestones. These milestones will be applied at a line-item level and will be tailored to the project schedule.
 - 20% upon delivery of drawings
 - 30% upon release of equipment
 - 50% upon shipment

Warranty

1. The warranty for Products shall expire one (1) year from date of installation or eighteen (18) months after date of shipment, whichever occurs first, except that software is warranted for ninety (90) days from delivery. The warranty for Services shall expire one (1) year after performance of the Service, except that software related Services are warranted for ninety (90) days.
2. Additional 12 months available for 2% adder, 24 months for 4% adder. Engage ABB representative if longer durations are needed.
3. All warranty claim remedies are provided under the General Terms and Conditions of Sale, or any applicable MSA, whichever is applicable between the parties.

Order Cancellation – Schedule of Charges

1. 10% - Order received.
2. 30% - Drawings for approval submitted, if required.
3. 50% - Revisions to approval drawings submitted, if required.
4. 80% - Order released for manufacturing and shipment.
5. 100% - Production started.

Delivery and Transportation

1. CPT/FCA ABB's facility, place of manufacture or warehouse (Incoterms 2020). Title and risk of loss passes upon shipment.
2. ABB will assume the risk of loss or damage to the destination for a 2% adder (but not less than \$500 net) applied to the total price of the equipment. "Destination" is defined as ABB's common carrier's delivery point nearest first destination or point of export within the continental U.S.
3. Transportation and handling are prepaid and billed, unless otherwise noted in this quotation or MSA.
4. Shipment via Air or Open Top/Flatbed/Lift gate truck not included unless specifically listed herein.
5. Special Instruction - The Receiving Associate is required to sign, date, and note specific visible or concealed damage on Bill of Lading at time of delivery. Freight Company Associate is required to witness Receiver's signature, date, and damage claim annotations. ABB's Post Sales Service Department must be provided with copy of annotated BOL within five (5) days of delivery or Shipper's responsibility ends.

Other Notes

1. Standard factory test procedures will be performed. Customer inspections, customer witness tests, and any other non-standard test procedures are not included unless specifically noted herein.
2. The accompanying Bill of Material is our interpretation of what is required to meet the intent of the listed Drawings and Specifications. Please review thoroughly for accuracy and completeness and advise immediately if any revisions are required. This proposal is limited to the attached Bill of Material only. Selective coordination of the system should be verified by a qualified engineer and may require changes to the design, Bill of Material, and price.
3. The Parties are aware of the shortage of raw materials, electronic components worldwide which is likely to last for the foreseeable future, as well as, of market fluctuations in the availability and cost of other raw materials, commodities, other critical components, and transportation capacities. Notwithstanding anything to the contrary in the contract terms and conditions / purchase order, if after the date of ABB's proposal / offer or during the term of the performance of the contract / purchase order there are any changes to availability and / or market conditions for electronic components, raw materials, commodities, and transportation capabilities directly or indirectly affecting ABB's performance, ABB shall be entitled to relief in the schedule of the performance or delivery of the directly or indirectly affected scope of work under the contract / purchase order. In such circumstances, the Parties shall meet without delay and discuss in good faith to find a mutually agreeable solution, with equitable adjustment to the contract / purchase order date of delivery or completion. Customer hereby acknowledges and agrees that in said circumstances ABB may not be able to comply with the originally agreed delivery or completion schedule and that ABB shall not be liable for any liquidated or actual damages in connection thereto.

ABB INC. GENERAL TERMS AND CONDITIONS OF SALE

(2025-02 U.S.)

1. General.

The terms and conditions contained herein, together with any additional or different terms contained or referenced in ABB's proposal or, quotation and ("Proposal"), any addenda to the Proposal, the purchase order (excluding any pre-printed terms and conditions and any terms that conflict with the Proposal or ABB's acknowledgment), and ABB's acknowledgement, submitted to Purchaser constitute the entire agreement (the "Agreement") between the parties with respect to the purchase order and supersede all other prior communications and agreements regarding the purchase order and ABB objects to any additional terms proposed by Purchaser. Acceptance by ABB of the purchase order, or Purchaser's acceptance of ABB's Proposal, is expressly limited to and conditioned upon Purchaser's acceptance of these terms and conditions, payment for or acceptance of any performance by ABB being acceptance. "Equipment" as used herein means all the equipment, parts, accessories sold, and all software and software documentation, if any, licensed to Purchaser by ABB ("Software") under the purchase order. "Services" as used herein means all labor, supervisory, technical and engineering, installation, repair, consulting or other services provided by ABB under the purchase order. "Purchaser" shall include the initial end user of the Equipment and/or services; provided, however, that Article 14(a) shall apply exclusively to the initial end user. "Hazardous Materials" means any toxic or hazardous substance, hazardous material, dangerous or hazardous waste, dangerous good, radioactive material, petroleum or petroleum-derived products or by-products, or any other chemical, substance, material or emission, that is regulated, listed or controlled pursuant to any national, state, provincial, or local law, statute, ordinance, directive, regulation or other legal requirement of the United States ("U.S.") or the country of the Site.

2. Prices.

(a) Unless otherwise specified in writing, all Proposals expire thirty (30) days from the date thereof and may be modified or withdrawn by ABB before receipt of Purchaser's conforming acceptance. All prices set forth in a purchase order may be revised by ABB at any time prior to delivery or performance based on ABB's sole but reasonable estimate of its cost increases (after the Proposal date) resulting directly or indirectly from factors such as: (i) a significant increase in raw material, component, labor, or energy costs or (ii) governmental actions, such as increased tariffs on the Equipment, raw material, or components.

(b) Unless otherwise stated herein, Services prices are based on normal business hours (8 a.m. to 5 p.m. Monday through Friday). Overtime and Saturday hours will be billed at one and one-half (1 1/2) times the hourly rate; and Sunday hours will be billed at two (2) times the hourly rate; holiday hours will be billed at three (3) times the hourly rate. If a Services rate sheet is attached hereto, the applicable Services rates shall be those set forth in the rate sheet. Rates are subject to change without notice.

(c) Except as otherwise agreed by ABB, the price does not include any federal, state or local property, license, privilege, sales, use, excise, gross receipts, tariffs or other like taxes ("Taxes") which may now or hereafter be applicable. Purchaser agrees to pay or reimburse any such Taxes, or ABB's reasonable estimated cost impact thereof, which ABB or its suppliers are required to pay or collect. If Purchaser is exempt from the payment of any Tax or holds a direct payment permit, Purchaser shall, upon purchase order placement, provide ABB a copy, acceptable to the relevant governmental authorities of any such certificate or permit.

3. Payment.

(a) Unless specified to the contrary in writing by ABB, payment terms are net cash, payable without offset, in United States Dollars, 30 days from date of invoice by wire transfer to the account designated by ABB in the Proposal. ABB is not required to commence or continue its performance unless and until invoiced payments have been received in a timely fashion. For each day of delay in receiving required payments, ABB shall be entitled to a matching extension of the schedule.

(b) If in the judgment of ABB, the financial condition of Purchaser at any time prior to delivery does not justify the terms of payment specified, ABB may require payment in advance, payment security satisfactory to ABB and suspend its performance until said advance payment or payment security is received or may terminate the purchase order, whereupon ABB shall be entitled to receive reasonable cancellation charges. If delivery is delayed by Purchaser, payment shall be due on the date ABB is prepared to make delivery. Delays in delivery or nonconformities in any installments delivered shall not relieve Purchaser of its obligation to accept and pay for remaining installments.

(c) Purchaser shall pay, in addition to the overdue payment, a late charge equal to the lesser of 1 1/2% per month or any part thereof or the highest applicable rate allowed by law on all such overdue amounts plus ABB's attorneys' fees and court costs incurred in connection with collection. If Purchaser fails to make payment of any amounts due under any purchase order and fails to cure such default within ten (10) days after receiving written notice specifying such default, then ABB may by written notice, at its option, suspend its performance under the purchase order until such time as the full balance is paid or terminate the purchase order, as of a date specified in such notice. In the event of suspension, cancellation or termination hereunder, ABB will be entitled to recover all costs for work performed to date, costs associated with suspension, cancellation or termination of the work and all other costs recoverable at law.

4. Changes.

(a) Any changes requested by Purchaser affecting the ordered scope of work must first be reviewed by ABB and any resulting adjustments to affected provisions, including price, schedule, and guarantees mutually agreed in writing prior to implementation of the change.

(b) ABB may, at its expense, make any changes in the Equipment or Services as it deems necessary, in its sole discretion, to conform the Equipment or Services to the applicable specifications (including but not limited to technical, standards, codes, performance, schedule, location or performance, plus applicable laws and regulations). If Purchaser objects to any such changes, ABB shall be relieved of its obligation to conform to the applicable specifications to the extent that conformance may be affected by such objection. ABB will not be obligated to meet specifications if not provided by Purchaser in the scope of work.

5. Delivery.

(a) All Equipment manufactured, assembled or warehoused in the continental United States is delivered FCA ABB point of shipment, Incoterms® 2020 unless otherwise mutually agreed in writing. Equipment shipped outside the continental United States is delivered FCA Incoterms® 2020 United States port of export unless otherwise mutually agreed in writing. Purchaser shall be responsible for any and all demurrage or detention charges.

(b) If the scheduled delivery of Equipment is delayed by Purchaser or by Force Majeure, ABB may move the Equipment to storage for the account of and at the risk of Purchaser whereupon it shall be deemed to be delivered.

(c) Shipping and delivery dates are contingent upon Purchaser's timely approvals and delivery by Purchaser of any documentation required for ABB's performance hereunder.

(d) Claims for shortages or other errors in delivery must be made in writing to ABB within ten (10) days of delivery. Equipment may not be returned except with the prior written consent of and subject to terms specified by ABB. Claims for damage after delivery shall be made directly by Purchaser with the common carrier.

6. Title & Risk of Loss.

Except with respect to Software (for which title shall not pass, use being licensed) title to Equipment shall transfer to Purchaser upon delivery according to the applicable freight term. Notwithstanding any agreement with respect to delivery terms or payment of transportation charges, risk of loss or damage with respect to the sale of Equipment shall pass from ABB to Purchaser at delivery as defined in this Agreement.

7. Inspection, Testing and Acceptance.

(a) Any inspection by Purchaser of Equipment on ABB's premises shall be scheduled in advance to be performed during normal working hours and subject to rules and regulations in place at the ABB premises.

(b) If the purchase order provides for factory acceptance testing, ABB shall notify Purchaser when ABB will conduct such testing prior to shipment. Unless Purchaser states specific objections in writing within ten (10) days after completion of factory acceptance testing, completion of the acceptance test constitutes Purchaser's factory acceptance of the Equipment and its authorization for shipment.

(c) If the purchase order provides for site acceptance testing, testing will be performed by ABB personnel to verify that the Equipment has arrived at site complete, without physical damage, and in good operating condition. Completion of site acceptance testing constitutes full and final acceptance of the Equipment. If, through no fault of ABB, acceptance testing is not completed within thirty (30) days after arrival of the Equipment at the site, the site acceptance test shall be deemed completed and the Equipment shall be deemed accepted.

8. Warranties and Remedies.

(a) Equipment and Services Warranty. ABB warrants that Equipment (excluding Software, which is warranted as specified in paragraph (d) below) shall be delivered free of defects in material and workmanship and that

Services shall be free of defects in workmanship. The Warranty Remedy Period for Equipment (excluding Software and spare parts) shall end twelve (12) months after installation or eighteen (18) months after date of shipment, whichever first occurs. The Warranty Remedy Period for new spare parts shall end twelve (12) months after date of shipment. If the purchase order includes the sale of refurbished or repaired parts, the Warranty Remedy Period for such parts shall end ninety (90) days after date of shipment. The Warranty Remedy Period for Services shall end ninety (90) days after the date of completion of Services.

(b) Equipment and Services Remedy. If a nonconformity to the foregoing warranty is discovered in the Equipment or Services during the applicable Warranty Remedy Period, as specified above, under normal and proper use and provided the Equipment has been properly stored, installed, operated and maintained and written notice of such nonconformity is provided to ABB promptly after such discovery and within the applicable Warranty Remedy Period, ABB shall, at its option, either (i) repair or replace the nonconforming portion of the Equipment or re-perform the nonconforming Services or (ii) refund the portion of the price applicable to the nonconforming portion of Equipment or Services. If any portion of the Equipment or Services so repaired, replaced or re-performed fails to conform to the foregoing warranty, and written notice of such nonconformity is provided to ABB promptly after discovery and within the original Warranty Remedy Period applicable to such Equipment or Services or thirty (30) days from completion of such repair, replacement or re-performance, whichever is later, ABB will repair or replace such nonconforming Equipment or re-perform the nonconforming Services. The original Warranty Remedy Period shall not otherwise be extended.

(c) Exceptions. ABB shall not be responsible for providing temporary power, removal, installation, reimbursement for labor costs or working access to the nonconforming Equipment, including disassembly and re-assembly of non-ABB supplied equipment, or for providing transportation to or from any repair facility, or for any other expenses incurred in connection with the repair or replacement, all of which shall be at Purchaser's risk and expense. ABB shall have no obligation hereunder with respect to any Equipment which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to ABB's instructions; (iv) is comprised of materials provided by or a design specified by Purchaser; or (v) has failed as a result of ordinary wear and tear. Equipment supplied by ABB but manufactured by others is warranted only to the extent of the manufacturer's warranty, and only the remedies, if any, provided by the manufacturer will be allowed.

(d) Software Warranty and Remedies. ABB warrants that, except as specified below, the Software will, when properly installed, execute in accordance with ABB's published specification. If a nonconformity to the foregoing warranty is discovered during the period ending one (1) year after the date of shipment and written notice of such nonconformity is provided to ABB promptly after such discovery and within that period, including a description of the nonconformity and complete information about the manner of its discovery, ABB shall correct the nonconformity by, at its option, either (i) modifying or making available to the Purchaser instructions for modifying the Software; or (ii) making available at ABB's facility necessary corrected or replacement programs. ABB shall have no obligation with respect to any nonconformities resulting from (i) unauthorized modification of the Software or (ii) Purchaser-supplied software or interfacing. ABB does not warrant that the functions contained in the software will operate in combinations which may be selected for use by the Purchaser, or that the software products are free from errors in the nature of what is commonly categorized by the computer industry as "bugs".

(e) THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE, WHETHER WRITTEN, ORAL OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USAGE OF TRADE ARE HEREBY DISCLAIMED. THE REMEDIES STATED HEREIN CONSTITUTE PURCHASER'S EXCLUSIVE REMEDIES AND ABB'S ENTIRE LIABILITY FOR ANY BREACH OF WARRANTY.

9. Intellectual Property Infringement.

(a) ABB shall defend at its own expense any action brought against Purchaser alleging that the Equipment or the use of the Equipment to practice any process for which such Equipment is specified by ABB ("a Process") directly infringes a patent in effect in the United States, an European Union member state or the country of the Site (provided there is a corresponding patent issued by the U.S., UK or an EU member state), or any

copyright or trademark registered in the country of the Site and to pay all damages and costs finally awarded in any such action, provided that Purchaser has given ABB prompt written notice of such action, all necessary assistance in the defense thereof and the right to control all aspects of the defense thereof including the right to settle or otherwise terminate such action in behalf of Purchaser.

(b) ABB shall have no obligation hereunder and this provision shall not apply to: (i) any other equipment or processes, including Equipment or Processes which have been modified or combined with other equipment or process not supplied by ABB; (ii) any Equipment or Process supplied according to a design, other than an ABB design, required by Purchaser; (iii) any products manufactured by the Equipment or Process; (iv) any use of the Equipment or Process contrary to ABB instructions; (v) any patent issued after the date hereof; or (vi) any action settled or otherwise terminated without the prior written consent of ABB.

(c) If, in any such action, the Equipment is held to constitute an infringement, or the practice of any Process using the Equipment is finally enjoined, ABB shall, at its option and its own expense, procure for Purchaser the right to continue using said Equipment; or modify or replace it with non-infringing equipment or, with Purchaser's assistance, modify the Process so that it becomes non-infringing; or remove it and refund the portion of the price allocable to the infringing Equipment. THE FOREGOING PARAGRAPHS STATE THE EXCLUSIVE LIABILITY OF ABB AND EQUIPMENT MANUFACTURER FOR ANY INTELLECTUAL PROPERTY INFRINGEMENT.

(d) To the extent that said Equipment or any part thereof is modified by Purchaser, or combined by Purchaser with equipment or processes not furnished hereunder (except to the extent that ABB is a contributory infringer) or said Equipment or any part thereof is used by Purchaser to perform a process not furnished hereunder by ABB or to produce an article, and by reason of said modification, combination, performance or production, an action is brought against ABB, Purchaser shall defend and indemnify ABB in the same manner and to the same extent that ABB would be obligated to indemnify Purchaser under this "Intellectual Property Indemnification" provision.

10. Waiver of Consequential Damages.

In no event shall ABB, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, whether in contract, warranty, tort, negligence, strict liability or otherwise, including, but not limited to, loss of profits or revenue, loss of data, loss of use, loss of use of any of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, delays, and claims of customers of the Purchaser or other third parties for any damages.

11. Limitation of Liability.

(a) ABB's aggregate liability for all claims whether in contract, warranty, tort, negligence, strict liability, or otherwise for any loss or damage arising out of, connected with, or resulting from this Agreement or the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, repair, replacement, installation, technical direction of installation, inspection, operation or use of any equipment covered by or furnished under this Agreement, or from any services rendered in connection therewith, shall in no case (except as provided in the section entitled "Intellectual Property Indemnification") exceed the purchase order price.

(b) All causes of action against ABB arising out of or relating to this Agreement or the performance or breach hereof shall expire unless brought within one (1) year of the time of accrual thereof.

(c) In no event, regardless of cause, shall ABB be liable for penalties or penalty clauses of any description or for indemnification of Purchaser or others for costs, damages, or expenses arising out of or related to the Equipment and/Services.

(d) The rights and remedies of the parties contained under these terms and conditions shall be sole and exclusive.

12. Laws and Regulations.

ABB does not assume any responsibility for compliance with federal, state or local laws and regulations, except as expressly set forth in this Agreement, and compliance with any laws and regulations related to Purchaser's duties, obligations, and business practices including the application, operation, or use and disposal of the Equipment Services or Software is the sole responsibility of the Purchaser. All laws and regulations referenced in this Agreement shall be those in effect as of the original Proposal date. In the event of any subsequent revisions or changes thereto, ABB assumes no responsibility for compliance therewith. If Purchaser desires a modification as a result of any such change or revision, it shall be treated as a change per Article 4. Nothing contained herein shall be construed as imposing responsibility or liability upon ABB for obtaining any permits, licenses or approvals from any agency required in connection with the supply, erection or operation of the Equipment. This Agreement shall in all respects be governed by, and construed, interpreted and enforced in accordance with the laws of the State of New York, USA, excluding its conflicts of laws rules and the provisions of the United Nations Convention on Contracts for the International Sale of Goods, and both parties hereby agree that any litigation concerning, arising out of, or related to this Agreement, whether claims are based on contract, tort, equity or otherwise, shall be conducted only in the state or federal courts functioning in the State of New York, New York County and waive the defense of an inconvenient forum in respect to any such litigation. If any provision hereof, partly or completely, shall be held invalid or unenforceable, such invalidity or unenforceability shall not affect any other provision or portion hereof and these terms shall be construed as if such invalid or unenforceable provision or portion thereof had never existed.

13. OSHA.

ABB warrants that the Equipment will comply with the relevant standards of the Occupational Safety and Health Act of 1970 ("OSHA") and the regulations promulgated thereunder as of the date of the Proposal. Upon prompt written notice from the Purchaser of a breach of this warranty, ABB will replace the affected part or modify it so that it conforms to such standard or regulation. ABB's obligation shall be limited to such replacement or modification. In no event shall ABB be responsible for liability arising out of the violation of any OSHA standards relating to or caused by Purchaser's design, location, operation, or maintenance of the Equipment, its use in association with other equipment of Purchaser, or the alteration of the Equipment by any party other than ABB.

14. Software License. (a) ABB owns all rights in or has the right to sublicense all of the Software, if any, to be delivered to Purchaser under this Agreement. As part of the sale made hereunder Purchaser hereby obtains a limited license to use the Software, subject to the following: (i) the Software may be used only in conjunction with equipment specified by ABB; (ii) the Software shall be kept strictly confidential; (iii) the Software shall not be copied, reverse engineered, or modified; (iv) the Purchaser's right to use the Software shall terminate immediately when the specified equipment is no longer used by the Purchaser or when otherwise terminated, e.g. for breach, hereunder; and (v) the rights to use the Software are non-exclusive and non-transferable, except with ABB's prior written consent.

(b) Nothing in this Agreement shall be deemed to convey to Purchaser any title to or ownership in the Software or the intellectual property contained therein in whole or in part, nor to designate the Software a "work made for hire" under the Copyright Act, nor to confer upon any person who is not a named party to this Agreement any right or remedy under or by reason of this Agreement. In the event of termination of this License, Purchaser shall

immediately cease using the Software and, without retaining any copies, notes or excerpts thereof, return to ABB the Software and all copies thereof and shall remove all machine-readable Software from all of Purchaser's storage media.

15. Intellectual Property, Inventions and Information.

(a) "Intellectual Property Rights" means all current and future rights in copyrights, trade secrets, trademarks, mask works, patents, design rights, trade dress, and any other intellectual property rights that may exist anywhere in the world, including, in each case whether unregistered, registered or comprising an application for registration, and all rights and forms of protection of a similar nature or having equivalent or similar effect to any of the foregoing. "Technology" means all inventions, discoveries, ideas, concepts, methods, code, executables, manufacturing processes, unique compositions, mask works, designs, marks, and works of authorship fixed in the medium of expression, and materials pertaining to any of the preceding; whether or not patentable, copyrightable or subject to other forms of protection.

(b) ABB shall maintain all right, title and interest in any Technology and Intellectual Property Rights that ABB owned, created, conceived or discovered prior to entering into this Agreement, or owns, creates or discovers separately from the activities contemplated by this Agreement. Unless otherwise agreed in writing by ABB and Purchaser, ABB shall have all right, title and interest in any Technology and Intellectual Property Rights that ABB creates, conceives or discovers in furtherance of this Agreement, and ABB shall have all right, title and interest in any Technology and Intellectual Property Rights embodied in the Equipment and Services. Any design, manufacturing drawings or other information submitted to the Purchaser remains the exclusive property of ABB. Purchaser shall not, without ABB's prior written consent, copy or disclose such information to a third party, unless required by a public information request from a governmental body. Such information shall be used solely for the operation or maintenance of the Equipment and not for any other purpose, including the duplication thereof in whole or in part.

16. Force Majeure.

ABB shall neither be liable for loss, damage, detention or delay nor be deemed to be in default for failure to perform when prevented from doing so by causes beyond its reasonable control including but not limited to acts of war (declared or undeclared), delays attributable to outbreaks, epidemics and pandemics (including any variations),

Acts of God, fire, strike, labor difficulties, acts or omissions of any governmental authority or of Purchaser, compliance with government regulations, insurrection or riot, embargo, delays or shortages in transportation or inability to obtain necessary labor, materials, or manufacturing facilities from usual sources or from defects or delays in the performance of its suppliers or subcontractors due to any of the foregoing enumerated causes. In the event of delay due to any such cause, the date of delivery will be extended by period equal to the delay plus a reasonable time to resume production, and the price will be adjusted to compensate ABB for such delay.

17. Cancellation.

Special order, custom designed, and made-to-order Equipment are non-cancelable and non-returnable. Any other purchase order may be cancelled by Purchaser only upon prior written notice and payment of termination charges as set forth in the cancellation schedule included in the Proposal or payment of, including but not limited to, the purchase price of the work performed prior to the effective date of notice of termination, the costs identified to the purchase order incurred by ABB for work not completed, and all expenses incurred by ABB attributable to the termination, plus a fixed sum of ten (10) percent of the final total price to compensate for disruption in scheduling, planned production and other indirect costs.

18. Termination.

(a) No termination by Purchaser for material default shall be effective unless, within fifteen (15) days after receipt by ABB of Purchaser's written notice specifying such default, ABB shall have failed to initiate and pursue with due diligence correction of such specified default.

(b) If the event of termination for a material default, ABB shall reimburse Purchaser the difference between that portion of the Agreement price allocable to the terminated scope and the actual amounts reasonably incurred by Purchaser to complete that scope, and Purchaser shall pay to ABB the portion of the Agreement price allocable to Equipment completed and any amounts due for Services performed before the effective date of termination.

(c) ABB may terminate the Agreement (or any affected portion thereof) immediately for cause if Purchaser becomes insolvent/bankrupt, or materially breaches the Agreement, including, but not limited to, failure or delay in Purchaser making any payment when due, or fulfilling any payment conditions.

19. Export Control.

(a) The following definitions apply to this Article 19:

"Trade Control Laws" means all applicable trade and economic sanctions laws and regulations, specifically including but not limited to the U.S. International Traffic in Arms Regulations ("ITAR"), 22 C.F.R. 120 et seq.; the Export Administration Regulations ("EAR"), 15 C.F.R. 730-774; the Foreign Assets Control Regulations ("FACR"), 31 C.F.R. 500-598; the Foreign Trade Regulations ("FTR"), 15 C.F.R. 30-199; and, any administrative or regulatory decisions or guidelines adopted pursuant to Trade Control Laws.

"Purchaser Entities" means Purchaser's officers, directors, employees, parent company, subsidiaries and other affiliates, and if the Equipment, Software and/or Services are subject to resale or other distribution, Purchaser's customers and end-users of the same.

(b) Purchaser shall comply in all respects with Trade Control laws and shall not export, re-export, transfer, disclose or otherwise provide or make accessible the Equipment, Software, data or other information provided to Purchaser by ABB hereunder, to any non-U.S. person or entity (including Purchaser's dual and/or third-country national employees or third party contractors) without first complying with all requirements of the applicable Trade Control Laws. If Purchaser is a U.S. entity and is engaged in the business of either exporting or manufacturing (whether exporting or not) Defense Articles or furnishing Defense Services as defined in the ITAR, Purchaser represents that it shall maintain an active registration with the U.S. Department of State's Directorate of Defense Trade Controls ("DDTC"), as required by the ITAR, throughout the performance of this Contract, and that it maintains an effective export and import compliance program in accordance with the ITAR. If Purchaser is a U.S. entity and will export ABB's Equipment, Software, and/or data, Purchaser will be considered an exporter within the meaning of the U.S. export regulations. Therefore, ABB should not be listed as the exporter or U.S. Principal Party in Interest ("USPPI") on any documentation or filings relating to any export. Purchaser acknowledges it's acting on its own behalf and not as ABB's agent for export or any other purposes.

(c) Purchaser represents and warrants that the Equipment, Software and Services provided hereunder, and the "direct product" thereof are intended for civil use only and will not be used, directly or indirectly, for the production of chemical or biological weapons or of precursor chemicals for such weapons, or for any direct or indirect nuclear end use or any other end use prohibited by Trade Control Laws.

(d) Purchaser represents and warrants that: (1) neither Purchaser nor any Purchaser

Entity is included on any of the restricted party lists maintained by the U.S. Government, including the Specially Designated Nationals List administered by the U.S. Treasury Department's Office of Foreign Assets Control ("OFAC"), Denied Parties List, Unverified List or Entity List maintained by the U.S. Commerce Department's Bureau of Industry and Security ("BIS"), or the List of Statutorily Debarred Parties maintained by the U.S. State Department's Directorate of Defense Trade Controls, listed, the ITAR §126.1 Restricted Parties List, or the consolidated list of asset freeze targets designated by the United Nations, European Union, and United States or any similar list maintained by the European Union or European member state (collectively "Restricted Parties List"); and (2) no entity or person listed on the Restricted Parties List (or owned directly or indirectly, in whole or in part, by an entity or person on the Restricted Parties List) has any property, financial or other interest in the Equipment, Software or Services, and that the same shall not be transferred, reexported, disclosed to or otherwise provided to an entity or person on the Restricted Parties List. Purchaser shall notify ABB immediately if Purchaser or a Purchaser Entity becomes listed on the Restricted Party List.

(e) Purchaser shall notify ABB immediately upon awareness of any breach or suspected breach of this Article 19. Any violation of Purchaser's obligations under this Article 19 is a material breach of this Agreement and ABB reserves the right to terminate the Agreement immediately upon written notice for Purchaser's default. Purchaser shall indemnify, defend and hold harmless ABB, its officers, directors, employees, agents, affiliates, successors, and permitted assigns from and against all claims, causes of action, damages, liabilities, and expenses, including attorney's fees arising from Purchaser's breach of this Article 19 and any resulting termination of this Agreement.

(f) If agreed to by the Parties pursuant to a written statement of work or elsewhere in this Agreement, ABB shall file for a U.S. export license, but only after appropriate documentation for the license application has been provided by Purchaser. Purchaser shall furnish such documentation within a reasonable time after purchase order acceptance. Any delay in obtaining such license shall suspend performance of this Agreement by ABB. If an export license is not granted or, if once granted, is thereafter revoked or modified by the appropriate authorities, this Agreement may be canceled by ABB without liability for damages of any kind resulting from such cancellation. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

(g) When applicable, the party considered the exporter of the Equipment, Software, Services and/or data, will apply for the export license in compliance with all applicable Trade Control Laws. If ABB is the applicant of the export license, the Purchaser agrees to immediately provide all the necessary information and documentation (i.e. End-User/End-Use Certificate and Letter of Assurance) required to apply for the license. If an export license is denied or revoked, the applicant must notify the other party immediately and this Agreement may be terminated by ABB without liability for damages of any kind resulting from such termination.

20. Trade Controls

a) The Parties agree to comply with all applicable sanctions and export control laws in connection with this Agreement. Sanctions and export control laws and regulations include any applicable laws, regulations, or administrative or regulatory decisions or guidelines that sanction, prohibit or restrict certain activities including, but not limited to, (i) import, export, re-export, transfer, or transshipment of goods, services, technology, or software; (ii) financing of, in-vestment in, or direct or indirect transactions or dealings with certain countries, territories, regions, governments, projects, or specifically designated persons or entities, including any future amendments to these provisions; or (iii) any other laws, regulations, administrative or regulatory decisions, or guidelines adopted, maintained, or enforced by any Sanctions Agency on or after the date of the [purchase order] (collectively, "Trade Control Laws"). "Sanctions Agency" means any governmental or regulatory body, instrumentality, authority, institution, agency or court that promulgates or administers Trade Control Laws including, but not limited to, the aforementioned governmental and regulatory bodies of (i) the United Nations, (ii) the United States of America (including the U.S. Department of Treasury Office of Foreign Assets Control, U.S. Department of State and U.S. Department of Commerce), (iii) the European Union or (iv) Switzerland.

(b) The Parties confirm that they have not violated, shall not violate, and shall not cause the other Party to violate, any applicable Trade Control Laws. Each Party represents and warrants that, to the best of its knowledge, at the date of the [purchase Order] neither it, nor any of their respective directors or officers are a Restricted Person. Each Party agrees that it shall promptly notify the other Party if it becomes a Restricted Person. "Restricted Person" means any entity or person included on a list (including U.S. and EU lists) of targeted parties, blocked parties, or persons subject to asset-freezing or other restrictions introduced under any applicable Trade Control Laws (and includes any entity that is directly or indirectly owned fifty (50) percent or more, in the aggregate or individually, or otherwise controlled by any Restricted Person).

(c) If, as a result of Trade Control Laws issued or amended after the date of the [purchase order], including, but not limited to, (i) the Purchaser or the end-user is/becomes a Restricted Person, or (ii) any necessary export license or authorization from a Sanctions Agency is not granted, the performance by ABB or any of its affiliates becomes illegal or impracticable, ABB shall be entitled to either immediately suspend the performance of the affected obligation under the [purchase Order] until such time as ABB may lawfully discharge such obligation or unilaterally terminate the [purchase order] in whole or in part. ABB will not be liable to the Purchaser for any costs, expenses or damages associated with such suspension or termination of the [purchase order].

(d) The Parties undertake to obtain all the necessary licenses and/or permits from the competent authorities for the import or export, re-export, or in-country transfer of Equipment and Services, Equipment and Software, and the "direct product" thereof, that originate from the United States are subject to the U.S. Export Administration Regulations ("EAR") and must not be exported, re-exported, or transferred (in-country) without obtaining the necessary valid li-censes/authorizations of the competent US authorities. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

(e) The Purchaser represents and warrants that the Equipment and Services are for civil use only. The Purchaser further represents that it will not directly or indirectly sell, export, re-export, release, transmit or otherwise transfer any items received from ABB to any Restricted Parties, or parties that operate, or whose end use will be, in a jurisdiction/region prohibited by ABB including Belarus, Crimea, Cuba, Iran, North Korea, Russia, Syria, as well as the Donetsk, Luhansk, Kherson, and Zaporizhzhia regions of Ukraine (such list may be amended by ABB at any time).

(f) If the Purchaser infringes any obligations in this Trade Controls clause in connection with the [purchase order], the Purchaser must immediately notify ABB. Failure to comply with these Trade Compliance obligations shall be con-sidered a material breach, and ABB shall have the right to unilaterally terminate the Agreement with immediate effect. Such termination would be without prejudice to all rights of recourse which could be exercised by ABB, and ABB shall not be liable to Purchaser for any claim, losses or damages whatsoever related to its decision to terminate performance under this provision. Further, Purchaser shall indemnify ABB for all liabilities, damages, costs, or expenses incurred as a result of any such violation, breach and/or termination of the Agreement. ABB may report such violations to relevant authorities as required by applicable Trade Control Laws.

(g) For the avoidance of doubt, no provision in this Agreement shall be interpreted or applied in a way that would require any Party to do, or refrain from doing, any act which would constitute a violation of, or result in a loss of economic benefit under, applicable Trade Control Laws.

21. Bribery and Corruption.

(a) Purchaser hereby warrants that it will not, directly or indirectly, and it has no knowledge that other persons will, directly or indirectly, make any payment, gift or other commitment to its customers, to government officials or to agents, directors and employees of ABB or any other party in a manner contrary to applicable laws (including but not limited to the Corruption of Foreign Public Officials Act (Canada), the Foreign Corrupt Practices Act (United States) and, where applicable, legislation enacted by member States and signatories implementing the OECD Convention Combating Bribery of Foreign Officials) and shall comply with all relevant laws, regulations, ordinances and rules regarding bribery and corruption.

(b) Nothing hereunder shall render ABB liable to reimburse Purchaser for any such consideration given or promised.

(c) Purchaser's material violation of any of the obligations contained in Article 20(a) above may be considered by Seller to be a material breach hereunder and shall entitle Seller to terminate this agreement with immediate effect and without prejudice to any further right or remedies on the part of Seller hereunder or applicable law. Purchaser shall indemnify Seller for all liabilities, damages, costs or expenses incurred as a result of any such violation of the above-mentioned obligations and termination of this agreement.

(d) Purchaser understands that Seller's Code of Conduct is available for consultation online at <http://www.abb.com/integrity>. Purchaser agrees to perform its contractual obligations hereunder with substantially similar standards of ethical behavior as those found in Supplier's Code of Conduct.

(e) Seller has established the following reporting channels where Purchaser and its employees may report suspected violations of applicable laws, policies or standards of conduct:

Web portal: www.abb.com/integrity

Telephone: number specified on the above Web portal

Mail: address specified on the above Web portal

22. Assignment.

Any assignment of this Agreement or of any rights or obligations under the Agreement without prior written consent of ABB shall be void.

23. Nuclear.

Equipment and Services sold hereunder are not intended for use in connection with any nuclear facility or activity, and Purchaser warrants that it shall not use or permit others to use Equipment or Services for such purposes, without the advance written consent of ABB. If, in breach of this, any such use occurs, ABB (and its parent, affiliates, suppliers and subcontractors) disclaims all liability for any nuclear or other damage, injury or contamination, including without limitation any physical damage to a nuclear facility itself, resulting from a nuclear incident and, in addition to any other rights of ABB, Purchaser shall indemnify and hold ABB (and its parent, affiliates, suppliers and subcontractors) harmless against all such liability including, but not limited to, any physical damage to the nuclear facility or surrounding properties, if any. Consent of ABB to any such use, if any, will be conditioned upon additional terms and conditions that ABB determines to be acceptable for protection against nuclear liability including but not limited to the requirement that the Purchaser and/or its end user customer shall have complete insurance protection against liability and property damage including without limitation physical damage to a nuclear facility itself or any surrounding properties, if any, resulting from a nuclear incident and shall indemnify ABB, its subcontractors, suppliers and vendors against all claims resulting from a nuclear incident including, but not limited to, any physical damage to the nuclear facility.

24. Resale.

If Purchaser resells any of the Equipment or Services, the sale terms shall limit ABB's liability to the buyer to the same extent that ABB's liability to Purchaser is limited hereunder. Additionally, if the end-user intends to use the Equipment or Services in connection with any nuclear facility or activity, the Purchaser shall require the end-user comply with the financial requirements under Price-Anderson Act (PAA) and secure a written release of liability which flows from the end-user to the benefit of ABB.

25. Environmental, Health and Safety Matters.

(a) Purchaser shall be obligated to maintain safe working conditions at its facility or location (the "Site"), including the implementing of appropriate procedures regarding Hazardous Materials, confined space entry, and energization and de-energization of power systems (electrical, mechanical and hydraulic) using safe and effective lock- out/tag-out ("LOTO") procedures including physical LOTO or a mutually agreed upon alternative method.

(b) Purchaser shall immediately advise ABB in writing of all applicable Site-specific health, safety, security and environmental requirements and procedures. Without limiting Purchaser's responsibilities hereunder, ABB has the right but not the obligation to, from time to time, review, audit and inspect applicable health, safety, security and environmental documentation, procedures and conditions at the Site.

(c) If, in ABB's reasonable opinion, the health, safety, or security of personnel or the Site is, or is likely to be, imperiled by security risks, the presence of or threat of exposure to Hazardous Materials, or unsafe working conditions, ABB may, in addition to other rights or remedies available to it, remove some or all of its personnel from Site, suspend performance of all or any part of the purchase order, and/or remotely perform or supervise work. Any such occurrence shall be considered a Force Majeure event. Purchaser shall reasonably assist in ensuring the safe departure of personnel from the Site.

(d) Purchaser shall not require or permit ABB's personnel to operate Purchaser's equipment at Site.

(e) Purchaser will make its Site medical facilities and resources reasonably available to ABB personnel who need medical attention.

(f) ABB has no responsibility or liability for the pre-existing condition of Purchaser's equipment or the Site, which is the sole responsibility of Purchaser. Prior to ABB starting any work at Site, Purchaser will provide documentation that identifies the presence and condition of any Hazardous Materials existing in or about Purchaser's equipment or the Site that ABB may encounter while performing under this Agreement. The provision of such documentation shall in no way release Purchaser from its responsibility for said conditions. Purchaser shall disclose to ABB industrial hygiene and environmental monitoring data regarding conditions that may affect ABB's work or personnel at the Site. Purchaser shall keep ABB informed of changes in any such conditions.

(g) ABB shall promptly notify Purchaser if ABB becomes aware of: (i) conditions at the Site differing materially from those disclosed by Purchaser, or (ii) previously unknown physical conditions at Site differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Agreement. If any such conditions cause an increase in ABB's cost of, or the time required for, performance of any part of the work under the Agreement, an equitable adjustment in price and schedule shall be made.

(h) If ABB encounters Hazardous Materials in Purchaser's equipment or at the Site that require special handling or disposal, ABB is not obligated to continue work affected by the hazardous conditions. In such an event, Purchaser shall at its sole cost and expense eliminate the hazardous conditions in accordance with applicable laws and regulations so that ABB's work under the Agreement may safely proceed, and ABB shall be entitled to an equitable adjustment of the price and schedule to compensate for any increase in ABB's cost of, or time required for, performance of any part of the work. Purchaser shall properly store, transport and dispose of all Hazardous Materials introduced, produced or generated in the course of ABB's work at the Site. (i) Purchaser shall indemnify ABB for any and all claims, damages, losses, and expenses arising out of or relating to any Hazardous Materials which are or were (i) present in or about Purchaser's equipment or the Site prior to the commencement of ABB's work, (ii) improperly handled or disposed of by Purchaser or Purchaser's employees, agents, contractors or subcontractors, or (iii) brought, generated, produced or released on Site by parties other than ABB.

26. Confidentiality.

a) ABB and Purchaser (as to information disclosed, the "Disclosing Party") may each provide the other party (as to information received, the "Receiving Party") with Confidential Information in connection with this Agreement. "Confidential Information" means (a) information that is designated in writing as "confidential" or "proprietary" by Disclosing Party at the time of written disclosure, and (b) information that is orally designated as "confidential" or "proprietary" by Disclosing Party at the time of oral or visual disclosure and is confirmed to be "confidential" or "proprietary" in writing within fifteen (15) days after the oral or visual disclosure. In addition, prices for Products and Services shall be considered ABB's Confidential Information.

(b) Receiving Party agrees: (i) to use the Confidential Information only in connection with the Agreement and use of Products and Services, (ii) to take reasonable measures to prevent disclosure of the Confidential Information to third parties, and (iii) not to disclose the Confidential Information to a competitor of Disclosing Party. Notwithstanding these restrictions, each party shall permit access to the other's Confidential Information only to its employees who: (i) reasonably require access to Confidential Information for purposes approved by this Agreement, and (ii) have undertaken a binding obligation of confidentiality with respect to the confidential information of others entrusted to him or her, and (iii) have been apprised of the confidentiality obligations hereunder. ABB may disclose Confidential Information to its affiliates and subcontractors in connection with performance of the purchase order. A Receiving Party may only disclose Confidential Information to any other third party with the prior written permission of Disclosing Party, and in each case, only so long as the Receiving Party obtains a non-disclosure commitment from any such third party that prohibits disclosure of the Confidential Information and provided further that the Receiving Party remains responsible for any unauthorized use or disclosure of the Confidential Information. Receiving Party shall upon request return to Disclosing Party or destroy all copies of Confidential Information except to the extent that a specific provision of the Agreement entitles Receiving Party to retain an item of Confidential Information. ABB may also retain one archive copy of Purchaser's Confidential Information.

(c) The obligations under this Article 25 shall not apply to any portion of the Confidential Information that: (i) is or becomes generally available to the public other than as a result of disclosure by Receiving Party, its representatives or its affiliates; (ii) is or becomes available to Receiving Party on a non-confidential basis from a source other than Disclosing Party when the source is not, to the best of Receiving Party's knowledge, subject to a confidentiality obligation to Disclosing Party; (iii) is independently developed by Receiving Party, its representatives or affiliates, without reference to the Confidential Information; (iv) is required to be disclosed by law or valid legal process provided that the Receiving Party intending to make disclosure in response to such requirements or process shall promptly notify the Disclosing Party in advance of such disclosure and reasonably cooperate in attempts to maintain the confidentiality of the Confidential Information.

(d) As to any individual item of Confidential Information, the restrictions under this Article 25 shall expire five (5) years after the date of disclosure. This Article 25 does not supersede any separate confidentiality or nondisclosure agreement signed by the parties.

27. Non-Survival.

The following Articles shall not survive termination or cancellation of this Agreement: 5, 7, 8, 17 and 18. All other Articles shall survive the termination or cancellation of the Agreement.

28. Entire Agreement.

This Agreement constitutes the entire agreement between ABB and Purchaser. There are no agreements, understandings, restrictions, warranties, or representations between ABB and Purchaser other than those set forth herein or herein provided. As stated in Article 1 of this Agreement, ABB's Proposal, policies, addendum(s), if any, submitted to Purchaser, shall control over any conflicting terms. ABB specifically rejects any exceptions to this Agreement, Proposals, policies, and/or addendum(s) on the face of any purchase order. Purchaser shall advise ABB in writing of all conflicts, errors, omissions, or discrepancies among the Proposal, Policies, Addendum(s) and this Agreement immediately upon discovery. This Agreement shall supersede any standard, preprinted terms and conditions that are automatically attached to purchase orders issued by Purchaser.

29. US Government Contracts.

This Article 28 applies only if the Agreement is for the direct or indirect sale, or is funded in whole or in part by, an agency of the U.S. federal government, or a state government, or any other U.S. government instrumentality or political subdivision (collectively "U.S. government entity"). Unless otherwise expressly stated and specifically agreed in ABB's Proposal:

(a) Purchaser agrees that:

(i) all Equipment, Software, and Services provided by ABB meet the definition of "commercial-off-the-shelf" ("COTS") or "commercial product" or "commercial service" or "commercial computer software" as those terms are defined in Federal Acquisition Regulation ("FAR") 2.101.

(ii) ABB technical data and computer software are developed at ABB's private expense and not in performance of the Agreement. ABB retains ownership and proprietary rights in all technical data and computer software provided to Purchaser under the Agreement and under a U.S. Government contract or subcontract. Neither the Purchaser, the U.S. Government nor any higher-tier contractor under a U.S. Government contract will obtain any rights in ABB technical data or computer software beyond the rights provided under ABB's standard commercial licenses consistent with FAR 12.211 and 12.212.

(iii) to the extent the Buy American Act (41 U.S.C. §§ 8301 – 8305, as amended), Trade Agreements Act (19 U.S.C. §§ 2501 – 2581, as amended), Build America, Buy America (Pub. L. 117-58, December 29, 2022, as amended) or other domestic preference requirements are applicable to this Agreement, the country of origin of Equipment or Software is unknown.

(iv) the version of any applicable FAR clause listed in this Article 28 shall be the one in effect on the effective date of this Agreement.

(b) If Purchaser is an agency of the U.S. Government, then as permitted by FAR 12.302, Purchaser agrees that:

(i) all paragraphs of FAR 52.212-4 (except those listed in 12.302(b)) are replaced with these Terms and Conditions.

(ii) only the clauses identified in FAR 52.212-5 apply and only to the extent applicable for sale of COTS and/or commercial products and/or commercial services and as appropriate for the purchase order price.

(iii) any Services offered by ABB are exempt from the Service Contract Act of 1965 (41 U.S.C. §§ 6701 - 6707, as amended).

(iv) all other U.S. Government agency contract provisions are rejected.

(c) If Purchaser is procuring as a contractor, or subcontractor at any tier, on behalf of an agency of a U.S. government entity, then Purchaser agrees that:

(i) only the clauses identified in FAR 52.212-5(e)(1) or 52.244-6(c)(1) (whichever is applicable) apply and only to the extent applicable for sale of COTS and/or commercial products and/or services and as appropriate for the purchase order price.

(ii) Purchaser shall notify ABB prior to transmitting any Controlled Unclassified Information ("CUI") to ABB, and only upon written authorization by ABB may Purchaser transmit CUI to ABB. Purchaser shall transmit CUI to ABB in accordance with applicable CUI safeguarding and/or dissemination authority requirements.

(iii) prevailing wage and related public works labor and employment laws or regulations are not applicable to ABB's services offered in the Proposal.

(iv) Purchaser is solely responsible for its obligations to its customer(s), including validating that ABB's Proposal fulfills Purchaser's U.S. Government contracting obligations, if any. To the extent the terms and conditions of Purchaser's customer contract(s) are different from the terms and conditions of this Agreement, Purchaser shall defend, indemnify and hold ABB harmless from and against all losses, liabilities, cost, expense (including attorney's fees and expenses of litigation and/or settlement), damages, allegations, claims, causes of action and judgments resulting from such difference. In no event will Purchaser withhold payment due to ABB for any dispute or liability incurred between Purchaser and its customer(s).

30. Data Protection.

(a) The parties agree that the protection of Personal Data is very important. If Purchaser discloses Personal Data to ABB, ABB shall comply with all applicable data protection laws and regulations. Purchaser shall comply with all applicable data protection laws and regulations in respect of any Personal Data it receives from ABB in the course of receiving the Equipment or Services.

(b) The parties agree that neither will withhold or delay its consent to any changes to this clause which are required to be made in order to comply with applicable data protection laws and regulations and/or with guidelines and order from any competent supervisory authority, and their application to the Equipment or Services from time to time, and agrees to implement any such changes at no additional cost to the other party.

(c) The parties acknowledge that the processing of Personal Data in accordance with this purchase order may require the conclusion of additional data processing agreements or additional data protection agreements. If and to the extent such additional data processing agreements or additional data protection agreements are not initially concluded as part of the purchase order, the parties shall, and shall ensure that their relevant affiliates or subcontractors shall, upon the other's request promptly enter into any such agreement with an affiliate, as designated by the other party and as required by mandatory law or a competent data protection or other competent authority.

VBE-2
VBE PARTICIPATION SUBMITTAL

Bidder/Offerer: I.B. Abel, Inc. **Solicitation # :** DGS C-0948-0090 P3.4

Solicitation Title: Capitol Complex Central Plant - Building Reno. Chiller System Rep

Discipline: .4 Electrical (.1 GC, .2 HVAC, .3 Plumbing, or .4 Electrical)

Base Bid: 1.00 (identify the corresponding Base Bid for this VBE Participation Submittal)

CHECK ONE, AND ONLY ONE, BOX. FAILURE TO COMPLY WILL RESULT IN REJECTION OF YOUR BID/PROPOSAL.

Click on bold titles to navigate to that specific page.

☐ **I agree to meet the VBE participation goal in full.**
I have completed and am submitting with my bid or proposal a **VBE Utilization Schedule (VBE-3)**, which is required in order to be considered for award.

☐ **I am requesting a partial waiver of the VBE participation goal.**
After making good faith outreach efforts as more fully described in the **Guidance for Documenting Good Faith Efforts to Meet the VBE Participation Goal**, I am unable to achieve the total VBE participation goal for this solicitation and am requesting a partial waiver of the VBE 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. a **VBE Utilization Schedule (VBE-3)** for that portion of the VBE participation goal that I will meet; AND
2. a **Good Faith Efforts Waiver Request** for the portion of the VBE participation goals that I am unable to meet.

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

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

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

VBE-3 VBE UTILIZATION SCHEDULE

Bidder/Offeror: I.B. Abel, Inc.

Solicitation # : DGS C-0948-0090 P3.4 **Solicitation Title:** Capitol Complex Central Plant - Building Reno. Chiller

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

VBE Name SAP Vendor Number (6-digit number provided by VBE) VBE Verification Number (located on DGS VBE verification)	Type of VBE (check all that apply)	Description of Work to be Performed (Statement of Work/Specification reference)	% Commitment (or % of work to be self-performed by VBE bidder/offeror)	Dollar Value of Commitment (after applying any calculation per VBE-1, Section IV, Calculating VBE participation)
Name: <u>Veterans R Us</u> SAP Vendor Number: <u>123456</u> VBE Verification Number: <u>123456-2023-VBE</u>	VBE	staffing resources	%	\$
Name: Schneider SAP Vendor Number: VBE Verification Number:	☒ VBE ☐ SDVBE		%	
Name: Perry County SAP Vendor Number: VBE Verification Number:	☐ VBE ☐ SDVBE		%	
Name: Manna Supply SAP Vendor Number: VBE Verification Number:	☐ VBE ☐ SDVBE		%	
Name: SAP Vendor Number: VBE Verification Number:	☐ VBE ☐ SDVBE		%	
Attach additional sheets if necessary			Total % VBE commitment: <u>0</u>	Total \$ amount: <u>0</u>

VBE-3.1
LETTER OF COMMITMENT

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

Solicitation #: _____ Solicitation Title: _____

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

Services/Supplies and Time Frame. If Bidder/Offeror is the successful vendor, the VBE 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 VBE will provide:	
Specific Time Frame the VBE 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 VBE-3
	(c)	(d)	(c) x (d) = (e)
VBE Subcontractor - performs at least 50% of the value of the subcontract with its own forces		100%	
VBE Manufacturer - produces on premise material, supplies, articles, or equipment required for contract.		100%	
VBE Stocking Suppliers - maintains materials on premises that are bought and stored and required for the contract.		60%	
VBE Non-stocking Supplier - Service Fee Only - Does not carry inventory.		100%	

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

Sincerely,

Acknowledged

Printed name

Printed name

Bidder/Offeror Point of Contact Signature

VBE Point of Contact Signature

** The work performed by a firm that is dually verified as both an SDB and 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. See SDB-1 Instructions, Section II, Paragraph 4 for example of how work performed by a firm that is dually verified is credited.*

VBE-5

GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF VBE PARTICIPATION GOAL

Project Description:	Capitol Complex Central Plant - Building Reno. Chiller System Replacement and Electrical System Upgrades
Commonwealth Agency Name:	DGS
Solicitation #:	DGS C-0948-0090 P3.4
Solicitation Due Date and Time:	1/20/26 2:00 pm

Bidder/Offeror Company Name:	I.B. Abel, Inc.
Bidder/Offeror Contact Name:	Mat Robinson
Bidder/Offeror Contact Email:	mrobinson@ib-abel.com
Bidder/Offeror Contact Phone Number:	(717) 451-6179

Part 1 – Identified Items of Work Offeror Made Available to VBEs

Identify those items of contract work that the Offeror made available to VBEs. This includes, where appropriate, those items the Offeror identified and subdivided into economically feasible units to facilitate the VBE participation. For each item listed, show the anticipated percentage of the total contract cost. Offeror must demonstrate that enough work to meet the VBE participation goal was made available to VBEs, and the total percentage of the items of work identified for VBE participation met or exceeded the VBE 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 VBE Firms? If not, explain why.
Excavating, Rigging, Testing, Equipment	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no

Attach additional sheets if necessary.

VBE-5

GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF VBE PARTICIPATION GOAL

Part 2 – Identified VBEs and Record of Solicitations

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

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

Name of Identified VBE 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
VBE Name: NCE Testing ☐ VBE ☐ SDVBE	Electrical Testing	Date: 12/8/25 ☐ mail ☒ email ☐ fax	Date: 12/17/25 ☐ mail ☒ email ☐ fax	Date and Time of Call: 1/8/26 12:00 am Spoke with: Robert Maceenia Left Message:	☐ yes ☐ no	☐ yes ☐ no	☐ Used other VBE ☐ Used non-VBE ☐ Self performing
VBE Name: Keystone ☐ VBE ☐ SDVBE	Equipment	Date: 12/8/25 ☐ mail ☒ email ☐ fax	Date: 12/17/25 ☐ mail ☒ email ☐ fax	Date and Time of Call: 12/11/25 12:00 am Spoke with: Rob Stern Left Message:	☐ yes ☐ no	☐ yes ☐ no	☐ Used other VBE ☐ Used non-VBE ☐ Self performing

Attach additional sheets as necessary.

VBE-5
GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF
VBE PARTICIPATION GOAL

Part 3 – VBE Outreach Compliance Statement

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

- Stocking supplies for fire alarm parts and smarts
- Stocking suppliers for electrical materials
- Stocking suppliers for electrical equipment
- Excavation
- Rigging

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

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

Emails, phone calls

4. Bonding Requirements (Please Check One):

☐

This project does not involve bonding requirements.

☐

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

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

☐

Offeror did attend the pre-Bid/Proposal conference or Supplier Forum

☐

No pre-Bid/Proposal conference or Supplier Forum was held

☐

Offeror did not attend the pre-Bid/Proposal conference or Supplier Forum

VBE-5

GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF VBE PARTICIPATION GOAL

Part 4 – Additional Information Regarding Rejected VBE Quotes

This form must be completed if Part 2 indicates that a VBE quote was rejected because the Offeror is using a non-VBE or is self-performing the Identified Items of Work. List the Identified Items of Work, state whether the work will be self-performed or performed by a non-VBE, and if applicable, state the name of the non-VBE firm. Also include the names of all VBEs and non-VBE firms that provided a quote and the amount of each quote.

Describe Identified Items of Work not being performed by VBEs (include specific section from bid or proposal)	Self-performing or using non-VBE (provide name of non-VBE if applicable)	Amount of non-VBE quote \$	Name of other firms that provided quotes and whether they are VBE	Amount quoted \$	Reason why VBE quote was rejected along with brief explanation
Electrical Testing	☐ self-performing ☒ using Non-VBE Name: Qualas	\$ 86,625	☐ VBE ☒ Non-VBE Name: Tactical Testing	\$ 184,900	☐ price ☒ capabilities ☐ other Qualas was lower than Tactical Testing. No VBE quotes were received to compare pricing
Security	☐ self-performing ☒ using Non-VBE Name: Schneider	\$ 9,100	☐ VBE ☒ Non-VBE Name: n/a	\$ 0	☐ price ☒ capabilities ☐ other Proprietary as per RFP documents
Fire Alarm	☐ self-performing ☒ using Non-VBE Name: Siemens	\$ 9,850	☐ VBE ☒ Non-VBE Name: n/a	\$ 0	☐ price ☒ capabilities ☐ other Proprietary as per RFP documents
Excavating	☐ self-performing ☒ using Non-VBE Name: Perry County	\$ 79,250	☐ VBE ☒ Non-VBE Name: n/a	\$ 0	☐ price ☒ capabilities ☐ other Received no quotes from VBE excavating
Equipment	☐ self-performing ☒ using Non-VBE Name: Manna Supply	\$ 2,676,240	☐ VBE ☒ Non-VBE Name: Keystone	\$ 8,995,964	☐ price ☒ capabilities ☐ other Price was lower from a different supplier

Attach additional sheets as necessary.

VBE-5
GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF
VBE PARTICIPATION GOAL

Part 5 – VBE Subcontractor Unavailability Certificate

1. It is hereby certified that the firm of _____
(Name of VBE)

located at _____
(Number) (Street)

(City) (State) (Zip)

was offered an opportunity to bid on Solicitation No. _____

by _____
(Name of Bidder/Offeror's Firm)

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

(Signature of VBE's Representative) (Title) (Date)

(DGS VBE Certification #) (Telephone #)

***** 3.
If the VBE does not complete this form, the bidder.offeror must complete the following:

To the best of my knowledge and belief, the above-listed VBE is either unavailable for the work/service
for this project, is unable to prepare a Proposal, or did not respond to a request for a price Proposal and
has not completed the above portion of this submittal.

(Signature of Bidder/Offeror) (Title) (Date)

Arijana Cooper

From: Arijana Cooper
Sent: Monday, December 8, 2025 9:35 AM
Cc: Mathew Robinson; Jason Vansickle
Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

I.B. Abel, Inc. is currently seeking SBD/VBE participation for applicable UNSPSC codes related to the P3.4 scope of electrical work for the DGS C-0948-0090 P3.4 Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

This includes:

- Stocking supplies for fire alarm parts and smarts
- Stocking suppliers for electrical materials
- Stocking suppliers for electrical equipment
- Excavation
- Rigging
- Project Management

Please review the project information provided below, along with the link to the project documents:

<https://ib-abel.sharefile.com/public/share/web-sbd01e338ab6747b3b907b7e83f5b63bc>

Kindly confirm your intent to participate or decline this opportunity by **Friday, December 19, 2025**.

Should you have any questions or require additional information, please don't hesitate to reach out. Mat Robinson is the lead estimator and his contact information is:

MRobinson@ib-abel.com

717-451-6179

Thank you for your time and consideration.

Project: Project No. the **DGS C-0948-0090 P3.4** Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Harrisburg, PA 17110

Bid Opening Date and Time: 12/29/2025

Brief Description: The project consists of upgrades, relocations and replacement of various building, HVAC and electrical systems and components associated with the existing 8,600 ton Central Chiller Plant serving the PA State Capitol Complex. To support the electrical equipment replacement and reconfiguration an underground electrical vault will be constructed and connected to the existing chiller plant, via an underground tunnel.

Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

AC

Arijana Cooper

To

Cc

Bcc

Mathew Robinson; Jason Vansickle

'tmarenco@battagassoc.com'; 'jennifer.moses@zitomedia.com'; 'mljordan@zoominternet.net'; 'pcep@pa.net'; 'gundyexca@yahoo.com'; Brion Martin - Manna Supply, Inc. (brion.martin@mannasupply.com); Janell Butorac - J Sterling Solutions LLC (janell@sterlingdistr.com); 'amy@allaccessrigging.com'; Kenneth Dupree - Unique Harmony Consultants LLC (kdupree@uniqueharmonyconsultantsllc.com)

Reply

Reply All

Forward

Mon 12/8/2025 9:35 AM

Arijana Cooper

From: Arijana Cooper
Sent: Friday, December 12, 2025 7:31 AM
Cc: Mathew Robinson; Jason Vansickle
Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Good morning,

Please note the bid due date has been extended. Addendum 3 and 4 have been added to the project share folder.

I.B. Abel, Inc. is currently seeking SBD/VBE participation for applicable UNSPSC codes related to the P3.4 scope of electrical work for the DGS C-0948-0090 P3.4 Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

This includes:

- Stocking supplies for fire alarm parts and smarts
- Stocking suppliers for electrical materials
- Stocking suppliers for electrical equipment
- Excavation
- Rigging
- Project Management

Please review the project information provided below, along with the link to the project documents:

<https://ib-abel.sharefile.com/public/share/web-sbd01e338ab6747b3b907b7e83f5b63bc>

Kindly confirm your intent to participate or decline this opportunity by **Friday, December 19, 2025**.

Should you have any questions or require additional information, please don't hesitate to reach out. Mat Robinson is the lead estimator and his contact information is:

MRobinson@ib-abel.com

717-451-6179

Thank you for your time and consideration.

Project: Project No. the **DGS C-0948-0090 P3.4** Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Harrisburg, PA 17110

Bid Opening Date and Time: 01/12/2026

Brief Description: The project consists of upgrades, relocations and replacement of various building, HVAC and electrical systems and components associated with the existing 8,600 ton Central Chiller Plant serving the PA State Capitol Complex. To support the electrical equipment replacement and reconfiguration an underground electrical vault will be constructed and connected to the existing chiller plant, via an underground tunnel.

Arijana Cooper

From: Microsoft Outlook
To: robstern7@aol.com; jennifer.moses@zitomedia.com; mljordan@zoominternet.net; pcep@pa.net; gundyexca@yahoo.com; brion.martin@mannasupply.com; janell@sterlingdistr.com; amy@allaccessrigging.com; kdupree@uniqueharmonyconsultantsllc.com; jgormley@ncetest.com; bjmessina@ncetest.com
Sent: Friday, December 12, 2025 7:32 AM
Subject: Relayed: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

robstern7@aol.com

jennifer.moses@zitomedia.com

mljordan@zoominternet.net

pcep@pa.net

gundyexca@yahoo.com

brion.martin@mannasupply.com

janell@sterlingdistr.com

amy@allaccessrigging.com

kdupree@uniqueharmonyconsultantsllc.com

jgormley@ncetest.com

bjmessina@ncetest.com

Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Arijana Cooper

From: Microsoft Outlook
To: tmarenco@battagassoc.com
Sent: Friday, December 12, 2025 7:31 AM
Subject: Relayed: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

tmarenco@battagassoc.com

Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Arijana Cooper

From: Mathew Robinson
Sent: Friday, January 9, 2026 1:04 PM
To: pcep@pa.net
Cc: Arijana Cooper
Subject: Re: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
Addendum 11 has been uploaded. Our bid is now due on the 20th. Please verify but I see no changes to the project other than due date pertaining to addendums 9-11. Please send your pricing by EOB the 14th.

<https://ib-abel.sharefile.com/public/share/web-s39c36c308ba94e1492b09558f0848215>

Thank you,
Mat

Mathew Robinson
Senior Estimator
Mobile: 717-451-6179
www.ib-abel.com

 **24/7 Service & Support 717-845-1639**

From: Mathew Robinson <mrobinson@ib-abel.com>
Sent: Thursday, January 08, 2026 11:39 AM
To: pcep@pa.net <pcep@pa.net>
Cc: Arijana Cooper <arijana.cooper@ib-abel.com>
Subject: Re: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
Addendum 8 has been uploaded. Our bid is still due on the 13th. Please send your pricing to us as soon as you can.

<https://ib-abel.sharefile.com/public/share/web-s59e439513e364d9982fdbec9f38d6e52>

Thank you,
Mat

Mathew Robinson
Senior Estimator
Mobile: 717-451-6179
www.ib-abel.com

24/7 Service & Support 717-845-1639

From: Mathew Robinson <mrobinson@ib-abel.com>
Sent: Tuesday, December 30, 2025 6:32 AM
To: pcep@pa.net <pcep@pa.net>
Cc: Arijana Cooper <arijana.cooper@ib-abel.com>
Subject: Re: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
Addendum 6 and 7 have been uploaded to the sharefile. Let me know if you plan to attend the additional walk through.

<https://ib-abel.sharefile.com/public/share/web-sb015c2e830bb4b8aa778671c76f83b15>

Thank you,
Mat

Mathew Robinson
Senior Estimator
Mobile: 717-451-6179
www.ib-abel.com

24/7 Service & Support 717-845-1639

From: Mathew Robinson <mrobinson@ib-abel.com>
Sent: Thursday, December 18, 2025 2:15 PM
To: pcep@pa.net <pcep@pa.net>
Cc: Arijana Cooper <arijana.cooper@ib-abel.com>
Subject: Fw: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
We are currently bidding the above referenced project in Harrisburg, PA. We would like to get a quote for the Excavation from you. The attached drawings are for your use. The link below contains the spec's and all bidding information pertaining to the project. This information is for your use. Our pricing is due 1/13/26. We would like your quote by EOB 1/09/26. With the Holidays and company schedules please confirm timing of this quote.

Notes:

Prevailing wage determination is located in the project manual of the link provided.
We will probably build the duct bank as an assembly and lower into the excavation. Including the rebar.
Please provide concrete for the duct bank and reinstalled exterior light poles.
~~Plan to form and pour the light pole bases.~~
Test bores, soil composition, and other information are contained in the project manual and specs through the link below.
Highlighted routing and footages are approx.
The grounding triads scale out to be about 4'6" per side however please plan on 10' per side of excavation.

<https://ib-abel.sharefile.com/public/share/web-sfc805706b3604cf9878bf5c74cb93974>

If you have any questions please contact me directly.

Thank you,

Mat

Mathew Robinson

Senior Estimator

Mobile:717-451-6179

www.ib-abel.com



 **24/7 Service & Support 717-845-1639**



January 5, 2026

I B Abel Inc.
2745 Black Ridge Road
York, PA 17406-7920

Attention: Mathew Robinson

Subject: 2508324 I.B. Abel - DGS Central Plant Proposal

Reference:

Dear Mathew,

Qualus Services, LLC appreciates this opportunity to be of service to I B Abel Inc. After careful review, it is our pleasure to submit this proposal for your consideration. The execution strategy described in this proposal has been prepared to define the scope of work and overall approach that Qualus intends to follow throughout the execution of this project.

Staffed with experienced engineers, field service technicians, operational professionals, and outfitted with the most up-to-date software and equipment, Qualus prides itself on being at the forefront in terms of industry standards, testing and design capabilities, and quality assurance processes. Our proven business philosophy is to invest in building long-term relationships with our clients based on our strong client-centric culture emphasizing safety, quality, and project execution track record.

We appreciate the opportunity to work with you on this project. If you have any questions or concerns, please contact me at 410-344-0300 or by email at JP.Shoop@QualusCorp.com

Sincerely,

JP Shoop
Account Manager

TABLE OF CONTENTS

PROJECT SUMMARY.....3

HSSE & HUMAN PERFORMANCE.....3

ABOUT QUALUS.....3

EQUIPMENT SCOPE.....4

WORK SCOPE.....6

CLARIFICATIONS 13

CUSTOMER RESPONSIBILITIES 14

PROJECT SCHEDULE 14

PROJECT PRICING 14

PROPOSAL ACCEPTANCE.....15

TERMS & CONDITIONS.....15

PROJECT SUMMARY

NETA Acceptance Testing at Capitol Complex - Central Chiller Plant. 7th Street / Soldier's Grove. Dauphin County. City of Harrisburg.

HSSE & HUMAN PERFORMANCE

Safety First, We All Own It is a core value and a top priority for all projects. Qualus operates with a strict zero-tolerance policy when it comes to non-compliance of safety protocols. In addition to our Corporate Safety Manual and our Life Saving Rules, a site-specific safety plan will be created, tailored, and distributed to meet the specific needs and challenges of the project. Our teams also utilize Job Task Hazard Analyses and HP utilization checklists to ensure that we maintain our heightened state of awareness when it comes to your infrastructure. Any elements of your programs not covered in our standards will be included as a requirement in the working conditions.

ABOUT QUALUS

Qualus is a leading pure-play power services firm and innovator at the forefront of the energy transition and transformation, with differentiated capabilities across grid modernization, resiliency, security, and sustainability. The firm partners with utilities, commercial, industrial, data center, and government clients, and renewable and energy storage developers, offering comprehensive solutions through boutique and integrated advisory, planning, engineering, digital solutions, program management, and specialized field services. Qualus also provides software and technology enabled services and develops breakthrough solutions for critical power industry challenges such as distributed and variable resource integration, emergency management, and secure data exchange. The firm has nearly 1,600 professionals, with offices throughout the U.S. and Canada.

EQUIPMENT SCOPE

Relocated Existing 10MVA Unit Substations (x2)

Relays:

51,51G 2

51 2

81,47,27,59 2

Instrument Transformers

CT 6

PT 2

Meters (Schneider Electric PM8000) 2

MDS15' - 1200A 15KV Switchgear 1

Vacuum Circuit Breakers 7

CT 22

PT 4

Lightning Arresters 2

Relays:

50/51,50G 4

51 2

51,50G 2

87B 2

25 1

81,47,27,59 2

Meters (Schneider Electric ION 9000T) 2

Meters (Schneider Electric PM8000) 4

MDS5' - 2000A 5KV Switchgear 1

5KV Main Disconnects 2

5KV Fused Disconnects 5

Lightning Arresters 2

CT 5

Meters (Schneider Electric PM8000) 5

12.47KV:480/277V Unit Substation XFMR	2
3500kVA 12.47KV-480Y/277V XFMR	2
480V Draw-Out Circuit Breakers	3
Meters (Schneider Electric PM8000)	3
MTM2' 5000A 480V Switchgear	1
480V Draw-Out Circuit Breakers	9
Meters (Schneider Electric PM8000)	8
MTM1' 3200A 480V Switchgear	1
480V Draw-Out Circuit Breakers	5
Meters (Schneider Electric PM8000)	4
CT	2
Cables / Busway	
15KV Cable Set	8
5KV Cable Set	4
2000A 4.16KV Busway	2
LV Cable Sets #3 AWG & Larger	24
LV Busway	4
LV Panels	14
Small Transformers	1
600A Circuit Breaker in 'MDS2'	1
LV Disconnects	4
LV CB > 225 Amp (MDP-NE, PP, LR)	3
Grounding System	1

NOTE: UPS, VFD, Existing and Relocated equipment is not included in this proposal.

WORK SCOPE

Qualus Services (Qualus) will provide the required technical labor, supervision, basic equipment, consumable materials, and engineering services to perform the following scope of work:

CABLES, MEDIUM AND HIGH VOLTAGE CABLE

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage, where visible and safely accessible.
2. Verify tightness of bolted electrical connections with a calibrated torque wrench, where possible.
3. Inspect compression applied connectors for correct cable match and indentation, where visible.
4. Inspect shield grounding, cable supports and terminations. (See note below)
5. Where applicable, verify that visible cable bends meet or exceed ICEA and manufacturer's bending radius, where visible (See note below)
6. If cables are terminated through window type current transformers, inspect to verify that neutral and ground conductors are correctly placed and that shields are correctly terminated for operation of protective devices, where visible.
7. Inspect for correct identification and arrangements, where visible. (See note below)
8. Inspect cable jacket insulation and condition, where visible. (See note below)

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Insulation resistance test on each conductor with all other conductors and shield grounded.
3. Shield continuity test on each cable.
4. Perform very low frequency (VLF) dielectric withstand voltage test.
 - All cables must be outside of manholes for testing. Qualus Services will not enter manholes with energized conductors. Electrical contractors are responsible for disconnecting and re-connection of cables.

CABLES, LOW VOLTAGE, 600-VOLT MAXIMUM (#3AWG and larger)

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Verify tightness of bolted electrical connections with a calibrated torque wrench (where possible).
3. Inspect compression applied connectors for correct cable match and indentation, where visible.
4. Inspect for correct identification and arrangements, where visible.
5. Inspect cable jacket insulation and condition, where visible.

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Insulation resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable for 1 minute.
3. Continuity tests to ensure correct cable connection.
 - Electrical contractor is responsible for disconnecting and re-connection of cables.

DRY TYPE TRANSFORMERS (500KVA and greater)

A. Perform the following mechanical inspections

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment and grounding.
3. Verify that resilient mounts are free and that any shipping brackets have been removed.
4. Verify tightness of bolted electrical connections with a calibrated torque wrench.
5. Verify that as-left tap connections are as specified.
6. Verify that cooling fans operate and that fan motors have correct overcurrent protection.
7. Verify the presence of surge protection.

B. Perform the following electrical testing

1. Resistance measurements through bolted electrical connections.
2. Insulation resistance tests winding to winding and each winding to ground (where possible).
3. Calculate the polarization index.
4. Turns ratio and winding resistance test on all tap positions.
5. Test surge arresters.

MEDIUM VOLTAGE, METAL ENCLOSED AIR SWITCHES

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Inspect anchorage, alignment, grounding, and required clearances.
3. Verify correct blade alignment, blade penetration, travel stops and mechanical operation.
4. Verify that fuses sizes and types are in accordance with drawings, and all engineered studies.
5. Verify that expulsion limiting devices are in place on all holders having expulsion type elements.
6. Verify that each fuse has adequate mechanical support and contact integrity.
7. Verify tightness of bolted electrical connections with a calibrated torque wrench.
8. Verify operation and sequencing of interlocking systems.
9. Verify correct barrier installation.
10. Verify correct operation of all indicating and control devices.
11. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.
12. Verify operation of heaters when safely possible.

B. Perform the following electrical testing

1. Resistance measurements through bolted connections.
2. Measure contact resistance across each switchblade and fuse holders.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. Dielectric withstand voltage test.
5. Measure fuse resistance.

MEDIUM VOLTAGE VACUUM CIRCUIT BREAKERS

A. Perform the following mechanical inspections

1. Visually inspect for signs of physical damage.
2. Inspect anchorage, alignment and grounding.
3. Mechanical operator test in accordance with manufacturer's published data, if applicable.
4. Measure critical distances such as contact gap on the operating mechanism in accordance with
5. manufacturer's published data.
6. Verify tightness of bolted electrical connections with a calibrated torque wrench.
7. Verify cell fit and element alignment.
8. Verify racking mechanism operation.
9. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.
10. Verify operation of heaters.
11. Record as-left operation counter readings.

B. Perform the following electrical testing

1. Resistance measurements through bolted connections.
2. Contact/pole resistance test.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. Minimum pickup voltage tests on trip and close coils.
5. Verify operation of electrical close and trip operations, trip-free and antipump function.
6. Trip breaker via protective relays.
7. Vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the contacts in the open position.
8. Dielectric withstand voltage test.

PANELBOARDS

A. Visual and Mechanical Inspection

1. Inspect and note general condition of each section and document equipment nameplate information.
2. Inspect physical and mechanical condition.
3. Inspect anchorage, alignment, grounding, and required area clearances.

B. Electrical Tests

1. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground.

MICROPROCESSOR BASED RELAYS

A. Perform the following mechanical inspections.

1. Verify operation of light-emitting diodes, display and targets.
2. Record passwords for all access levels.
3. Clean the front panel and remove foreign material from the case.
4. Check tightness of connections.
5. Verify that the frame is grounded in accordance with manufacturer's instructions.
6. Set the relay in accordance with the coordination study.
7. Download settings from the relay. Print a copy of the settings for the report and compare the settings to those of the coordination study.

B. Perform the following electrical testing.

1. Insulation resistance test on each circuit to frame. Procedures for performing this test on solid state relays shall be determined from the manufacturer's published data.
2. Apply voltage or current to all analog inputs and verify correct registration of the relay meter function.
3. Check functional operation of each element used in the protection scheme.
4. Control verification:
 - Check operation of all active digital inputs.
 - Check all output contacts or SCRs, preferably by operating the controlled device such as circuit breaker, auxiliary relay or alarm.
 - Check all internal logic functional used in protection scheme.
 - For pilot schemes, perform a loop-back test to check the receive and transmit communications circuits.
 - For pilot schemes, perform satellite synchronized end to end tests.
 - For pilot schemes with direct transfer trip (DTT), perform communications statistics, fault counters, sequence of events recorder and all event records.
 - Upon completion of testing, reset all min/max recorders, communications statistics, fault counters, sequence of events recorders and all event records.

METERING DEVICE

Visual and Mechanical Inspection

1. Document equipment nameplate data.
2. Inspect physical and mechanical condition.
3. Verify freedom of movement, end play, and alignment of rotating disks.

Electrical Tests

1. Verify accuracy of meters at all cardinal points.
2. Calibrate meters according to manufacturer's recommendations.
3. Verify all instrument multipliers.
4. Verify that current transformer and voltage transformer secondary circuits are intact.

SWITCHGEAR AND SWITCHBOARDS ASSEMBLIES

A. Perform the following mechanical inspections.

1. Inspect switchboard for damage and overall condition.
2. Inspect anchorage, alignment, grounding, and required area clearances.
3. Verify that the unit is clean and that all shipping bracing, loose parts, and documentation shipped inside cubicle have been removed.
4. Verify that fuse and circuit breaker sizes and types correspond to drawings and coordination study (**customer provided**).
5. Verify that current and voltage transformers ratios correspond to drawings.
6. Verify tightness of bolted electrical connections with a calibrated torque wrench.
7. Confirm correct operation and sequencing of electrical and mechanical interlocks.
8. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.
9. Inspect insulators for evidence of damage or contaminated surfaces.
10. Verify barrier and shutter installation and operation.
11. Exercise all active components.
12. Inspect mechanical indicating devices for correct operations.
13. Verify that filters are in place and vents are clear, if applicable.
14. Verify cubicle heater operation, when safely possible.
15. Perform visual and mechanical inspection of instrument transformers.
16. Inspect control power transformers.
17. Inspect for physical damage, cracked insulation, broken leads, tightness of connections and defective wiring.
18. Verify that primary and secondary fuse and circuit breaker ratings match drawings.

B. Perform the following electrical testing.

1. Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.1.A.8.1.
2. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1.
3. Perform a dielectric withstand voltage test on each bus section, each phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If the manufacturer has no recommendation for this test, it shall be in accordance with Table 100.2. The test voltage shall be applied for one minute.
4. Perform current-injection tests on the entire current circuit in each section of switchgear per manufacturers specifications.
5. Control power transformers:
 - a) Insulation resistance test.
 - b) Turns ratio test on all taps.
6. Voltage transformers:
 - a) Verify correct secondary voltage.
 - b) Turns Ratio Test
 - c) Insulation Resistance Test
7. Current transformers:
 - a) Turns Ratio Test
 - b) Insulation Resistance Test

CIRCUIT BREAKERS, AIR, INSULATED-CASE/MOLDED-CASE (LOW VOLTAGE)

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Inspect anchorage and alignment.
3. Operate breaker.
4. Verify tightness of bolted electrical connections with a calibrated torque wrench.
5. Inspect operating mechanism, contacts and arc chutes in unsealed units.
6. Verify operation of charging mechanism where applicable.
7. Perform adjustments for final protective device settings. We have included one (1) input of settings. Additional setting changes would result in additional costs.

B. Perform the following electrical testing

1. Resistance measurements through bolted connections.
2. Contact/pole resistance test.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. High current injection test. (Secondary Injection on temporarily equipment)
 - Electrical testing will be performed only on breakers rated over 225 Amp.
 - Customer must provide 480V, 1P, 100A for our primary injection test set.
 - Customer will remove and reinstall any fixed mounted breakers that require primary injection testing.

TRANSFORMERS, DRY TYPE, AIR COOLED, LOW VOLTAGE, SMALL (<500KVA).

A. Perform the following mechanical inspections.

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment, and grounding.
3. Verify that resilient mounts are free and that any shipping brackets have been removed.
4. Verify tightness of bolted electrical connections with a calibrated torque wrench.
5. Verify that as-left tap connections are as specified.

B. Perform the following electrical testing.

1. Resistance measurements through bolted electrical connections.
2. Insulation resistance tests winding to winding and each winding to ground (where possible). Calculate the polarization index.
3. Perform Turns Ratio on the as found tap.

GROUNDING SYSTEMS

A. Perform the following mechanical inspections.

1. Inspect physical and mechanical condition.
2. Verify tightness of bolted electrical connections with a calibrated torque wrench.
3. Inspect anchorage.

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Fall of potential or alternative test in accordance with ANSI/IEEE 81 on the main grounding electrode or system (if applicable).
3. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and derived neutral points.

LOW VOLTAGE AIR SWITCHES

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Inspect anchorage, alignment, grounding, and required clearances.
3. Verify correct blade alignment, blade penetration, travel stops and mechanical operation.
4. Verify that fuses sizes and types are in accordance with drawings, and all engineered studies.
5. Verify that each fuse has adequate mechanical support and contact integrity.
6. Verify tightness of bolted electrical connections with a calibrated torque wrench.
7. Verify operation and sequencing of interlocking systems.
8. Verify correct barrier installation.
9. Verify correct operation of all indicating and control devices.
10. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Measure contact resistance across each switchblade and fuseholders.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. Measure fuse resistance.
5. Perform ground fault test (if applicable).

INFRARED SCANNING (New equipment only)

In addition to the outlined services, we will perform an infrared survey of the equipment listed in accordance with NETA and project specifications and bid specifications.

Customer will provide a person to assist with removal and reinstallation of panel covers. This person is required to be:

- Qualified as defined under provisions statement in NFPA-70E.
- Must have the appropriate shock and arc flash PPE.

CLARIFICATIONS

1. Qualus is committed to a safe work environment for our personnel and in maintaining our industry leading safety record. In support of this effort, Qualus will “Move at the Speed of Safety”. If site conditions are less than ideal, requiring additional time and effort to meet typical safety standards, Qualus reserves the right to pass on any delay costs to the customer.
2. Testing and/or abatement of hazardous materials including but not limited to PCBs, asbestos, and lead paint, are not included in this proposal.
3. Utility switching fees and/or wiring permit fees, if any, are not included in this proposal and will be additional to the base contract price.
4. This proposal does not include any permitting or inspection fees.
5. Standby time is not included in this proposal. Any non-Qualus caused delays in accessing the required workspace and/or equipment once on site, such as inclement weather, de-energizing/energizing equipment for an outage, equipment malfunction, coordination between trade(s), etc. may be subject to additional charges.
6. Notice of delays or change orders will be brought to your attention before costs are incurred. The customer must provide written authorization to proceed with any additional work.
7. A charge will apply if work is cancelled within 48 hours of the scheduled date.
8. Qualus pricing does not include any work outside the substation yard.
9. Qualus to mobilize to site once all apparatus is set. Any requirement to mobilize early without all equipment in the final position will incur additional costs via Change Order.
10. Qualus pricing does not include any purchasing or transporting of SF6 gas.
11. A written purchase order or signed copy of the Work Authorization/Proposal is required before materials can be ordered and/or before site work can be performed.
12. Certain NETA testing may not be feasible and will not be performed.
13. Pricing is based on performing the scope of work listed in this quotation only. Any equipment or test procedures not explicitly listed will require a change order. Testing will be performed once on all equipment unless otherwise specified. Re-testing failed equipment will be addressed as a change order.
14. Excludes time and cost for badging, safety training, drug testing, or COVID testing.
15. Excludes load testing of any kind unless otherwise specified.
16. No retainage is agreed to or accepted for this project.
17. Ground rods must be made accessible prior to final concealment and or connection.

CUSTOMER RESPONSIBILITIES

- 1. Provide any available existing drawings of the existing switchgear.
- 2. Provide the existing Short Circuit, Coordination, and Arc Flash Study model for incorporation of the new circuit breakers and relays. If an existing study and model is not available, additional charges will apply.
- 3. Perform Isolation and LO/TO activities, witnessed and verified by Qualus personnel.
- 4. Clear and free access to the work location and parking for required vehicles.
- 5. Provide adequate site conditions clear from mud, snow, and ice, as required. This includes removal of debris, snow, or other obstructions for clear and safe access.
- 6. Provide offloading, storage, and site handling of all material delivered from Qualus.
- 7. Provide a safe, secure laydown area for Qualus supplied equipment, and materials.
- 8. Equipment must be deenergized and ready for testing prior to Qualus arriving onsite. Any deviation may require a change order.
- 9. Provide 480V, 100A, 1PH for our test set.

PROJECT SCHEDULE

- 1. The pricing is based on work being performed during normal working hours, Monday through Friday, 7:00AM-3:30PM. Work after normal working hours, Saturdays, Sundays, and Holidays is not included.
- 2. Any specific schedule or time frame offered for accomplishing the scope of work in this proposal is subject to prior sale and the availability of Qualus resources. The schedule for performance of this work scope must be confirmed with Qualus at the time of order placement.

PROJECT PRICING

Qualus proposes completing the Work Scope listed above for the following amounts:

BASE WORK SCOPE:

▪ NETA ATS (New Equipment)	\$65,750.00 Fixed
▪ NETA ATS (Temp. Equipment):	\$11,275.00 Fixed
▪ Infrared Scan (1 Tech X 1 Day X 2 Times):	\$4,900.00 Fixed
▪ Commissioning Support (1 Tech X 2 Days):	\$4,700.00 Fixed

Note:

- 1. Prices quoted are exclusive of any present or future federal or state taxes or local sales, use or excise taxes, or tariffs. If any such present or future sales, use or excise taxes, or tariffs apply, then they shall be added to the invoice as a separate item unless Purchaser has furnished an acceptable tax exemption certificate from such tax prior to shipment.

PROPOSAL ACCEPTANCE

Upon acceptance of this proposal, please send a contract/purchase order to:

Qualus Services LLC

Attn: JP Shoop

11620 Crossroads Circle

Middle River MD 21220

Fax: 410-335-4389

Email: JP.Shoop@QualusCorp.com

This proposal is considered proprietary in nature, intended for the sole use of the entity addressed above, and as such is not intended for general public distribution.

TERMS & CONDITIONS

Qualus Terms & Conditions Apply

AIA Monthly Progress Billing, Net 30 Day Terms

Freight: Prepay and Add

FOB: Factory

This proposal is valid for 45 days.

QUALUS Standard Terms & Conditions

Unless a separate agreement on terms and conditions exist between the Company and the Purchaser, the following terms and conditions shall apply to all sales by Qualus Corp. and its affiliates, including Qualus, LLC, Qualus Services, LLC, Qualus Consulting, LLC, Qualus Solutions, LLC, and Qualus Solutions of FL, LLC (collectively, hereinafter the "Company").

1. Terms of Payment – Payment terms are due thirty (30) days from the date of invoice. Company shall invoice Purchaser monthly. If payment is not made within thirty (30) days of the invoice date, a late payment charge of one and one half percent (1 1/2%) per month shall be imposed on the unpaid balance. With respect to goods purchased, pro rata payments shall become due as partial shipments are made. When shipments are delayed by the Purchaser, payment shall become due from the date the Company is prepared to make shipment. Goods which at Purchaser's request (i) are held for delayed shipment or (ii) are placed in off-site storage, will be invoiced as if shipped when originally scheduled and will be held and stored at the risk and expense of the Purchaser.

2. Payment - If, in the sole opinion of the Company, the financial condition of the Purchaser at the time the equipment is ready for shipment does not justify the terms of payment specified, then as a condition of shipment, Company may require (i) that the Purchaser provide adequate assurances of payment or (ii) payment terms satisfactory to the Company, in its sole discretion.

3. Quotations -

3.1 Quotations are void unless accepted within thirty (30) days from the date thereof, unless otherwise stated and, in the meantime, are subject to change or withdrawal upon notice. Orders made thereon are not binding until and unless accepted by the Company. Shipping dates are approximate and based upon prompt receipt of all necessary information and approved drawings whenever required. Stenographic and clerical errors are subject to correction.

3.2 Unless otherwise specified in writing, all quotes are on a straight time basis, excluding work on Saturdays, Sundays and Holidays.

4. Changes, Deletions and Extra Work – Purchaser, without invalidating the Contract, may order extra work scope and make changes in addition to or deducting from the work, and the Contract sum shall be adjusted accordingly. All such work shall be executed under the conditions of this Contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.

The value of any such extra work or change shall be determined in one or more of the following ways:

- (a) by estimate and acceptance of lump sum.
- (b) by unit prices named in the Contract or subsequently agreed upon.
- (c) by cost and percentage of cost or by cost and a fixed fee.

5. Minimum Billing Charge - The minimum billing charge shall be \$100.00.

6. Delivery - Unless otherwise specified, all products are delivered f.o.b. point of shipment regardless of transportation costs being "allowed", "pre-paid", or "collect".

7. Shipment Delays - The Company shall not be liable for delays in starting work or in shipment or non-shipment due to causes beyond its reasonable control or due to acts of God, acts of the

Purchaser, fires, strikes, labor disturbances, floods, pandemics, epidemics, quarantine restrictions, war, insurrections or riot, civil or military authority, compliance with priority orders or preference ratings issued by the Government, freight embargo's, car shortages, wrecks or delays in transportation, unusually severe weather, or inability to obtain necessary labor, materials or manufacturing facilities due to such causes or any of them. In the event of any such delay, the date of shipment will be extended, at the minimum, for a period equal to the period of the delay. The contract of sale will in no event be subject to cancellation by the Purchaser, whether due to delay in delivery or to any other cause, except by mutual agreement of the parties, nor shall the Company be liable under any circumstances for special or consequential damages on any account of delay.

8. Suspension/Cancellation – In the event Purchaser requests a suspension of work under this Contract, Purchaser shall, in writing, notify Company reasonably in advance of the suspension date; this notification will indicate the anticipated suspension period. Company shall advise Purchaser of the price adjustment resulting from the planned suspension of the work. The price adjustment will be based on Company's ability to reasonably relocate manpower, and any materials, and equipment during the suspension period. Remobilization costs will be priced on the same basis.

Purchaser may cancel this contract upon thirty (30) days written notice to the Company, and upon payment to Company of reasonable and proper cancellation charges; including but not limited to charges for engineering, testing, repair, upgrade and installation work completed, and for materials on order / in manufacture / in storage and lost profits ("Cancellation Charges").

If the financial condition of Purchaser at any time does not, in the judgment of Company, justify continuance of the work to be performed hereunder on the terms of payment agreed upon, Company may require full or partial payment in advance or shall be entitled to cancel the Contract and shall receive reimbursement for its reasonable and proper Cancellation Charges. In the event of bankruptcy or insolvency of Purchaser or in the event any proceeding is brought against the Purchaser, voluntarily or involuntarily, under the bankruptcy or any insolvency laws, Company shall be entitled to cancel the Contract at any time during the period allowed for filing claims against the estate and shall receive reimbursement for its reasonable and proper cancellation charges. Company's rights under this paragraph are in addition to all rights available to it at law or in equity.

9. Limitation of Liability - The Company shall not accept any penalty or liquidated damage clauses of any kind, or any liability arising from such clauses, unless specifically approved in writing by a duly authorized representative of the Company. The Company shall not be liable for any indirect, special, consequential, or punitive damages (including lost profits, loss of use, business interruption, lost productivity, loss of communications) arising out of or relating to this purchase (whether for breach of contract, breach of warranty, tort, negligence, or other form of action) and irrespective of whether Company has been advised of the possibility of any such damage. In no event shall the Company's liability exceed the price the Purchaser paid to the Company for the specific Goods or Services provided by the Company giving rise to the claim or cause of action.

10. Damage and Loss Claims – The Company shall not be responsible for loss, shortage, or damage after receipt of "in good order" receipts from the transportation company. The Company's

responsibility for loss, shortage, or damage ceases with the delivery to a common carrier, at which time title and risk of loss pass to the purchaser, and all claims for loss, shortage, damage, or delay must be made to the carrier by the Purchaser. Concealed damage claims must be reported to the carrier within fifteen (15) days from the date of delivery. The Company will reasonably assist the Purchaser in securing satisfactory adjustment of any claims.

11. Warranty –

11.1 The Company warrants that the (i) goods shall be as provided by the specifications provided by Purchaser and new (unless otherwise directed or permitted), and if new, without apparent damage or defect, (ii) services will be performed in accordance with the specifications provided by Purchaser and performed in a workmanlike manner. In the event Purchaser notifies Company of defective materials or workmanship within the lesser of eighteen (18) calendar months from shipment of materials or completion of the work, or twelve (12) calendar months from installation of the goods, the Company will, (i) at its option either repair or replace defective new materials, and correct the defective workmanship free of charge. Repairs or warranty work shall be performed f.o.b. factory or at a Purchaser's site, at the Company's option.

11.2 Whenever work is performed at Purchaser's site, it will be performed during a normal eight-hour straight-time day. If the Purchaser requests that product warranty work be performed during any other time period, Purchaser will be invoiced for the premium portion of the work; i.e. the difference between the applicable rate and the overtime rate for the services performed.

11.3 This warranty does not apply to, nor is any expense or other damages or liability assumed for, any goods which are used, which have been improperly stored, or installed, or from any accidental or intentional attempts to operate the goods in excess of their rating, or in any abnormal atmosphere or environments, or to which unauthorized repairs have been made whether or not such goods are defective or in accord with the specifications. Any such repairs or modifications must be authorized by the Company in writing.

11.4 This warranty does not apply to, nor is any expense or other damages or liability assumed for work performed on serviced equipment that has been subsequently serviced by another firm without authorization by the Company in writing.

12. Equipment and Materials of Others - The Company's responsibility does not extend to equipment not manufactured by the Company. The Company will reasonably assist Purchaser in making claims under any warranty provided by the supplier or manufacturer of such equipment.

12.1 The Company's responsibility does not extend to used equipment supplied in any other than "fully reconditioned" state.

12.2 THE FORGOING WARRANTY IS EXCLUSIVE AND EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES (EXCEPT TITLE), WHETHER EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE FORGOING REMEDIES OF REPAIR OR REPLACEMENT SHALL CONSTITUTE THE SOLE REMEDY OF THE PURCHASER AND SOLE LIABILITY OF THE COMPANY FOR ANY BREACH OF WARRANTY.

13. Nuclear Insurance – Indemnity - For applications in nuclear projects, the Purchaser/Owner shall have a complete and proper insurance protection against liability and

property damage resulting from a nuclear incident and shall indemnify the Company, its suppliers and subcontractors against all claims resulting from a nuclear incident.

14. Returned Goods – No goods shall be returned without the Purchaser having secured approval and terms of return from the Company. The return of all goods including, but not limited to, returnable shipping materials such as cable reels, end plates or covers, oil drums, gas bottles, etc. will not be permitted under any condition without the Company's properly executed Returned Goods Authorization Form. Goods returned without complete identification in accordance with the Company's instructions or without charges prepaid shall not be accepted. The Company reserves the right to refuse any goods returned for credit.

15. Termination - After acceptance by the Company, an order shall not be terminated, in whole or part by the Purchaser except by agreement in writing from the Company and such agreement shall be contingent upon payment of reasonable Cancellation Charges based upon expenses already incurred and commitments made by the Company plus a charge of 10% of the contract price to compensate the Company for indirect costs resulting from the termination.

16. Rescheduling - Rescheduling of an order by the Purchaser shall require agreement in writing executed by the Company and renegotiation of the price and escalation terms to reasonably cover additional costs and commitments occasioned by the change. Delivery commitments made by the Company are based upon complete specifications and/or information supplied by the Purchaser with the order and upon prompt return of approval drawings (if required by the Purchaser) by the date requested by the Company. Rescheduling of any order by the Company as a result of the Purchaser's delay in returning approval drawings shall require renegotiation of price and escalation terms to reasonably cover additional costs and commitments occasioned by the delay.

17. Drawing Approval and Changes - If at drawing approval, the Company has failed to design the product in accordance with the Purchaser's specifications, the Company shall, at its expense, make appropriate changes. Where Purchaser's specifications are not definitive, the Company reserves the right to design the product in line with, in the Company's judgment, good engineering practice. If at drawing approval, the Purchaser makes changes outside the scope of the design as covered in Purchaser's specifications, the price and delivery terms shall be renegotiated to reasonably cover any additional cost and commitments occasioned by the change. Such change must be in writing executed by the Purchaser and Company. Changes made to an order by the Purchaser after engineering is completed or entry of the order into manufacturing shall result in substantially greater costs and delivery delays.

18. Taxes - Prices quoted are exclusive of any present or future federal or state taxes or local sales, use or excise taxes, or tariffs. If any such present or future sales, use or excise taxes, or tariffs apply, then they shall be added to the invoice as a separate item unless Purchaser has furnished an acceptable tax exemption certificate from such tax prior to shipment.

19. Indemnification – Purchaser shall fully indemnify, defend and hold harmless Company, its affiliates and all of its and their respective co-owners, partners, joint venturers, officers, directors, employees and agents (collectively the "Company Indemnified Parties") from and against all claims directly or indirectly arising out of or resulting from or relating to any of the following:

- (a) Personal injury or death of any person, or damage to the extent in any way directly or indirectly arising out of or related to the negligence (of any type) or willful misconduct of Purchaser or anyone directly or indirectly employed by them or anyone for whose acts they may be liable (other than any Contractor Indemnified Parties")
- (b) Personal injury to or death of any employees of Purchaser, regardless of the cause of such damages, losses, costs, and expenses, including the sole or joint negligence, breach of contract or other basis of liability of any Contractor Indemnified Parties.

20. Dispute Resolution – Any controversy or claim arising out of or relating to this Contract, or the breach thereof, shall be settled by arbitration by the American Arbitration Association under its Commercial Arbitration Rules, and judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof. The arbitration shall be conducted in accordance with the Federal Arbitration Act, 9 U.S.C. 1 *et seq*, and the venue for the arbitration shall be the Circuit Court of Seminole County, Florida.

20.1 Both Company and Purchaser hereby knowingly, voluntarily, and intentionally waive and forever relinquish any and all claims or rights that such party may have to any trial by jury on any issue arising out of any litigation or disputes or claims under this Contract or any order or in any way associated therewith. Both parties intend to waive and forever relinquish any right under the Seventh Amendment of the United States Constitution to trial by jury and any claims or rights to a trial by jury under the constitution of any state or any other constitutional, statutory, or otherwise applicable law providing for a right to trial by jury.

21. General –

21.1 Company shall not be responsible for the acts and workmanship of the employees, contractors, subcontractors or agents of the Purchaser. The Company reserves the right to subcontractor any of the work to one or more subcontractors.

21.2 The delegation or assignment by Purchaser of any or all of its duties or rights hereunder without Company's prior written consent shall be void.

21.3 The rights and obligations of the parties under this Contract shall be interpreted and governed in all respects by the laws of the state of Florida. If either party brings against the other party any proceeding arising out of this agreement, that party may bring that proceeding only in the United States District Court for the Middle District of Florida or, only if there is no federal subject matter jurisdiction, in Circuit Court of Seminole County, Florida.

21.4 Any information, suggestions or ideas transmitted by Purchaser to Company in connection with performance hereunder are not to be regarded as secret or submitted in confidence except as may be otherwise provided in a writing signed by a duly authorized representative of Purchaser.

21.5 Company shall comply with all state and federal safety and health laws, including but not limited to the Occupational Safety and Health Act of 1970 (OSHA) and all standards, rules, regulations and orders issued pursuant to such state and federal safety and health laws and laws related to non-segregated facilities and equal employment opportunity.

21.6 This Contract contains the complete agreement between the parties and no modification, amendment, revision, waiver or other change will be binding on Company unless assented to in writing by Company's authorized representative. Any oral or written

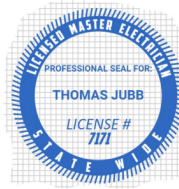
representation, warranty, course of dealing or trade usage not contained or referenced herein will not be binding on Company.

21.7 Purchaser shall obtain and pay for all necessary permits for the work to be done and shall hold company harmless from any liability for work done without said permits.

21.8 Should any term or provisions of this Contract be held invalid, illegal, or unenforceable, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby and such provision shall be ineffective only to the extent of such invalidity, illegality, or unenforceability.

INITIALS: COMPANY _____
PURCHASER _____

CL2:459754_v6
Revised February 2, 2025



A Member of the Professional Electrical Services and Management, L.L.C. (PESM) Team

Mathew Robinson

Senior Estimator

Mobile: 717-451-6179

www.ib-abel.com

Date: 12/3/25

Due Date-12/15/25

Proposal #: tjpesmprott dgs hb cap complex cup 12 3 25

Project: 25-2216 - DGS Central Plant Upgrades

Thank you for allowing us the opportunity to service you and your team. Our team has over 65 years of providing quality electrical related services to commercial, educational, institutional, mission critical data centers, and industrial buildings, in both the private and government sectors.

We will strive to insure that your electrical systems installation and maintenance, will meet the required specifications, electrical industry recommended and or required codes and standards, (such as NETA, NFPA70A, NFPA70B, NFPA70E, NFPA110, IEEE, NEMA, OSHA, ANSI, ASTM, BOCA, JACHO- as well as local jurisdictional and general insurance requirements). Our solutions are tailored to each specific client/facility. This will assist in minimizing the hazards to **life, property, and equipment for the final owners.**

Based on industry insurance reports, hundreds of millions of dollars are lost, as well as many lives lost and injuries reported, as a direct result of property owners, first-not having a properly tested new electrical system installation and second- owners not implementing a form of a recommended or required code/standard compliant Electrical Risk Management Program (ERMP) program in their facilities.

Please see below your supplied specifications and equipment drawings that reflect the 3rd party independent testing/engineering services that are required for this project. PESM has assembled a plan with multiple options for your review. Please contact us to discuss or if changes are needed. Areas **highlighted in yellow** are either comments from PESM or emphasized information. Items ~~crossed out~~ are to be completed by others.



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Were general testing or NETA type testing is noted in the specs, (unless otherwise noted) it was utilized as the bases for this testing plan. As the spec listed testing of devices that are not shown on the supplied drawings- they are excluded.

I) SPECIFICATIONS and information supplied by client: (as applicable)

SECTION 260513

MEDIUM-VOLTAGE CABLES

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.

b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.

2. Test results that comply with requirements.

3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

3.8 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal.

a. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of



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reducing natural ground resistance.

b. Perform tests by the fall-of-potential method according to IEEE 81.

4. Provide drawings locating each ground rod/plate and ground rod/plate assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods/plates driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

a. Equipment Rated 500 kVA and Less: 10 ohms.

b. Equipment Rated 500 to 1000 kVA: 5 ohms.

c. Equipment Rated More Than 1000 kVA: 3 ohms.

d. Equipment Rated More Than 600V/GND: 3 ohms.

SECTION 260543

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL AND TELECOMMUNICATION SYSTEMS

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

SECTION 261116

SECONDARY UNIT SUBSTATIONS WITH SWITCHGEAR SECONDARY

3.6 FIELD QUALITY CONTROL

A. General Field Testing Requirements:

1. Comply with provisions of NFPA 70B, "Testing and Test Methods" Chapter.

2. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

3. After installing secondary unit substation but before primary is energized, verify that grounding system at substation is tested at specified value or less.

4. After installing secondary unit substation and after electrical circuitry has been energized, test for compliance with requirements.

5. Visual and Mechanical Inspection:

a. Verify equipment nameplate data complies with Contract Documents.

b. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

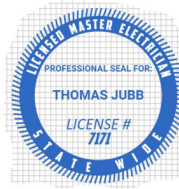
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

7. Prepare test and inspection reports. Record as-left set points of all adjustable devices.

B. Switchgear Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.



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- b. Inspect anchorage, alignment, grounding, and required area clearances.
- c. Verify unit is clean and shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.
- d. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study as well as to address of circuit breaker that is used to identify it in microprocessor-communication software.
- e. Verify that current and voltage-transformer ratios correspond to Drawings.
- f. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
 - 1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
 - 2) Make key exchange with devices operated in off-normal positions.
- g. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- h. Inspect insulators for evidence of physical damage or contaminated surfaces.
- i. Verify correct barrier and shutter installation and operation.
- j. Exercise all active components.
- k. Inspect mechanical indicating devices for correct operation.
- l. Verify that filters are in place and vents are clear.
- m. Inspect control power transformers as follows:
 - 1) Inspect for physical damage, cracked insulation, broken leads, connection tightness, defective wiring, and overall general condition.
 - 2) Verify that primary- and secondary-fuse or circuit-breaker ratings match Drawings and comply with manufacturer's recommendations.
 - 3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.
- 2. Electrical Tests:
 - a. Perform dc voltage insulation-resistance tests on each bus section, phase-to phase and phase-to-ground, for one minute. If temperature of bus is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.
 - 1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.
 - 2) Do not proceed to dielectric-withstand-voltage tests until insulation resistance levels are raised above minimum values.
 - b. Perform a dielectric-withstand-voltage test on each bus section, each phase-to ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.
 - 1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric-withstand-voltage test, test specimen is considered to have passed test.
 - c. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for



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600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's recommendation.

1) Minimum insulation-resistance values of control wiring must not be less than 2 megohms.

d. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at all devices.

2) Verify secondary voltages by energizing primary winding with system voltage.

e. Perform current-injection tests on entire current circuit in each section of switchgear.

1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 A flows in secondary circuit. Verify correct magnitude of current at each device in circuit.

2) Perform current tests by primary injection with magnitudes such that a minimum of 1.0 A flows in secondary circuit. Verify correct magnitude of current at each device in circuit.

f. Verify operation of space heaters.

g. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from each source.

C. Medium-Voltage Surge Arrester Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, grounding, and clearances.

c. Verify arresters are clean.

d. Verify that ground lead on each device is individually attached to a ground bus or ground electrode.

e. Verify that stroke counter is correctly mounted and electrically connected if applicable. Record stroke counter reading.

2. Electrical Test:

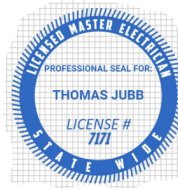
a. Perform an insulation-resistance test on each arrester, phase terminal-to-ground. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to meet recommended minimum insulation resistance listed in table.

b. Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.

3. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than this table or manufacturer's recommendations. Dielectric-withstand-voltage tests must not proceed until insulation-resistance levels are raised above minimum values.

b. Perform a contact/pole-resistance test. Compare bolted connection resistance



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values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of lowest value. Microhm or dc millivolt drop values must not exceed high levels of normal range as indicated in manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

c. Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.

d. Verify correct operation of any auxiliary features, such as electrical close and trip operation, trip-free operation, and anti-pump function. Auxiliary features must operate in accordance with manufacturer's published data.

e. Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators.

f. Perform power-factor or dissipation-factor tests on each pole with breaker open and each phase with breaker closed. Power-factor or dissipation-factor values must meet manufacturer's published data.

g. Perform vacuum bottle integrity (dielectric-withstand-voltage) test across each vacuum bottle, with contacts in "open" position in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by end of total time of voltage application during vacuum bottle integrity test, test specimen is considered to have passed test.

h. Perform a dielectric-withstand-voltage test in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric-withstand-voltage test, test specimen is considered to have passed test.

i. Verify operation of heaters.

D. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Verify correct connection of transformers with system requirements.

c. Verify that adequate clearances exist between primary and secondary circuit wiring.

d. Verify unit is clean.

e. Verify that required grounding and shorting connections provide contact.

f. Verify correct operation of transformer withdrawal mechanism and grounding operation.

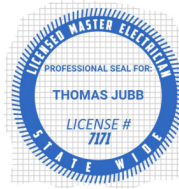
g. Verify correct primary- and secondary-fuse sizes for voltage transformers.

h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:

a. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, comply with manufacturer's recommendations. Insulation-resistance values of instrument transformers must not be less than values shown in NETA ATS, Table 100.5.

b. Perform a polarity test of each current transformer in accordance with



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IEEE C57.13.1. Polarity results must agree with transformer markings.

c. Perform a ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must comply with IEEE C57.13.

d. Perform an excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or must comply with IEEE C57.13.1.

e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. The measured burdens must match instrument transformer Accuracy Class rating.

f. Perform dielectric-withstand-voltage tests on primary winding with secondary grounded. Test voltages must comply with NETA ATS, Table 100.9. If no evidence of distress or insulation failure is observed by end of total time of voltage application, primary winding is considered to have passed test.

g. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with test equipment manufacturer's published data.

h. Verify that current-transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3.

3. Electrical Tests of Voltage and Potential Transformers:

a. Perform insulation-resistance tests winding-to-winding and each winding-toground. Apply test voltage for one minute in accordance with NETA ATS, Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's recommendations. Insulation-resistance values of instrument transformers must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.5.

b. Perform insulation-resistance tests winding-to-winding and each winding-toground. Test voltages must be applied for one minute in accordance with NETA ATS, Table 100.5. Insulation-resistance values of transformers must not be less than values shown in NETA ATS, Table 100.5.

c. Perform a polarity test on each transformer to verify polarity marks or H(1)-X(1) relationship. Polarity results must agree with transformer markings.

d. Perform a turns-ratio test on all tap positions. Ratio errors must not exceed tolerances specified in IEEE C57.13.

e. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to instrument transformer ratings. The measured burdens must match instrument transformer Accuracy Class rating.

f. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with test equipment manufacturer's published data.

g. Verify that voltage-transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3.

E. Dry-Type Transformer Section Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, and grounding.



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- c. Verify that resilient mounts are free and that any shipping brackets have been removed.
- d. Verify unit is clean.
- e. Verify that alarm, control, and trip settings on temperature and level indicators are set and operate within manufacturer's recommended settings.
- f. Verify that cooling fans operate and that fan motors have correct overcurrent protection.
- g. Perform specific inspections and mechanical tests recommended by manufacturer.
- h. Verify that as-left tap connections are as specified.
- i. Verify presence of surge arresters and that their ratings are as specified.
- 2. Electrical Tests:
 - a. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index; value of index must not be less than 1.0.
 - b. Perform power-factor or dissipation-factor tests on windings in accordance with test equipment manufacturer's published data. Investigate and correct power-factor values that exceed:
 - 1) 2.0 percent for power transformers.
 - 2) 5.0 percent for distribution transformers.
 - c. Measure core insulation resistance at 500 V(dc) if core is insulated and core ground strap is removable. Core insulation-resistance values must not be less than 1 megohm at 500 V(dc).
 - d. Perform a power-factor or dissipation-factor tip-up test on windings greater than 2.5 kV. Tip-up test result exceeding 1.0 percent must be investigated.
 - e. Perform turns-ratio tests at all tap positions. The test results must not deviate by more than one-half percent from either adjacent coils or calculated ratio. If test fails, replace transformer.
 - f. Perform an excitation-current test on each phase. The typical excitation-current test data pattern for a three-legged core transformer is two similar current readings and one lower current reading. Investigate and correct if test shows a different pattern.
 - g. Measure resistance of each winding at each tap connection.
 - h. Perform an applied-voltage test on all primary and secondary windings-to-ground. See IEEE C57.12.91, Sections 10.2 and 10.9. The ac dielectric-withstand-voltage test result must not exceed 75 percent of factory test voltage for one-minute duration. The dc dielectric-withstand-voltage test result must not exceed 100 percent of ac RMS test voltage specified in IEEE C57.12.91, Section 10.2, for one minute duration. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric-withstand-voltage test, test specimen is considered to have passed test.
 - i. Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.
- F. Low-Voltage Power Circuit-Breaker Field Tests:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, and grounding.
 - c. Verify that all maintenance devices are available for servicing and operating



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breaker.

d. Verify unit is clean.

e. Verify that arc chutes are intact.

f. Inspect moving and stationary contacts for condition and alignment.

g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.

h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.

i. Verify cell fit and element alignment.

j. Verify racking mechanism operation.

k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

l. Perform adjustments for final protective-device settings in accordance with coordination study provided by end user.

m. Record as-found and as-left operation counter readings.

2. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations must be investigated.

b. Measure contact resistance across each power contact of circuit breaker. Microhm or dc millivolt drop values must not exceed high levels of normal range as indicated in manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic must not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are not available, trip times must not exceed value shown in NETA ATS, Table 100.7.

d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic must not exceed manufacturer's published time-current tolerance band.

e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic must not exceed manufacturer's published time-current tolerance band.

f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.

g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.

h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and



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close coils must conform to manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.

i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.

j. Verify correct operation of any auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, anti-pump function, and trip unit battery condition. Reset trip logs and indicators.

Auxiliary features must operate in accordance with manufacturer's published data.

k. Verify operation of charging mechanism. The charging mechanism must operate in accordance with manufacturer's published data.

G. Metering Device Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

c. Verify unit is clean.

d. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.

b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.

c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specification

d. Verify that current-transformer and voltage-transformer secondary circuits are intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

H. Nonconforming Work:

1. Equipment will be considered defective if it does not pass tests and inspections.

2. Remove and replace defective units and retest.

I. Prepare test and inspection reports.

4. Report:

a. Prepare a written report covering monitoring performed and corrective action taken.

b. For each relay and adjustable circuit breaker, tag device with adjusting technician's initials and date of adjustment. Record settings and file with test records specified in "Field Quality Control" Article.

B. Infrared Inspection and Adjusting: Perform survey during periods of maximum possible loading. Remove all necessary covers prior to inspection.

1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of electrical power connections of unit substation.

2. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchgear 11 months after date of Substantial Completion.

3. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1.8 deg F (1 deg C) at 104 deg F (30 deg C).

4. Record of Infrared Inspection: Prepare a certified report that identifies testing technician and equipment used, and lists the following results:

a. Description of equipment to be tested.



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- b. Discrepancies.
- c. Temperature difference between area of concern and reference area.
- d. Probable cause of temperature difference.
- e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
- f. Identify load conditions at time of inspection.
- g. Provide photographs and thermograms of deficient area.
- 5. Act on inspection results in accordance with recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Client Agency's operations permit.

SECTION 261323

MEDIUM-VOLTAGE SWITCHGEAR

3.5 FIELD QUALITY CONTROL

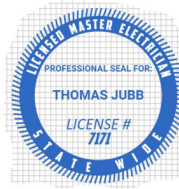
A. General Field Testing Requirements:

- 1. Comply with the provisions of NFPA 70B, "Testing and Test Methods."
- 2. After installing switchgear and after electrical circuitry has been energized, test for compliance with requirements.
- 3. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

B. Medium-Voltage Switchgear Assembly Field Tests:

1. Visual and Mechanical Inspection:

- a. Verify that fuse and switch sizes and types correspond to Drawings and coordination study, as well as to the switch's address in the control network.
- b. Verify that current and voltage transformer ratios correspond to Drawings.
- c. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
- d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
 - 1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
 - 2) Make key exchange with devices operated in off-normal positions.
- e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- f. Inspect insulators for evidence of physical damage or contaminated surfaces.
- g. Verify correct barrier and shutter installation and operation.
- h. Exercise active components.
- i. Inspect mechanical indicating devices for correct operation.
- j. Verify that filters are in place and vents are clear.
- k. Perform visual and mechanical inspection of instrument transformers in accordance with Article "Instrument Transformer Field Tests."
- l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or switch ratings match drawings.



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3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.

2. Electrical Tests:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Perform dc voltage insulation-resistance tests on each bus section, phase to phase and phase to ground, for one minute. If the temperature of the bus is other than plus or minus 20 deg C, adjust the resulting resistance as provided in NETA ATS, Table 100.11.

1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.

2) Do not proceed to the dielectric withstand voltage tests until insulation resistance levels are raised above minimum values.

c. Perform a dielectric withstand voltage test on each bus section, each phase to ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply the test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.

d. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate the applied voltage, follow the manufacturer's recommendation.

1) Minimum insulation-resistance values of control wiring must not be less than two megohms.

e. Control Power Transformers:

1) Perform insulation-resistance tests. Perform measurements from winding to winding and each winding to ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.

2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to a rated secondary voltage source. Verify correct potential at all devices.

3) Verify correct secondary voltage by energizing the primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected.

4) Verify correct function of control transfer relays located in the switchgear with multiple control power sources.



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f. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at all devices.

2) Verify secondary voltages by energizing the primary winding with system voltage.

g. Perform current-injection tests on the entire current circuit in each section of switchgear.

1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.

2) Perform current tests by primary injection with magnitudes such that a minimum of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.

h. Perform system function tests in accordance with "System Function Tests" Article.

i. Verify operation of space heaters.

j. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from each source.

3. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Insulation resistance values must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than this

table or manufacturer's recommendations. Dielectric-withstand-voltage tests must not proceed until insulation-resistance levels are raised above minimum values.

b. Perform a contact/pole-resistance test. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value. Microhm or dc millivolt drop values must not exceed the high levels of the normal range in accordance with manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

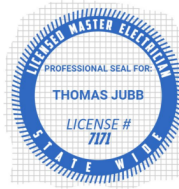
c. Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the trip and close coils must comply with manufacturer's published data. In the absence of the manufacturer's published data, comply with NETA ATS, Table 100.20.

d. Verify correct operation of any auxiliary features, such as electrical close and trip operation, trip-free operation, and anti-pump function. Auxiliary features must operate in accordance with manufacturer's published data.

e. Trip switch by operation of each protective device. Reset trip logs and indicators.

f. Perform power-factor or dissipation-factor tests on each pole with the switch open and each phase with the switch closed. Power-factor or dissipation-factor values must comply with manufacturer's published data.

g. Perform vacuum bottle integrity (dielectric-withstand-voltage) test across each vacuum bottle, with the contacts in the "open" position in accordance with manufacturer's published data. If no evidence of distress or insulation failure is



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observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.

h. Perform a dielectric-withstand-voltage test in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric-withstand-voltage test, the test specimen is considered to have passed the test.

i. Verify operation of heaters.

C. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.

b. Inspect physical and mechanical condition.

c. Verify correct connection of transformers with system requirements.

d. Verify that adequate clearances exist between primary and secondary circuit wiring.

e. Verify the unit is clean.

f. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.

Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

g. Verify that required grounding and shorting connections provide contact.

h. Verify correct operation of transformer withdrawal mechanism and grounding operation.

i. Verify correct primary and secondary fuse sizes for voltage transformers.

j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000 V(dc) for one minute. For units with solid state components that cannot tolerate the applied voltage, follow manufacturer's written recommendations. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.5.

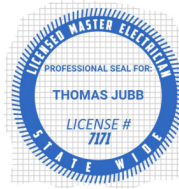
c. Perform a polarity test of each current transformer in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.

d. Perform a ratio-verification test using the voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.

e. Perform an excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match the curve supplied by the manufacturer or be in accordance with IEEE C57.13.1.

f. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared with and must match instrument transformer ratings.

g. Perform insulation-resistance tests on the primary winding with the secondary



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grounded. Test voltages must be in accordance with Table 100.5.

h. Perform dielectric withstand tests on the primary winding with the secondary grounded. Test voltages must be in accordance with Table 100.9.

i. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.

j. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by the engineer in the project drawings.

3. Electrical Tests of Voltage Transformers:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Perform insulation-resistance tests winding-to-winding and each winding to ground. Test voltages must be applied for one minute in accordance with Table 100.5. For units with solid-state components that cannot tolerate the applied voltage, follow manufacturer's recommendations. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.5.

c. Perform a polarity test on each transformer to verify the polarity marks or H1- X1 relationship as applicable. Polarity results must agree with transformer markings.

d. Perform a turns-ratio test on all tap positions. Ratio errors must be in accordance with IEEE C57.13.

e. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared with and must match instrument transformer ratings.

f. Perform a dielectric withstand test on the primary windings with the secondary windings connected to ground. The dielectric voltage must be in accordance with Table 100.9. The test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the primary windings are considered to have passed the test.

g. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use test equipment manufacturer's published data.

h. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that the circuits are grounded at only one point.

D. Ground Resistance Test:

1. Visual and Mechanical Inspection:

a. Verify ground system complies with the Contract Documents and NFPA 70 Article 250, "Grounding and Bonding."

b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.

c. Inspect bolted electrical connections using a calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.



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Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

d. Inspect anchorage.

2. Electrical Tests:

a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on the main grounding electrode or system. The resistance between the main grounding electrode and ground must be no more than 5 ohms.

b. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 ohms. Compare equipment nameplate data with Contract Documents.

c. Inspect physical and mechanical condition.

d. Inspect bolted electrical connections for high resistance using a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

E. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

d. Verify the unit is clean.

e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Verify accuracy of meters at all cardinal points. Meter accuracy must be in accordance with manufacturer's published data.

c. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.

d. Verify all instrument multipliers. Instrument multipliers must be in accordance with system design specifications.

e. Verify that current transformer and voltage transformer secondary circuits are intact. Test results must confirm the integrity of the secondary circuits of current and voltage transformers.

F. Medium-Voltage Surge Arrester Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.

b. Inspect physical and mechanical condition.

c. Inspect anchorage, alignment, grounding, and clearances.

d. Verify the arresters are clean.

e. Verify that the ground lead on each device is individually attached to a ground bus



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or ground electrode.

f. Verify that the stroke counter is correctly mounted and electrically connected if applicable. Record the stroke counter reading.

2. Electrical Test:

a. Perform an insulation-resistance test on each arrester, phase terminal to ground. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to meet recommended minimum insulation resistance listed in the table.

b. Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.

c. Test grounding connections. Resistance between the arrester ground terminal and the ground system must be less than 0.5 ohm.

G. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.

b. Verify operation of light-emitting diodes, display, and targets.

c. Record passwords for each access level.

d. Clean the front panel and remove foreign material from the case.

e. Check tightness of connections.

f. Verify that the frame is grounded in accordance with manufacturer's instructions.

g. Set the relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."

h. Download settings from the relay. Print a copy of the settings for the report and compare the settings to those specified in the coordination study.

2. Electrical Tests:

a. Perform insulation-resistance tests from each circuit to the grounded frame in accordance with manufacturer's published data.

b. Apply voltage or current to analog inputs, and verify correct registration of the relay meter functions.

c. Functional Operation: Check functional operation of each element used in the protection scheme as follows:

1) Timing Relay:

a) Determine time delay.

b) Verify operation of instantaneous contacts.

2) Volts/Hertz Relay:

a) Determine pickup frequency at rated voltage.

b) Determine pickup frequency at a second voltage level.

c) Determine time delay.

3) Sync Check Relay:

a) Determine closing zone at rated voltage.

b) Determine maximum voltage differential that permits closing at zero degrees.

c) Determine live line, live bus, dead line, and dead bus set points.

d) Determine time delay.

e) Verify dead bus/live line, dead line/live bus, and dead bus/dead line control functions.



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- 4) Undervoltage Relay:
 - a) Determine dropout voltage.
 - b) Determine time delay.
 - c) Determine time delay at a second point on the timing curve for inverse time relays.
- 5) Directional Power Relay:
 - a) Determine minimum pickup at maximum torque angle.
 - b) Determine closing zone.
 - c) Determine maximum torque angle.
 - d) Determine time delay.
 - e) Verify time delay at a second point on the timing curve for inverse time relays.
 - f) Plot the operating characteristic.
- 6) Current Balance Relay:
 - a) Determine pickup of each unit.
 - b) Determine percent slope.
 - c) Determine time delay.
- 7) Negative Sequence Current Relay:
 - a) Determine negative sequence alarm level.
 - b) Determine negative sequence minimum trip level.
 - c) Determine maximum time delay.
 - d) Verify two points on the I-two-squared-t curve.
- 8) Phase Sequence or Phase Balance Voltage Relay:
 - a) Determine positive sequence voltage to close the NO contact.
 - b) Determine positive sequence voltage to open the NC contact (undervoltage trip).
 - c) Verify negative sequence trip.
 - d) Determine time delay to close the NO contact with sudden application of 120 percent of pickup.
 - e) Determine time delay to close the NC contact upon removal of voltage when previously set to rated system voltage.
- 9) Instantaneous Overcurrent Relay:
 - a) Determine pickup.
 - b) Determine dropout.
 - c) Determine time delay.
- 10) Time Overcurrent:
 - a) Determine minimum pickup.
 - b) Determine time delay at two points on the time current curve.
- 11) Ground Detector Relay:
 - a) Determine maximum impedance to ground causing relay pickup.
- 12) Directional Overcurrent Relay:
 - a) Determine directional unit minimum pickup at maximum torque angle.
 - b) Determine closing zone.
 - c) Determine maximum torque angle.
 - d) Plot operating characteristics.
 - e) Determine overcurrent unit pickup.
 - f) Determine overcurrent unit time delay at two points on the time current curve.



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d. Control Verification:

1) Functional Tests:

- a) Check operation of all active digital inputs.
- b) Check output contacts or silicone-controlled rectifiers (SCRs), preferably by operating the controlled device, such as switch, auxiliary relay, or alarm.
- c) Check internal logic functions used in protection scheme.
- d) Upon completion of testing, reset min/max recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.

2) In-Service Monitoring: After the equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.

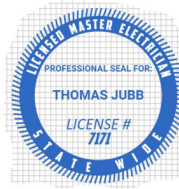
H. DC System VRLA Batteries Field Test:

1. Visual and Mechanical Inspection:

- a. Verify that batteries are adequately located.
- b. Verify that battery area ventilation system is operable.
- c. Verify existence of suitable eyewash equipment.
- d. Verify equipment nameplate data complies with Contract Documents.
- e. Inspect physical and mechanical condition.
- f. Verify adequacy of battery support racks, mounting, anchorage, alignment, grounding, and clearances.
- g. Verify the units are clean.
- h. Inspect spill containment installation.
- i. Verify application of an oxide inhibitor on battery terminal connections.

2. Electrical Tests:

- a. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended levels.
- b. Verify charger functions and that alarms comply with system manufacturer's recommendations.
- c. Measure negative post temperature. Negative post temperature must comply with manufacturer's published data or IEEE 1188.
- d. Measure charger float and equalizing voltage levels. Charger float and equalizing voltage levels must be in accordance with the battery manufacturer's published data.
- e. Measure each monoblock/cell voltage and total battery voltage with charger energized and in float mode of operation. Monoblock/cell voltages must be in accordance with manufacturer's published data.
- f. Measure intercell connection resistances.
- g. Perform internal ohmic measurement tests. Cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical cells that are in a fully charged state. Monoblock/cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical monoblocks/cells in a fully charged state.
- h. Perform a load test in accordance with manufacturer's published data or IEEE 1188. Replace units that fail to pass the test.
- i. Measure the battery system voltage from positive to ground and negative to ground. Voltage measured from positive to ground must be equal in magnitude to



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the voltage measured from negative to ground.

I. Nonconforming Work:

1. Switchgear will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.
- J. Prepare test and inspection reports. Record as-left set points of adjustable devices.

1. The contractor shall provide three (3) copies of the manufacturer's representative certification.
2. The contractor shall provide three (3) copies of the manufacturer's field startup report.
3. The contractor shall provide three (3) copies of factory test reports.

3.6 SYSTEM FUNCTION TESTS

A. System function tests must prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and all components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
3. Verify the correct operation of sensing devices, alarms, and indicating devices.

3.7 FOLLOW-UP SERVICE

A. Voltage Monitoring and Adjusting: After acceptance by the Department, but not more than six months after acceptance, if requested by the Department or Client Agency, perform the following voltage monitoring:

1. During a period of normal load cycles as evaluated by Client Agency, perform seven days of three-phase voltage recording at the outgoing section of each switchgear. Use voltmeters with calibration traceable to NIST standards and with a chart speed of not less than 1 inch (25 mm) per hour. Voltage unbalance greater than 1 percent between phases, or deviation of phase voltage from the nominal value by more than plus or minus 5 percent during the test period is unacceptable.
2. Corrective Action: If test results are unacceptable, perform the following corrective action, as appropriate:
 - a. Adjust switchgear taps.
 - b. Prepare written request for voltage adjustment by electric utility.
3. Retests: Repeat monitoring, after corrective action has been performed, until specified results are obtained.
4. Report:
 - a. Prepare a written report covering monitoring performed and corrective action taken.

B. Infrared Inspection: Perform the survey during periods of maximum possible loading. Remove covers prior to the inspection.

1. After acceptance by the Department, but not more than 60 days after acceptance, perform infrared inspection of the electrical power connections of the switchgear.
2. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1deg C at 86 deg F (30 deg C).
3. Record of Infrared Inspection: Prepare a certified report that identifies the testing technician and equipment used and lists the results as follows:
 - a. Description of equipment to be tested.
 - b. Discrepancies.



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- c. Temperature difference between the area of concern and the reference area.
- d. Probable cause of temperature difference.
- e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
- f. Identify load conditions at time of inspection.
- g. Provide photographs and thermograms of the deficient area.
- 4. Act on inspection results in accordance with the recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Client Agency's operations permit

SECTION 262200

LOW VOLTAGE TRANSFORMERS

3.3 FIELD QUALITY CONTROL

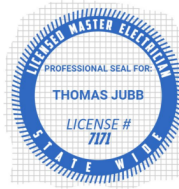
- A. Engage a qualified electrical testing and inspecting agency to administer and perform tests and inspections specified within this section, with the assistance of a factory authorized service representative.
- B. Test Objectives: To ensure transformer is operational within industry and manufacturer's tolerances, is installed according to the Contract Documents, and is suitable for energizing.
- C. Test Labeling: On satisfactory completion of tests for each transformer, attach a dated and signed "Satisfactory Test" label to tested component.
- D. Schedule tests and provide notification at least 7 days in advance of test commencement.
- E. Report: Submit a written report of observations and tests. Report defective materials and installation.
- F. Tests: Include the following minimum inspections and tests according to manufacturer's written instructions. Comply with IEEE C57.12.91 for test methods and data correction factors.
 - 1. Inspect accessible components for cleanliness, mechanical and electrical integrity, and damage or deterioration. Verify that temporary shipping bracing has been removed. Include internal inspection through access panels and covers.
 - 2. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, if not available, those specified in UL 486A and UL 486B.
 - 3. Insulation Resistance: Perform megohmmeter tests of primary and secondary winding to winding and winding to ground.
 - a. Minimum Test Voltage: 1000 V, dc.
 - b. Minimum Insulation Resistance: 500 megohms.
 - c. Duration of Each Test: 10 minutes.
 - d. Temperature Correction: Correct results for test temperature deviation from 20 deg C standard.

SECTION 262300

LOW-VOLTAGE SWITCHGEAR

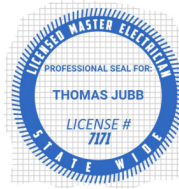
3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Comply with provisions of "Testing and Test Methods" Chapter in NFPA 70B and NETA ATS.
 - 2. After installing switchgear and after electrical circuitry has been energized, test for compliance with requirements.
 - 3. Perform visual and mechanical inspections and electrical tests stated in NETA ATS. Certify compliance with test parameters.
 - 4. Visual and Mechanical Inspection:



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- a. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study, as well as to circuit breakers address in control network.
- b. Verify that current and voltage transformer ratios correspond to Drawings.
- c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.
- d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
 - 1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
 - 2) Make key exchange with devices operated in off-normal positions.
- e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- f. Inspect insulators for evidence of physical damage or contaminated surfaces.
- g. Verify correct barrier and shutter installation and operation.
- h. Exercise active components.
- i. Inspect mechanical indicating devices for correct operation.
- j. Verify that filters are in place and that vents are clear.
- k. Perform visual and mechanical inspection of instrument transformers in accordance with "Instrument Transformer Field Tests" Paragraph.
- l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
 - 3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.
5. Electrical Tests:
 - a. Perform DC voltage insulation-resistance tests on bus sections, phase-to-phase and phase-to-ground, for one minute. If bus temperature is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.
 - 1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.
 - 2) Do not proceed to dielectric withstand voltage tests until insulation resistance levels are raised above minimum values.
 - b. Perform dielectric withstand voltage test on bus sections, phase-to-ground with phases not under test grounded, in accordance with manufacturer's published



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data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, test specimen is considered to have passed test.

c. Perform insulation-resistance tests on control wiring for ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's published instruction.

1) Minimum insulation-resistance values of control wiring may not be less than 2 MΩ.

d. Control Power Transformers:

1) Perform insulation-resistance tests. Perform measurements from winding-to winding and windings-to-ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.

2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to rated secondary voltage source. Verify correct potential at devices.

3) Verify correct secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with secondary wiring disconnected.

4) Verify correct function of control transfer relays located in switchgear with multiple control power sources.

e. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at devices.

2) Verify secondary voltages by energizing primary winding with system voltage.

f. Perform current-injection tests on entire current circuit in switchgear sections.

1) Perform current tests by secondary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.

2) Perform current tests by primary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.

g. Perform system function tests in accordance with "System Function Tests" Paragraph.

h. Verify operation of space heaters.

i. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from sources.

B. Circuit-Breaker Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, and grounding.

c. Verify that maintenance devices are available for servicing and operating breaker.

d. Verify unit is clean.



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- e. Verify that arc chutes are intact.
 - f. Inspect moving and stationary contacts for condition and alignment.
 - g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.
 - h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.
 - i. Verify cell fit and element alignment.
 - j. Verify racking mechanism operation.
 - k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - l. Perform adjustments for final protective-device settings in accordance with coordination study provided by Client Agency.
 - m. Record as-found and as-left operation counter readings.
2. Electrical Tests:
- a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across open poles. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than Table 100.1 or manufacturer's published instructions must be investigated.
 - b. Measure contact resistance across power contacts of circuit breakers. Drop values for $\mu\Omega$ or mV(dc) may not exceed high levels of normal range as indicated in manufacturer's published data. In absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
 - c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are unavailable, trip times may not exceed value shown in NETA ATS, Table 100.7.
 - d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
 - e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
 - f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.
 - g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.
 - h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.



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- i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
 - j. Verify correct operation of auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, ant pump function, and trip-unit battery condition. Reset trip logs and indicators. Auxiliary features must operate in accordance with manufacturer's published data.
 - k. Verify operation of charging mechanism. Charging mechanism must operate in accordance with manufacturer's published data.
- C. Instrument Transformer Field Tests:
- 1. Visual and Mechanical Inspection:
 - a. Verify that equipment nameplate data complies with Contract Documents.
 - b. Inspect physical and mechanical condition.
 - c. Verify correct connection of transformers with system requirements.
 - d. Verify that adequate clearances exist between primary and secondary circuit wiring.
 - e. Verify that unit is clean.
 - f. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.
 - g. Verify that required grounding and shorting connections provide contact.
 - h. Verify correct operation of transformer withdrawal mechanism and grounding operation.
 - i. Verify correct primary and secondary fuse sizes for voltage transformers.
 - j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - 2. Electrical Tests of Current Transformers:
 - a. Perform insulation-resistance test of current transformers and secondary wiring for ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
 - b. Perform polarity test on current transformers in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.
 - c. Perform ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.
 - d. Perform excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or be in accordance with IEEE C57.13.1.
 - e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared to, and must match, instrument transformer ratings.



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- f. Perform insulation-resistance tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.5.
 - g. Perform dielectric withstand tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.9.
 - h. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
 - i. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by Engineer in Project Drawings.
3. Electrical Tests of Voltage Transformers:
- a. Perform insulation-resistance tests, winding-to-winding and windings-to-ground. Test voltages must be applied for one minute in accordance with NETA ATS Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
 - b. Perform polarity test on transformers to verify polarity marks or H1-X1 relationship as applicable. Polarity results must agree with transformer markings.
 - c. Perform turns-ratio test on tap positions. Ratio errors must be in accordance with IEEE C57.13.
 - d. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to, and must match, instrument transformer ratings.
 - e. Perform dielectric withstand test on primary windings with secondary windings connected to ground. Dielectric voltage must be in accordance with NETA ATS, Table 100.9. Test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, primary windings are considered to have passed test.
 - f. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use test equipment manufacturer's published data.
 - g. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that circuits are grounded at only one point.
- D. Ground-Resistance Test:
1. Visual and Mechanical Inspection:
- a. Verify that ground system complies with Contract Documents and with Article 250, "Grounding and Bonding," in NFPA 70.
 - b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.
 - c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or



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NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Inspect anchorage.

2. Electrical Tests:

a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on main grounding electrode or system. Resistance between main grounding electrode and ground must be no more than 5 Ω .

b. Perform point-to-point tests to determine resistance between main grounding system and major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 Ω . Compare equipment nameplate data with the Contract Documents.

c. Inspect physical and mechanical condition.

d. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

E. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

d. Verify that unit is clean.

e. Verify freedom of movement, end play, and alignment of rotating disk(s).

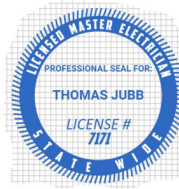
2. Electrical Tests:

a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.

b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.

c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specifications.

d. Verify that current transformer and voltage transformer secondary circuits are



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intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

F. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

- a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.
- b. Verify operation of LEDs, display, and targets.
- c. Record passwords for each access level.
- d. Clean front panel and remove foreign material from case.
- e. Check tightness of connections.
- f. Verify that frame is grounded in accordance with manufacturer's published instructions.
- g. Set relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."
- h. Download settings from relay. Print copy of settings for report and compare settings to those specified in coordination study.

2. Electrical Tests:

- a. Perform insulation-resistance tests from circuits to grounded frame in accordance with manufacturer's published data.
- b. Apply voltage or current to analog inputs, and verify correct registration of relay meter functions.
- c. Check functional operation of elements used in protection scheme as follows:
 - 1) ANSI No. 2/62, Timing Relay:
 - a) Determine time delay.
 - b) Verify operation of instantaneous contacts.
 - 2) ANSI No. 24, Volts/Hertz Relay:
 - a) Determine pickup frequency at rated voltage.
 - b) Determine pickup frequency at second voltage level.
 - c) Determine time delay.
 - 3) ANSI No. 25, Sync Check Relay:
 - a) Determine closing zone at rated voltage.
 - b) Determine maximum voltage differential that permits closing at zero degrees.
 - c) Determine set points of live line, live bus, dead line, and dead bus.
 - d) Determine time delay.
 - e) Verify control functions of dead bus/live line, dead line/live bus, and dead bus/dead line.
 - 4) ANSI No. 27, Undervoltage Relay:
 - a) Determine dropout voltage.
 - b) Determine time delay.
 - c) Determine time delay at second point on timing curve for inverse time relays.
 - 5) ANSI No. 32, Directional Power Relay:
 - a) Determine minimum pickup at maximum torque angle.
 - b) Determine closing zone.
 - c) Determine maximum torque angle.
 - d) Determine time delay.
 - e) Verify time delay at second point on timing curve for inverse time



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relays.

f) Plot operating characteristic.

6) ANSI No. 46, Current Balance Relay:

a) Determine pickup of unit.

b) Determine percent slope.

c) Determine time delay.

7) ANSI No. 46N, Negative Sequence Current Relay:

a) Determine negative sequence alarm level.

b) Determine negative sequence minimum trip level.

c) Determine maximum time delay.

d) Verify two points on I_2T curve.

8) ANSI No. 47, Phase Sequence or Phase Balance Voltage Relay:

a) Determine positive sequence voltage to close N.O. contact.

b) Determine positive sequence voltage to open N.C. contact (undervoltage trip).

c) Verify negative sequence trip.

d) Determine time delay to close N.O. contact with sudden application of 120 percent of pickup.

e) Determine time delay to close N.C. contact on removal of voltage when previously set to rated system voltage.

9) ANSI No. 50, Instantaneous Overcurrent Relay:

a) Determine pickup.

b) Determine dropout.

c) Determine time delay.

10) ANSI No. 51, Time Overcurrent:

a) Determine minimum pickup.

b) Determine time delay at two points on time current curve.

11) ANSI No. 64, Ground Detector Relay:

a) Determine maximum impedance to ground causing relay pickup.

12) ANSI No. 67, Directional Overcurrent Relay:

a) Determine directional unit minimum pickup at maximum torque angle.

b) Determine closing zone.

c) Determine maximum torque angle.

d) Plot operating characteristics.

e) Determine overcurrent unit pickup.

f) Determine overcurrent unit time delay at two points on time current curve.

13) ANSI No. 87, Differential Relay:

a) Determine operating unit pickup.

b) Determine operation of restraint unit.

c) Determine slope.

d) Determine harmonic restraint.

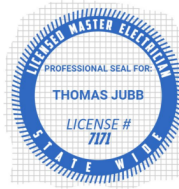
e) Determine instantaneous pickup.

d. Control Verification:

1) Functional Tests:

a) Check operation of active digital inputs.

b) Check output contacts or SCRs, preferably by operating controlled device, such as circuit breaker, auxiliary relay, or alarm.



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- c) Check internal logic functions used in protection scheme.
- d) On completion of testing, reset minimum/maximum recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.
- 2) In-Service Monitoring: After equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.
- G. Ground-Fault Protection Field Tests: Evaluate interconnected system in accordance with switchgear manufacturer's published instructions.
 - 1. Determine proper location of sensors around bus of circuit to be protected. This determination may be done visually, with knowledge of which bus is involved.
 - 2. Verify grounding points of system to determine that ground paths do not exist that would bypass sensors. Use high-voltage testers and resistance bridges.
 - 3. Test installed system for correct response by application of full-scale current into equipment to duplicate ground-fault condition, or by equivalent means such as by simulated fault current generated by the following:
 - a. A coil around sensors
 - b. A separate test winding in sensors.
 - 4. Record test results on test form provided with instructions provided by manufacturer.
- H. System Function Tests: Perform system function tests after other field quality-control tests have been completed and components have passed specified tests. Verify correct interaction of sensing, processing, and action devices.
 - 1. Develop test parameters and perform tests for purpose of evaluating performance of integral components and their functioning as complete unit within design requirements and manufacturer's published data.
 - 2. Verify correct operation of interlock safety devices for fail-safe functions in addition to design function.
 - 3. Verify correct operation of sensing devices, alarms, and indicating devices.

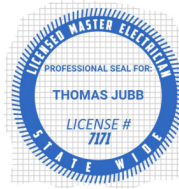
SECTION 262413

SWITCHBOARDS

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

- 1. Comply with provisions of "Testing and Test Methods" Chapter in NFPA 70B and NETA ATS.
- 2. After installing switchboard and after electrical circuitry has been energized, test for compliance with requirements.
- 3. Perform visual and mechanical inspections and electrical tests stated in NETA ATS. Certify compliance with test parameters.
- 4. Visual and Mechanical Inspection:
 - a. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study, as well as to circuit breaker's address in control network.
 - b. Verify that current and voltage transformer ratios correspond to Drawings.
 - c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated



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torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.

2) Make key exchange with devices operated in off-normal positions.

e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

f. Inspect insulators for evidence of physical damage or contaminated surfaces.

g. Verify correct barrier and shutter installation and operation.

h. Exercise active components.

i. Inspect mechanical indicating devices for correct operation.

j. Verify that filters are in place and that vents are clear.

k. Perform visual and mechanical inspection of instrument transformers in accordance with "Instrument Transformer Field Tests" Paragraph.

l. Inspect control power transformers.

1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.

2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.

3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.

5. Electrical Tests:

a. Perform DC voltage insulation-resistance tests on bus sections, phase-to-phase and phase-to-ground, for one minute. If bus temperature is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.

1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.

2) Do not proceed to dielectric withstand voltage tests until insulation-resistance levels are raised above minimum values.

b. Perform dielectric withstand voltage test on bus sections, phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, test specimen is considered to have passed test.

c. Perform insulation-resistance tests on control wiring for ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's published instruction.



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- 1) Minimum insulation-resistance values of control wiring may not be less than 2 MΩ.
- d. Control Power Transformers:
 - 1) Perform insulation-resistance tests. Perform measurements from winding-to winding and windings-to-ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.
 - 2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to rated secondary voltage source. Verify correct potential at devices.
 - 3) Verify correct secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with secondary wiring disconnected.
 - 4) Verify correct function of control transfer relays located in switchboard with multiple control power sources.
- e. Voltage Transformers:
 - 1) Perform secondary wiring integrity test. Verify correct potential at devices.
 - 2) Verify secondary voltages by energizing primary winding with system voltage.
- f. Perform current-injection tests on entire current circuit in switchboard sections.
 - 1) Perform current tests by secondary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.
 - 2) Perform current tests by primary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.
- g. Perform system function tests in accordance with "System Function Tests" Paragraph.
- h. Verify operation of space heaters.
- i. Perform phasing checks on double-ended or dual-source switchboard to ensure correct bus phasing from sources.
- B. Circuit-Breaker Field Tests:
 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, and grounding.
 - c. Verify that maintenance devices are available for servicing and operating breaker.
 - d. Verify unit is clean.
 - e. Verify that arc chutes are intact.
 - f. Inspect moving and stationary contacts for condition and alignment.
 - g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.
 - h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.
 - i. Verify cell fit and element alignment.
 - j. Verify racking mechanism operation.
 - k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - l. Perform adjustments for final protective-device settings in accordance with



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coordination study provided by Client Agency.

m. Record as-found and as-left operation counter readings.

2. Electrical Tests:

- a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across open poles. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than Table 100.1 or manufacturer's published instructions must be investigated.
- b. Measure contact resistance across power contacts of circuit breakers. Drop values for $\mu\Omega$ or mV(dc) may not exceed high levels of normal range as indicated in manufacturer's published data. In absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are unavailable, trip times may not exceed value shown in NETA ATS, Table 100.7.
- d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
- e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
- f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.
- g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.
- h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.
- i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
- j. Verify correct operation of auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, ant pump function, and trip-unit battery condition. Reset trip logs and indicators. Auxiliary features must operate in accordance with manufacturer's published data.
- k. Verify operation of charging mechanism. Charging mechanism must operate in accordance with manufacturer's published data.

C. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

- a. Verify that equipment nameplate data complies with Contract Documents.



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- b. Inspect physical and mechanical condition.
- c. Verify correct connection of transformers with system requirements.
- d. Verify that adequate clearances exist between primary and secondary circuit wiring.
- e. Verify that unit is clean.
- f. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.
- g. Verify that required grounding and shorting connections provide contact.
- h. Verify correct operation of transformer withdrawal mechanism and grounding operation.
- i. Verify correct primary and secondary fuse sizes for voltage transformers.
- j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- 2. Electrical Tests of Current Transformers:
 - a. Perform insulation-resistance test of current transformers and secondary wiring for ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
 - b. Perform polarity test on current transformers in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.
 - c. Perform ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.
 - d. Perform excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or be in accordance with IEEE C57.13.1.
 - e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared to, and must match, instrument transformer ratings.
 - f. Perform insulation-resistance tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.5.
 - g. Perform dielectric withstand tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.9.
 - h. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
 - i. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by Engineer in Project Drawings.
- 3. Electrical Tests of Voltage Transformers:
 - a. Perform insulation-resistance tests, winding-to-winding and windings-to-ground. Test voltages must be applied for one minute in accordance with NETA ATS



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Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.

- b. Perform polarity test on transformers to verify polarity marks or H1-X1 relationship as applicable. Polarity results must agree with transformer markings.
- c. Perform turns-ratio test on tap positions. Ratio errors must be in accordance with IEEE C57.13.
- d. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to, and must match, instrument transformer ratings.
- e. Perform dielectric withstand test on primary windings with secondary windings connected to ground. Dielectric voltage must be in accordance with NETA ATS, Table 100.9. Test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, primary windings are considered to have passed test.
- f. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use test equipment manufacturer's published data.
- g. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that circuits are grounded at only one point.

D. Ground-Resistance Test:

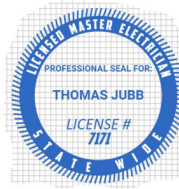
1. Visual and Mechanical Inspection:

- a. Verify that ground system complies with Contract Documents and with Article 250, "Grounding and Bonding," in NFPA 70.
- b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.
- c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Inspect anchorage.

2. Electrical Tests:

- a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on main grounding electrode or system. Resistance between main grounding electrode and ground must be no more than 5 Ω .
- b. Perform point-to-point tests to determine resistance between main grounding system and major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 Ω . Compare equipment nameplate data with the Contract Documents.
- c. Inspect physical and mechanical condition.



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d. Inspect bolted electrical connections for high resistance using one of the following two methods:

- 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

E. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

- a. Inspect physical and mechanical condition.
- b. Inspect bolted electrical connections for high resistance using one of the following two methods:

- 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

d. Verify that unit is clean.

e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

- a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.
- b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.
- c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specifications.
- d. Verify that current transformer and voltage transformer secondary circuits are intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

F. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

- a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.
- c. Record passwords for each access level.
- d. Clean front panel and remove foreign material from case.
- e. Check tightness of connections.
- f. Verify that frame is grounded in accordance with manufacturer's published instructions.
- g. Set relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."



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h. Download settings from relay. Print copy of settings for report and compare settings to those specified in coordination study.

2. Electrical Tests:

a. Perform insulation-resistance tests from circuits to grounded frame in accordance with manufacturer's published data.

b. Apply voltage or current to analog inputs, and verify correct registration of relay meter functions.

c. Check functional operation of elements used in protection scheme as follows:

1) ANSI No. 2/62, Timing Relay:

a) Determine time delay.

b) Verify operation of instantaneous contacts.

2) ANSI No. 24, Volts/Hertz Relay:

a) Determine pickup frequency at rated voltage.

b) Determine pickup frequency at second voltage level.

c) Determine time delay.

3) ANSI No. 25, Sync Check Relay:

a) Determine closing zone at rated voltage.

b) Determine maximum voltage differential that permits closing at zero degrees.

c) Determine set points of live line, live bus, dead line, and dead bus.

d) Determine time delay.

e) Verify control functions of dead bus/live line, dead line/live bus, and dead bus/dead line.

4) ANSI No. 27, Undervoltage Relay:

a) Determine dropout voltage.

b) Determine time delay.

c) Determine time delay at second point on timing curve for inverse time relays.

5) ANSI No. 32, Directional Power Relay:

a) Determine minimum pickup at maximum torque angle.

b) Determine closing zone.

c) Determine maximum torque angle.

d) Determine time delay.

e) Verify time delay at second point on timing curve for inverse time relays.

Plot operating characteristic.

6) ANSI No. 46, Current Balance Relay:

a) Determine pickup of unit.

b) Determine percent slope.

c) Determine time delay.

7) ANSI No. 46N, Negative Sequence Current Relay:

a) Determine negative sequence alarm level.

b) Determine negative sequence minimum trip level.

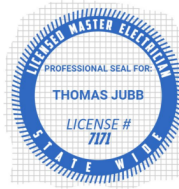
c) Determine maximum time delay.

d) Verify two points on I_2T curve.

8) ANSI No. 47, Phase Sequence or Phase Balance Voltage Relay:

a) Determine positive sequence voltage to close N.O. contact.

b) Determine positive sequence voltage to open N.C. contact



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(undervoltage trip).

c) Verify negative sequence trip.

d) Determine time delay to close N.O. contact with sudden application of 120 percent of pickup.

e) Determine time delay to close N.C. contact on removal of voltage when previously set to rated system voltage.

9) ANSI No. 50, Instantaneous Overcurrent Relay:

a) Determine pickup.

b) Determine dropout.

c) Determine time delay.

10) ANSI No. 51, Time Overcurrent:

a) Determine minimum pickup.

b) Determine time delay at two points on time current curve.

11) ANSI No. 64, Ground Detector Relay:

a) Determine maximum impedance to ground causing relay pickup.

12) ANSI No. 67, Directional Overcurrent Relay:

a) Determine directional unit minimum pickup at maximum torque angle.

b) Determine closing zone.

c) Determine maximum torque angle.

d) Plot operating characteristics.

e) Determine overcurrent unit pickup.

f) Determine overcurrent unit time delay at two points on time current curve.

13) ANSI No. 87, Differential Relay:

a) Determine operating unit pickup.

b) Determine operation of restraint unit.

c) Determine slope.

d) Determine harmonic restraint.

e) Determine instantaneous pickup.

d. Control Verification:

1) Functional Tests:

a) Check operation of active digital inputs.

b) Check output contacts or SCRs, preferably by operating controlled device, such as circuit breaker, auxiliary relay, or alarm.

c) Check internal logic functions used in protection scheme.

d) On completion of testing, reset minimum/maximum recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.

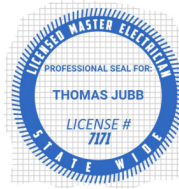
2) In-Service Monitoring: After equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.

G. Ground-Fault Protection Field Tests: Evaluate interconnected system in accordance with switchboard manufacturer's published instructions.

1. Determine proper location of sensors around bus of circuit to be protected. This determination may be done visually, with knowledge of which bus is involved.

2. Verify grounding points of system to determine that ground paths do not exist that would bypass sensors. Use high-voltage testers and resistance bridges.

3. Test installed system for correct response by application of full-scale current into equipment to duplicate ground-fault condition, or by equivalent means such as by



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simulated fault current generated by the following:

- a. A coil around sensors.
- b. A separate test winding in sensors.
4. Record test results on test form provided with instructions provided by manufacturer.
- H. System Function Tests: Perform system function tests after other field quality-control tests have been completed and components have passed specified tests. Verify correct interaction of sensing, processing, and action devices.
 1. Develop test parameters and perform tests for purpose of evaluating performance of integral components and their functioning as complete unit within design requirements and manufacturer's published data.
 2. Verify correct operation of interlock safety devices for fail-safe functions in addition to design function.
 3. Verify correct operation of sensing devices, alarms, and indicating devices.
- I. Nonconforming Work:
 1. Switchboard components will be considered defective if they do not pass tests and inspections.
 2. Remove and replace defective units and retest.
- J. Collect, assemble, and submit test and inspection reports. Record as-left set points of adjustable devices.
- B. Infrared Inspection: Perform survey during periods of maximum possible loading. Remove covers prior to inspection.
 1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of electrical power connections of switchboard.
 2. Instrument: Inspect distribution systems with imaging equipment capable of detecting minimum temperature difference of 1 deg C at 30 deg C.
 3. Record of Infrared Inspection: Prepare certified report that identifies testing technician and equipment used and that lists results as follows:
 - a. Description of equipment to be tested.
 - b. Discrepancies.
 - c. Temperature difference between area of concern and reference area.
 - d. Probable cause of temperature difference.
 - e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
 - f. Identify load conditions at time of inspection.
 - g. Provide photographs and thermograms of deficient area.
 4. Act on inspection results in accordance with recommendations in NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Client Agency's operations permit. Retest until deficiencies are corrected.
 5. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of switches 11 months after date of Substantial Completion.

SECTION 262416

PANELBOARDS

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.



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C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After acceptance by the Department, but not more than 60 days after acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of acceptance by the Department.
- c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

SECTION 262500

ENCLOSED BUS ASSEMBLIES

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Remove and replace units that do not pass tests and inspections and retest as specified above.
- D. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of bus assembly including joints and plug-in units.
 1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
 2. Perform 2 follow-up infrared scans of bus assembly, one at 4 months and the other at 11 months after Substantial Completion.
 3. Prepare a certified report identifying bus assembly checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.
- E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
 2. Test continuity of each line- and load-side circuit.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated



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in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

SECTION 262913

ENCLOSED CONTROLLERS

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports: Retain first two paragraphs below to describe tests and inspections to be performed.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.

2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.

3. Test continuity of each circuit.

4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Using Agency before starting the motor(s).

5. Test each motor for proper phase rotation.

6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each multi-pole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.

b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multi-pole enclosed controller 11 months after date of Substantial Completion.

c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed controllers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

SECTION 262923

VARIABLE-FREQUENCY MOTOR CONTROLLERS

3.8 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:



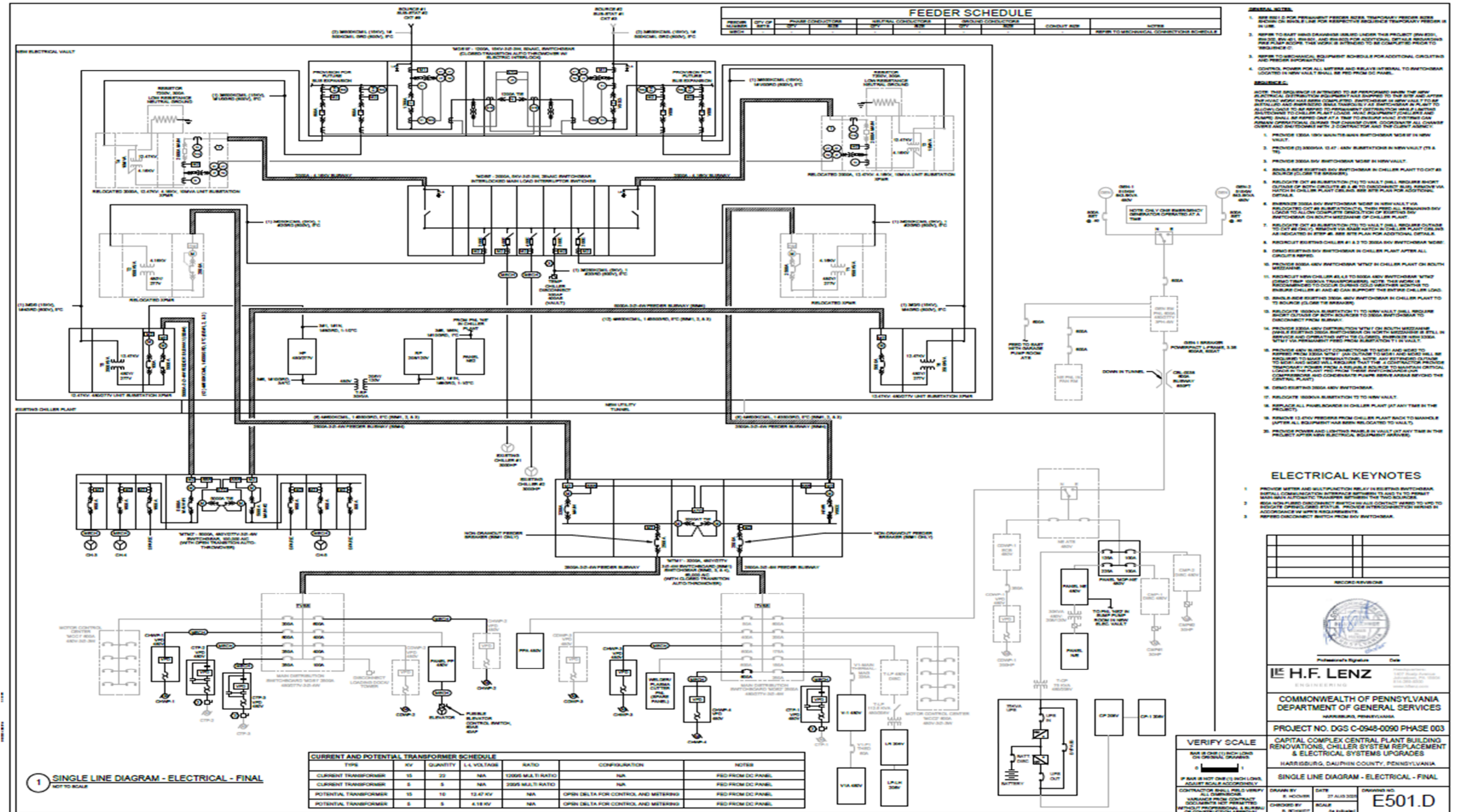
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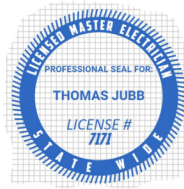
1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
 3. Report results in writing.
- C. Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS. Certify compliance with test parameters.



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DRAWING NEW EQUIPMENT:





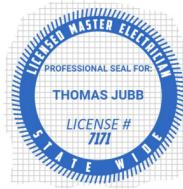
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EQUIPMENT SUPPLIED EQUIPMENT LIST WITH OUR ADDED NOTES HIGHLIGHTED IN YELLOW

es from client:
equipment list below does not include the existing MV transformers and Gear to be altered, relocated and reused.
on testing all transformers for re-installation before removal and after re-installation.
will be testing the Temp 5kV safety switch before and after usage and completion of that phase of work.
on testing the temporary trailer and transformer.
are required to offer two options for the 480V gear...conduit/wire and buss. Plan to test both options. If there is a difference please call that price
in your quote.
specs for further acceptance testing requirements.

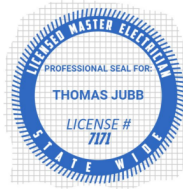
**Equipment List
Panels**

MDP-NE Panelboard Main Lugs Only Surface Mount 600A 480V
LP-LH Panelboard Main Lugs Only Surface Mount 250V 400A
CP Panelboard Main Breaker Surface Mount 250V 175A
V-1 RH Panelboard Main Lugs Only Surface Mount 480V
LR Panelboard Main Breaker Surface Mount 250V 400A
CP-1 Panelboard Main Breaker Surface Mount 250V 100A
V-1 Panelboard Main Breaker Surface Mount 250V 125A
PP Panelboard Main Breaker Only Surface Mount 300A 480V
Welder/Plasma Cutter Panel MLO Surface Mount 480V 250A
V1A Panel MLO Surface Mount 480V 250A
N/E Panelboard Main Lugs Only Surface Mount 250V 225A
NE2 Panelboard Main Breaker Surface Mount 250V 50A
NE Panelboard Main Breaker Surface Mount 250V 225A
RP Panelboard Main Breaker Surface Mount 250V 100A
HP Panel MLO Surface Mount 480V 100A
DC Panelboard Main Breaker Surface Mount 125V DC 50A
Switchgear & relays,ct/pt, cntrl wires



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MTM2 480V 5000A Service Switchgear*
MTM1 480V 3200A Service Switchgear*
MDS15 15KV 1200A Service Switchgear*
MDS5 5KV 2000A Service Switchgear*
Safety Switches
Temp Chiller 5kv Fused Safety Switch- test 2-times
Mechanical Equipment Safety Switches
AHU-6 30AMP 120V Single Phase
EF-1 480V 30Amp 3-phase
EF-2 480V 30Amp 3-phase
EF-3A 480V 30Amp 3-phase
EF-3B 480V 30Amp 3-phase
EF-3C 480V 30Amp 3-phase
EF-3D 480V 30Amp 3-phase
Elevator Power Unit 480V 60Amp 3-phase 40AMP Fuses
Foundation Pump 480V 30Amp 3-phase
TF-1 120V 30Amp 1-phase
TF-2 120V 30Amp 1-phase
Vault Pump 480V 30Amp 3-phase
Transformers
T-RP 30KVA Transformer Wall Mount 480V Primary
T-5 3500KVA New Transformer 15kv to 480v
T-6 3500KVA New Transformer 15kv to 480v
UPS System
75KVA UPS by OEM
1-Temp trailer-sw brd & transf
2-cable/bus sections:5kv
6-cable/bus sections:600v
4-existing transf/sw gear to be moved & relocated- test 2-times



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8-sets mv cable
20-sets lv cable
1-main grnd 3pt tst
10-equip grnd 2-pt tst
2-vfd's

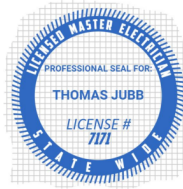
stments:

Acceptance testing-\$159,000

Infrared thermal scans of new equipment per spec- 2 in 11 month window-\$25,900 (client to supply qualified person tto remove/install covers during scans- approx. 14- 8hr days)

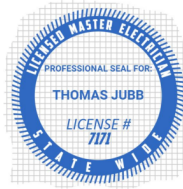
TES: (as applicable the specific project work scope)

1. Customer cancellations &/or rescheduling will be subject to an additional fee; 24 to 48 hours prior to scheduled outage - 10% of contract amount. 24 hours or less prior to scheduled outage – 25% of contract amount.
2. Equipment not shown on supplied drawings
3. Equipment excluded-motors, lv riser panels/br panels-or related breakers or branch cables, vfd's, ups, sw/pnl brds/brkrs
4. Retesting, parts, repairs, man hole entry,
5. Client to remove/install covers during IR scans



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6. Unless there is an emergency situation , we request a minimum of 48 hours' notice for the scheduling of non-emergency/normal services.
7. Site specific training, access, and/or security requirements, commissioning, as well as costs for testing for illnesses and/or disease are not included in this proposal.
8. Applicable taxes are not included in this proposal.
9. Credit card payments will be assessed a 3% processing fee (2/1/19 Implementation Date) accepted: Visa, Mastercard, American Express (4%).
10. If applicable: the cost of developing test plans is excluded from this proposal.
11. We require a minimum of 8 hours of ready work per day.
12. Provide reasonable parking and sanitary facilities for our technicians.
13. Provide test plans/procedures to us if applicable.
- 14. Client to supply all information for the Engineering studies**
15. Excluded: voltage/current recordings, power quality meters, static ups, engineering studies/device settings, commissioning, retests, -IR may be used in lieu of torquing main connections,
All investments are based on trained TT technicians.
All investments are based upon all work performed during normal business hours, Monday through Friday, 7am-3:30pm
All investments include 1- service vehicle.



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Information is shared with the receiving party. The information contained therein, nor any proprietary information furnished pursuant thereto, shall be disclosed to others or used for any purpose other than set forth above without approval. We sincerely appreciate the opportunity of submitting this proposal and hope that we may have the pleasure of serving you.

Respectfully,

Thomas Jubb

Professional Electrical Services and Management, L.L.C. (PESM)

Victory Gallop Court

Frederick, MD 21078

Contact: Thomas Jubb, ME, SE, FM

tjubbpesm@outlook.com

Phone: 443-417-6265

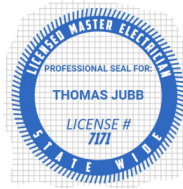
Please assign all purchase orders to Team Member:

Matthew McDermott

410-992-5980

Matthew McDermott <tacticaltestingllc@outlook.com>

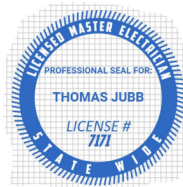
tactical-testing.com -619 Waterside Ct., Balto., MD 21220



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Terms and Conditions:

- **Terms of payment: 1:** Terms are net thirty (30) days. If invoice payment is not received within thirty (30) days, a service charge of 1.5% will be added to the outstanding balance. Based on project work scope, partial invoicing may be implemented.
- **Cancellations:** Cancellations of agreed services must be received twenty-four (24) hours prior to the agreed date and time. Professional Electrical Services and Management's costs plus ten percent (10%), and any rental fee charges will be incurred.
- **Delays:** Professional Electrical Services and Management shall be made aware of delays twenty-four (24) hours prior to site visit or charges will be incurred. Our employees are entitled to a minimum of four (4) hours for time missed to no fault of their own, acts of God, terrorism.
- **Standby time:** Service charges will be incurred if Professional Electrical Services and Management employees cannot perform the services requested due to no fault of their own. Overtime rates will be charged, if necessary, to complete services scheduled for that day.
- **Safety:** Professional Electrical Services and Management employees agree to follow all job specific, state, federal, rules and regulations. Professional Electrical Services and Management employees reserve the right not to perform work that in their trained opinion violates standard safety rules of the trade.
- **Disclaimer:** Professional Electrical Services and Management assumes no responsibility for any damage or injury to any property caused directly or indirectly as a result of Professional Electrical Services and Management performing its duties under this agreement except such damage or injury that may be held to result solely and directly from or out of: Any grossly negligent performance by Professional Electrical Services and Management its obligations under this Agreement or any willful misconduct on the part of Professional Electrical Services and Management, its agents or employees.
- **Responsibility:** All services are performed in accordance with industry standards, project specifications and/or NETA specifications. Where remediation is beyond the scope of normal reliability testing, and where corrective action is required, such services will be quoted separately.
- **Scheduling:** PESM requires a minimum of 48 hours of non-emergency/normal work scheduling notice.



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AUTHORIZATION TO PROCEED

Project: _____

Site Address: _____

Site Contact/Phone: _____ Office Contact/Phone: _____

We instruct TT to proceed with scheduling and performing the work described in the attached proposal.

Proposed date to begin work: _____

Alternate date: _____

Investment reimbursement will be by: (check one)

Company Name: _____

A) Company check before project start date ☐

Number/\$Amount: _____

B) Purchase ☐ or Service ☐ order

Number/\$Amount: _____

C) Charge card: Visa ☐ Master ☐ Other ☐

Number/\$Amount: _____

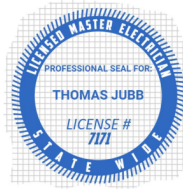
Billing/Company Address: _____

Authorization Signature: _____

Printed Name: _____

Title (Please Print): _____

Date: _____ Phone: _____ Email: _____



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Professional Electrical Services and Management, L.L.C.

(PESM)



(Master Licensed services for Private/Governmental, Industrial, Commercial, Contractor and Residential Client's)



I) PESM- "ELECTRICAL PROJECT SERVICES and MANAGEMENT": All project services will be reviewed and stamped by a "Licensed Master Electrical Manager"

- *Commissioning/Management – testing-new electrical systems, EV charging systems, solar/wind power projects, maintenance
- *Development/Interpretation of specifications — electrical related projects, maintenance, engineering, equipment evaluation
- *Project Management — all electrical related services and projects
- *Estimating/ Project Procurement Services— electrical services, maintenance, procurement development and reviews
- *Proposal Development — electrical services, maintenance, engineering, equipment verifications
- *Electrical System Inspections/ Assessments- Insurance requirements, real estate transactions, new construction, existing systems
- *Consulting - Codes/Standards compliance, training, specifications, RFP's, OSHA safety programs, new and existing system's

II) PESM- "ELECTRICAL SALES, MARKETING and CLIENT RETENTION SERVICES":

- *Sales assistance with perspective/existing clients— estimating, proposal development, client site visits, agreement negotiations, client retention services
- *Sales Training, Marketing Support-customer relationship management (CRM programs)- information input and management
- *Marketing Plan Development, Client Retention and Management— growing new client base, fostering relationships with client's, creating client retention and referral programs to assist in growing your business

III) PESM- "ELECTRICAL PRODUCTS" and "TEAM MEMBERS"

- *Power Quality Meters
- *Electrical Equipment Replacement, Retrofit, Retro Fills
- *Custom Code/Standards Compliant Field Labels
- *NRTL Labeling (UL)



MISSION STATEMENT:

To ensure our professional licensed electrical, technical, management, and marketing services, assist with the growth and continued success of your business, while protecting your assets.

Providing client assurance that their electrical systems will meet the current industry codes and standards while operating safely and efficiently, thus minimizing their liabilities.



SCHNEIDER ELECTRIC

Philadelphia Branch
125 Rock Rd.
Horsham, PA 19044
Phone: (215) 443-0442
Fax: (215) 443-0995

January 20, 2026

Attention: Mathew Robinson

C/O: IB Abel

Project: State Capitol Central Plant Upgrades – Security

General Scope of the Project:

Schneider Electric will provide material and labor to install the new access control equipment for the above-referenced project.

Scope of Work:

- Schneider Electric will provide and install one (1) access control dual reader module to support two (2) new door locations.
 - This proposal assumes that this reader module will connect to an existing intelligent controller and be installed within an existing enclosure.
- Schneider Electric will provide the card readers, door contacts, request-to-exit buttons and miscellaneous material.
- Schneider Electric will program and test the system to make sure it is in working condition.
- Schneider Electric will provide the appropriate Open Options subcontroller license.
- Schneider Electric will provide the appropriate Verint PSIM system licenses.

Exclusions:

- The electrical installation including cable pathway, cable and cable pulling, as well as any supporting devices are excluded from this proposal.
- Device installation will be executed by others and is excluded from this proposal.
- Electronic lock procurement and installation is excluded this proposal.
- 2026 Prevailing wage and certified payroll are excluded from this proposal.
- Taxes are excluded from this proposal.
- Overtime or premium labor is excluded.
- Patching, painting and all general construction will be done by others.

Investment Pricing:

Base Price.....\$9,100.00

Pricing is valid for thirty (30) days.

Please feel free to contact me at any time with questions or concerns regarding this proposal. I can be reached by phone at 215-469-0078

Respectfully,
Steven Palme
Service Account Manager
Schneider Electric – Philadelphia Branch



State Capitol Central Plant Upgrades - Security

Labor				
	Hours	listed \$/hr		
Installation Technician	16	\$	147.00	\$ 2,352.00
Project Management	8	\$	186.00	\$ 1,488.00
Solutions Engineer	4	\$	171.00	\$ 684.00
As-Built Documentation	4	\$	147.00	\$ 588.00
Software Programming	2	\$	171.00	\$ 342.00
Total:				\$ 5,454.00

Material				
	Quantity	Listed \$		
Open Options Two-Door Module (MR52-S3B)	1	\$	966.70	\$ 966.70
HID Signo20 Card Reader (20NKS-00-000000)	2	\$	366.97	\$ 733.94
Alarm Controls Pneumatic Exit Button (TS-14)	2	\$	368.52	\$ 737.04
Edwards Surface Contact with Armor Cable (2505A-L)	2	\$	93.65	\$ 187.30
Open Options Subcontroller License	1	\$	101.67	\$ 101.67
Verint PSIM License	2	\$	92.50	\$ 185.00
Misc Installation Material (Conduit, Fittings, Back Boxes, Etc.)	1	\$	322.16	\$ 322.16
Total:				\$ 3,233.81

Additional Costs				
Tax	1	\$	-	\$ -
Warranty	1	\$	347.51	\$ 347.51
Freight	1	\$	64.68	\$ 64.68
Total:				\$ 412.19

Sale Price:	\$	9,100.00

TERMS AND CONDITIONS OF SALE

900512PITC R07/15/21

This quotation and any exhibits and attachments hereto (collectively, "Agreement") and any information contained herein, is the property of Schneider Electric Buildings Americas Inc. ("Company") and shall constitute proprietary and confidential information unless given to a public entity and required by law to be public information. The party to whom this quotation is addressed ("Customer") acknowledges the confidential nature of this Agreement and agrees to take all commercially reasonable and necessary precautions to ensure the confidential treatment of this Agreement and all information contained herein. This Agreement will not be used, copied, reproduced, disclosed or otherwise disseminated or made available, directly or indirectly, to any third party for any purpose whatsoever without the prior written consent of Company. The parties agree to be bound by the following terms and conditions.

1. **Quotations and Acceptance.** The quotation is based solely on the bid documents, which consist of the project drawings, specifications and/or instructions of the Customer only modified by written agreement or Company objection. Significant deviations between the actual conditions and circumstances of the work and those specified in the bid documents shall be cause for an adjustment in work scope, price and time allowed for performance. Written quotations shall be valid for no more than thirty (30) days from the date of issue, unless specifically stated otherwise herein. Customer may accept the quotation by signing and returning a copy to Company or by returning Customer's own written instrument or order expressly acknowledging the quotation and terms set forth herein, provided, however, Company hereby gives notice of its objection to any different or additional terms or conditions contained or referenced in Customer's order, which will be of no force or effect except as may be expressly agreed to by Company in writing. It is the intent of the parties that these Terms and Conditions of Sale shall govern the sale of goods delivered and services performed. Upon acceptance, this Agreement constitutes the entire understanding between the parties respecting the goods or services delineated herein and supersede all prior oral or written understandings or representations relating to such goods or services. This Agreement may not be discharged, extended, amended or modified in any way except by a written instrument signed by a duly authorized representative of each party. Company assumes that the Subcontract Agreement offered will contain terms that are substantively similar to the AIA provisions that are in accordance with the provisions of the prime contract, including any supplements. Upon award, Company assumes that contract provisions will be reviewed and negotiated in good faith to reach a mutual acceptance of both parties.
2. **Payment.** Absent a contrary provision herein, Customer will pay Company monthly progress payments on a net thirty (30) days basis from date of invoice for materials delivered (or stored at an off-site storage facility) and services performed, less any retained reserve which will be mutually agreed upon in writing by the parties. The aggregate amount of any such retained reserves shall be paid by Customer to Company within thirty (30) days after the date of substantial completion. If Company provides a Certificate of Substantial Completion, such certificate shall conclusively establish such date. All invoices due and payable to Company, less any applicable retained reserve, shall accrue interest at a compounded per annum rate not to exceed 1½% per month (18% per annum) or the maximum rate permitted by law. Acceptance and endorsement by Company of an instrument for less than the full amount which Company claims to be due shall not be deemed to be an admission of payment in full and any conditions to the contrary which are noted on such an instrument shall not be binding on Company. If Customer does not pay Company, through no fault of Company, within seven (7) days from the time payment was due, Company may, without prejudice to any other remedy it may have, upon seven (7) additional days' written notice to Customer, stop its work until payment of the amount owing has been received and the contract sum shall be equitably adjusted for reasonable costs of shutdown, delay and startup or in the alternative Company may terminate this contract for material breach and all monies due Company for services performed and materials delivered shall be paid upon demand. Company shall be entitled to recover from Customer all costs for collection, including reasonable attorneys' and professionals' fees. To the extent payments are received and as required by law, and upon Customer's request, Company will furnish lien waivers as the work progresses.

Company reserves a security interest in any goods sold to the extent of the invoiced amount to secure payment of Customer's obligation. In event of payment default, Company may repossess such goods and a copy of the invoice may be filed with appropriate authorities as a financing statement to event or perfect Company's security interest in the goods. At Company's request, Customer will execute any necessary instrument to perfect Company's security interest.
3. **Price and Taxes.** The price for the goods and services hereunder are those shown on the face of this Agreement. The price of this Agreement does not include sales, use, excise, duties or other similar taxes, unless otherwise expressly provided herein. Any taxes (other than taxes due on Company's net income) that are payable hereunder shall be the responsibility of Customer. If applicable, Customer shall provide Company a copy of any appropriate tax exemption certificate for the state(s) into which the goods are to be shipped.
4. **Changes and Claims.** All materials and labor furnished hereunder shall be in accordance with shop drawings submitted by Company and approved by Customer. Any changes in the work as set forth in approved shop drawings, or from the scope of work as described herein, will require a written change order submitted to Company by Customer. An equitable adjustment will be made in the contract price or delivery dates or both, and this Agreement will be modified accordingly in writing. The cost or credit to Customer for performance of such change order shall be determined by mutual written agreement prior to the commencement of any work under such change order. Customer shall notify Company promptly in writing of any circumstances arising from the performance of the work herein described which reasonably may be anticipated to result in a claim or back charge to Company. Upon Company's receipt of such notification, Company shall have five (5) working days in which to remedy such circumstances and to avoid the imposition of such claim or back charge. Company will not be liable for any claim or back charge where Company has not been notified in the manner as set forth above.
5. **Access and Overtime.** This Agreement is based upon the use of straight time labor only during regular working hours (8:00 a.m. to 5:00 p.m., Monday through Friday, excluding Company's holidays). If Customer requests Company to perform any work outside of regular working hours, overtime and other additional expense occasioned thereby will be charged to and paid by Customer. If Company's work is to be performed on the project site, Customer will afford unrestricted access to Company and its employees and agents to all work areas.
6. **Damage or Loss to Equipment.** In the case of equipment not to be installed by or under supervision of Company, Company shall not be liable for damage to or loss of equipment after delivery of such equipment to the point of shipment. In the case of equipment to be installed by or under supervision of Company, Company shall not be liable for damage or loss after delivery by the carrier to the site of installation; if thereafter, pending installation or completion of installation or full performance by

Company, any such equipment is damaged or destroyed by any cause whatsoever, other than by the fault of Company, Customer agrees to promptly pay or reimburse Company an amount equal to the damage or loss which Company incurs as a result thereof, in addition to or apart from, any and all other sums due or to become due hereunder.

7. **Delays.** Customer shall prepare all work areas so as to be acceptable for Company's work required hereunder. Customer acknowledges that the contract sum is based upon Company being able to perform the work in an orderly and sequential manner, as Company so determines. If Company's performance is delayed, interfered with, suspended, or otherwise interrupted, in whole or in part, by Customer, other contractors on the project site, or by any other third party or by any act within the power and/or duty of Customer to control, then Customer agrees that it will be liable to Company for all increased costs and damages which Company incurs as a result thereof. Furthermore, if Company is delayed at any time in the progress of the work by any act or neglect of Customer, or by any separate contractor employed by Customer, or by changes ordered in the work or by labor disputes, fire, delay in transportation, adverse weather conditions, casualties, or any other causes beyond Company's control, then the time for completion of the work shall be extended for a period equal to the time lost by reason of such delay.
8. **Warranty.** Company warrants to Customer that all tangible articles manufactured by Company will be free of defects in workmanship and material and that the work performed will be of good quality and will conform to the requirements of the bid documents. If the article is installed by Company, Company's sole obligation under this warranty shall be to provide, without charge, parts and labor necessary to remedy defects which appear within twelve (12) months from the date of beneficial use or occupancy, as applicable. If Company provides a Certificate of Substantial Completion, such certificate shall conclusively establish such date. If article is not installed by Company, the warranty period shall be within twelve (12) months of shipment of said article. Warranty claim must be made to Company in writing within such twelve (12) month period. All transportation charges incurred in connection with the warranty for equipment not installed by Company shall be borne by Customer. Company warrants that for equipment furnished and or installed, but not manufactured by Company, Company will extend the same warranty terms and conditions which Company receives from the manufacturer of said equipment.

This warranty is the sole and exclusive warranty given with respect to any articles delivered or services performed by Company. THE WARRANTIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED (EXCEPT WARRANTIES OF TITLE), INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. This warranty is subject to proper installation of the articles (if installation is not performed by Company or authorized subcontractors of the Company) and maintenance and storage of the articles in accordance with the specifications and directions supplied by Company. This warranty does not apply to any defect, malfunction or failure caused by repairs made by other than or without the consent of Company or the article has been subject to abuse, misuse, neglect, tampering, accident or damage by circumstances beyond Company's control, including without limitation, acts of God, war, acts of government, corrosion, power fluctuations, freeze-ups, labor disputes, differences with workmen, riots, explosions, vandalism, or malicious mischief, nor to defective associated equipment or use of the articles with equipment for which they were not sold. All of Company's obligations under this warranty will immediately terminate and be of no further force or effect if all or any part of the purchase price (including any installment payment) with respect to any article covered by this warranty is not paid to Company when due. If cause of defect is found not to be Company's responsibility, standard rates for repair or replacement and labor shall apply.

9. **Limitation of Liability.** In no event will Company's total aggregate liability in warranty or contract exceed the contract price paid for the specific product or service that gives rise to the claim excluding third party claims for personal injury, death or as may be required by law. IN NO EVENT SHALL COMPANY BE LIABLE FOR ANY LOST PROFITS, LOSS OF USE, DATA, LOSS OF GOODWILL, BUSINESS INTERRUPTION OR ANY OTHER SPECIAL, INDIRECT, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES OF ANY KIND EVEN IF COMPANY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.
10. **Laws and Permits.** Company shall comply with all applicable federal, state, and local laws and regulation and shall obtain all temporary licenses and permits required for the prosecution of the work. Licenses and permits of a permanent nature shall be procured and paid for by the Customer. This contract shall be interpreted and governed under and in accordance with the laws of the jurisdiction in which the goods are delivered or services are performed without regard to its choice of law provisions.
11. **Disputes.** Any controversy or claim arising out of or relating to this Contract, or the breach thereof, shall be settled by good faith consultation and negotiation. If those attempts fail, either party shall provide written notice within thirty (30) days to the other to mutually agree on an arbitration process. If a process is not agreed upon within thirty (30) days, final and binding arbitration in accordance with the then current Construction Industry Arbitration Rules of the American Arbitration Association shall commence and judgment upon the award rendered may be entered in any court having jurisdiction thereof. The arbitration shall be held in the federal, state or municipal courts serving the county in which the project is located unless the parties mutually agree otherwise. The prevailing party shall recover all reasonable legal costs and attorney's fees incurred as a result, which shall be promptly paid by the non-prevailing party. Any dispute or demand for arbitration must be commenced within one (1) year after the cause of action has accrued. Nothing herein shall limit any rights Company may have under construction mechanic or materialmen lien laws. Company shall have the right to suspend affected services pending resolution of disputes.
12. **Insurance.** The parties shall each maintain insurance coverage including without limitation, Workers' Compensation and Employer's Liability at statutory limits, Automobile Liability covering all owned, hired and other non-owned vehicles, and Commercial General Liability covering public liability and property damage with limits generally required for its respective industry with not less than \$1,000,000 minimum coverage per occurrence. Such insurance shall be with reputable and financially responsible carriers authorized to transact business in the jurisdiction in which the project and services are being performed. No credit will be given or premium paid by Company for insurance afforded by others.
13. **Clean Up.** Company agrees to keep the job site clean of debris arising out of its operations. Customer shall not back charge Company for any costs or expenses for clean up or otherwise without prior written notice and Company's written consent.
14. **Severability.** The invalidity or unenforceability of any provision herein shall in no way affect the validity or enforceability of any other provision.
15. **Disclaimer.** Company reserves the right to amend, withdraw or otherwise alter this submission without penalty or charge as a result of any event beyond its control arising from or due to the current COVID-19 epidemic or events subsequent to this epidemic / pandemic including changes in laws, regulations, by laws or direction from a competent authority. The Customer

acknowledges that the products or part thereof are produced in, or otherwise sourced from, or will be installed areas already affected by, or that may be affected in the future by, the prevailing COVID-19 epidemics/pandemic and that the situation may trigger stoppage, hindrance or delays in Company's (or its subcontractors) capacity to produce, deliver, install or service the products, irrespective of whether such stoppage, hindrance or delays are due to measures imposed by authorities or deliberately implemented by the Company (or its subcontractors) as preventive or curative measures to avoid harmful contamination exposure of Company's (or its subcontractors') employees. The Customer therefore recognizes that such circumstances shall be considered as a cause for excusable delay not exposing the Company to contractual sanctions including without limitation delay penalties, liquidated or other damages or termination for default.

16. **Ethics and Compliance with Laws.** Each party shall comply in all respects with all applicable legal requirements governing the duties, obligations, and business practices of that party. Neither party shall take any action in violation of any applicable legal requirement that could result in liability being imposed on the other party. In the event Customer has concerns related to ethics, compliance, or Company's Principles of Responsibility, and/or any potential violations of these policies, Customer is welcome to make use of Company's GreenLine. The GreenLine is Company's global helpline for external stakeholders. It is a confidential channel through which Customers can ask questions and raise concerns. Reports can be made using the link: <https://secure.ethicspoint.eu/domain/media/en/gui/104677/index.html>.

17. **Cybersecurity.**

- 17.1. Customer's Obligations for Its Systems: Customer is solely responsible for the implementation and maintenance of a comprehensive security program ("Security Program") that contains reasonable and appropriate security measures and safeguards to protect its computer network, systems, machines, and data (collectively, "Systems"), including those Systems on which it runs the Products or Services provided by Company, against Cyber Threats. "Cyber Threat" means any circumstance or event with the potential to adversely impact, compromise, damage, or disrupt Customer's Systems or that may result in any unauthorized access, acquisition, loss, misuse, destruction, disclosure, and/or modification of Customer's Systems, including any data, including through malware, hacking, or similar attacks.

- 17.2. Without limiting the foregoing, Customer shall at a minimum:

- (a) have qualified and experienced personnel with appropriate expertise in cybersecurity maintain Customer's Security Program, and have such personnel regularly monitor cyber intelligence feeds and security advisories applicable to Customer's Systems or Customer's industry;
 - (b) promptly update or patch its Systems or implement other appropriate measures based on any reported Cyber Threats and in compliance with any security notifications or bulletins, whether publicly disclosed on Company's security notification webpage at <https://www.se.com/ww/en/work/support/cybersecurity/security-notifications.jsp> or otherwise provided to Customer;
 - (c) regularly monitor its Systems for possible Cyber Threats;
 - (d) regularly conduct vulnerability scanning, penetration testing, intrusion scanning, and other cybersecurity testing on its Systems; and
 - (e) meet the recommendations of Company's Recommended Cybersecurity Best Practices, available at <https://www.se.com/us/en/download/document/7EN52-0390/>, as may be updated by Company from time to time, and then-current industry standards.

- 17.3. Customer's Use of the Products, Software, and Services: Company may release Updates and Patches for its Products, Software, and Services from time to time. Customer shall promptly install any Updates and Patches for such Products, Software, or Services as soon as they are available in accordance with Company's installation instructions and using the latest version of the Products or Software, where applicable. An "Update" means any software that contains a correction of errors in a Product, Software, or Service and/or minor enhancements or improvements for a Product, Software, or Service, but does not contain significant new features. A "Patch" is an Update that fixes a vulnerability in a Product, Software, or Service. Customer understands that failing to promptly and properly install Updates or Patches for the Products, Software, or Services may result in the Products, Software, or Services or Customer's Systems becoming vulnerable to certain Cyber Threats or result in impaired functionality, and Company shall not be liable or responsible for any losses or damages that may result.

- 17.4. Identification of Cyber Threats: If Customer identifies or otherwise becomes aware of any vulnerabilities or other Cyber Threats relating to the Products, Software, or Services for which Company has not released a Patch, Customer shall promptly notify Company of such vulnerability or other Cyber Threat(s) via the Company's Report a Vulnerability page (<https://www.se.com/ww/en/work/support/cybersecurity/report-a-vulnerability.jsp#Customers>) and further provide Company with any reasonably requested information relating to such vulnerability (collectively, "Feedback"). Company shall have a non-exclusive, perpetual and irrevocable right to use, display, reproduce, modify, and distribute the Feedback (including any confidential information or intellectual property contained therein) in whole or part, including to analyze and fix the vulnerability, to create Patches or Updates for its customers, and to otherwise modify its Products, Software, or Services, in any manner without restrictions, and without any obligation of attribution or compensation to Customer; provided, however, Company shall not publicly disclose Customer's name in connection with such use or the Feedback (unless Customer consents otherwise). By submitting Feedback, Customer represents and warrants to Company that Customer has all necessary rights in and to such Feedback and all information it contains, including to grant the rights to Company described herein, and that such Feedback does not infringe any proprietary or other rights of third parties or contain any unlawful information.

18. **Import and Export.**

- 18.1. The Products and Services provided by Company under this Contract contain or may contain components and/or technologies from the United States of America ("US"), the European Union ("EU") and/or other nations. Customer acknowledges and agrees that the Products, assignment and/or usage of the Products, Software, Services, information, other deliverables and/or the embedded technologies (hereinafter referred to as "Deliverables") under these Terms and

Conditions of Sale shall fully comply with related applicable US, EU and other national and international export control laws and/or regulations.

- 18.2. Unless applicable export license/s has been obtained from the relevant authority and Company has approved, the Deliverables shall not (i) be exported and/or re-exported to any destination and party (may include but not limited to an individual, group and/or legal entity) restricted by the applicable export control laws and/or regulations; or (ii) be used for those purposes and fields restricted by the applicable export control laws and/or regulations. Customer also agrees that the Deliverables will not be used either directly or indirectly in any rocket systems or unmanned air vehicles; nor be used in any nuclear weapons delivery systems; and will not be used in any design, development, production or use for any weapons which may include but not limited to chemical, biological or nuclear weapons.
- 18.3. If any necessary or advisable licenses, authorizations or approvals are not obtained, whether arising from inaction by any relevant government authority or otherwise, or if any such licenses, authorizations or approvals are denied or revoked, or if the applicable export control laws and/or regulations would prohibit Company from fulfilling any order, or would in Company's judgment otherwise expose Company to a risk of liability under the applicable export control laws and/or regulations if it fulfilled the order, Company shall be excused from all obligations under such order and/or these Terms and Conditions of Sale.

PROPOSAL

PA DGS Central Plant - Fire Alarm

PREPARED BY

Siemens Industry, Inc. ("Siemens")

PREPARED FOR

Bidding Contractors

DELIVERED ON

January 05, 2026

SMART BUILDINGS

Transforming the Everyday



Table of Contents

SIEMENS PROPOSAL 3

 Contact Information 3

 Scope of Work 11-26-25.docx 4

 Equipment List 5

 Sell Price..... 6

 Payment Terms..... 7

TERMS OF SALE 8

 Siemens Terms of Sale (STS) 8

Signature Page 9

 Signature Page 9

Contact Information

Proposal #:	10281483
Date:	January 05, 2026

Sales Executive:	Kevin Hayden
Branch Address:	5095 Ritter Road Mechanicsburg, PA 17055
Telephone:	717-329-9514
Email Address:	kevin.hayden@siemens.com

Customer Contact:	
Customer:	Bidding Contractors
Address:	
Services shall be provided at:	
	Harrisburg, PA

PA Capitol Complex Central Plant – Fire Alarm Scope of Work

Siemens Industry is pleased to present the following scope of work for the PA Capitol Complex Central Plant project. Please note, Siemens scope of work is based on drawings dated 8-27-2025.

This proposal is based on approximate start date of February 2026 and approximate completion of June 2026.

Please be aware that the following proposal and device quantities are per plans and specifications and are to provide complete and operational systems. However, due to necessary design and/or engineering changes, final submittal quantities are subject to change.

Scope of Work:

1. Siemens to provide new fire alarm devices per plans
2. Siemens to provide device terminations
3. Includes device testing
4. Includes engineered drawings
5. Includes project supervision
6. Includes one year warranty

Electrical Contractor Responsibilities:

1. Provide and install necessary wiring and conduit to new device locations
2. Per State of PA requirements, leave 6' excess whip in flex cable at each device

Clarifications:

1. Professional engineer stamped or sealed drawings are not included
2. Pricing does not include providing or installing cabling and/or back boxes
3. Pricing includes project management for the duration of the tentative project schedule.
4. Materials pricing is for the extent of the tentative project schedule.
5. Work is assumed to be completed during normal business hours Monday – Friday (8am-5pm).
6. Pricing includes standard ground shipping.
7. Painting and Patching are excluded.
8. PA Sales Tax is excluded and a current tax exemption form will need to be provided or the applicable taxes will be added to the invoiced amount.
9. Any and all permits are the customers responsibility
10. Unless otherwise stated, this proposal is based on one phase for commissioning, testing and AHJ inspection. Should additional phases, testing and/or inspections be required, they will be provided at additional cost.
11. Prevailing wage labor IS INCLUDED

Equipment List

Fire Alarm Additions

Fire Alarm Additions

Qty	Ref #	Description
3	S54320-F7-A1	Multi-Crit. Fire Det.
3	500-094151	DETECTOR BASE ASSY
5	S54361-F3-A2	Spkr/Str (Wall,Wht,Fire)
5	S54370-F59-A1	SS Surface Mount Box Wht Wall
5	S54370-F44-A1	Wall (square) white standard cover alert text.

Sell Price

Total Quote Price	\$9,850.00*

This price is firm for 30 days from the date of this proposal.

**Siemens reserves the right to adjust prices to reflect the impact of any new or modified taxes, duties, tariffs, or equivalent measures, whether direct or indirect, imposed by any U.S. or foreign governmental authority that are applicable to our offering, including any hardware, software, or service components contained therein.*

Payment Terms

Payment Terms Acceptance Agreement

The total price of: \$9,850.00 and the estimated return on investment are based on the items outlined in this proposal. ANY STATEMENTS MADE HEREIN REGARDING SAVINGS THAT MAY BE ACHIEVED BY IMPLEMENTING THE SERVICES OFFERED IN THIS PROPOSAL ARE ESTIMATES ONLY. NO WARRANTY, EITHER EXPRESSED OR IMPLIED, SHALL BE CONSTRUED TO ARISE FROM SUCH STATEMENTS, NOR SHALL SUCH STATEMENTS BE CONSTRUED AS CONSTITUTING A GUARANTEE BY SIEMENS THAT SUCH SAVINGS WILL OCCUR IF THE SERVICES ARE IMPLEMENTED.

The Buyer acknowledges that when accepted by the Buyer as proposed by Siemens Industry, Inc., this Proposal and the Siemens Buildings Projects Business Standard Terms and Conditions, (together with any other documents incorporated into the forgoing) shall constitute the entire agreement of the parties with respect to its subject matter. BY EXECUTION HEREOF, THE SIGNER CERTIFIES THAT (S)HE HAS READ ALL OF THE TERMS AND CONDITIONS AND DOCUMENTS, THAT SIEMENS OR ITS REPRESENTATIVES HAVE MADE NO AGREEMENTS OR REPRESENTATIONS EXCEPT AS SET FORTH THEREIN, AND THAT (S)HE IS DULY AUTHORIZED TO EXECUTE THE SIGNATURE PAGE ON BEHALF OF THE BUYER.

Proposal is valid for thirty (30) days from the delivery date of January 05, 2026. Payment is due within 30 days of invoice date.

Payment Terms: 25% mobilization in advance, progress payments

Total: \$9,850.00

Siemens Industry, Inc. invoices paid by credit card may be subject to a surcharge of up to 2%.

Siemens Terms of Sale (STS)

Terms of Sale (Click to download)

[Base Terms \(United States\)](#)

Price Escalation. If, during the term of this Contract, the price of various materials or labor or logistics are increased as reflected by CRU/IHS Markit/CMAI/COMEX market index, then Siemens may increase the Contract Sum or apply a surcharge to Customer accordingly.

To the extent applicable, the following Supplements are incorporated and made part of the Siemens Terms of Sale:

Click on supplement(s) below to read/download

[Solutions Supplemental Terms](#)

[Hardware Supplemental Terms](#)

The order of precedence is stated in the Base Terms (United States).

To the extent the Offerings are purchased through an existing master or frame agreement, the terms and conditions of that agreement shall apply instead of the Siemens Terms of Sale.

Siemens reserves the right to adjust prices to reflect the impact of any new or modified taxes, duties, tariffs, or equivalent measures, whether direct or indirect, imposed by any U.S. or foreign governmental authority that are applicable to the Offerings, including any hardware, software, or service components contained therein.

Siemens is entitled to amend these terms and conditions at any time without prior notice. Previous and Retired versions of Base Terms & Supplemental Terms can be found here: www.siemens.com/terms-of-sale

Signature Page

Proposed by:

Siemens Industry, Inc.

Company

Kevin Hayden

Name

10281483

Proposal #

\$9,850.00

Proposal Amount

January 05, 2026

Date

Accepted by:

Bidding Contractors

Company

Name (Printed)

Signature

Title

Date

Purchase Order # ☐ PO for billing/pmnt only ☐ PO not required



Quote for IB Abel 2745 Black Bridge Road York, PA 17406 Re: DGS Central Plant Upgrades January 11, 2026

Electric Line Excavation

Excavating electric line trenches, triads, and box totaling approx.

740' L x 49" D x 36" W.

Disposal of all excavated spoils.

Bring in and pour 20" of concrete in trenches (not the 12' x 10' x 4' D box)
after contractor installs lines and rebar.

Bring in and place 4" of Aashto #57 over concrete. Sidewalk locations will be
backfilled with Aashto #57 to ground level.

Bring in fill and backfill trenches to ground level. \$74,975.00 _____

or

Backfill trenches with Aashto #57 instead of fill. \$79,250.00 _____

- *Hauling of Hazmat materials is not included. Certain Hazmat materials can be hauled for an additional cost.*
- *Compaction is not included in price, but can be done for an additional cost.*
- *Does not include cutting/removing sidewalks or replacing/repairing them.*

We try to make our estimates as accurate as possible. Unfortunately, there are times when unforeseen issues making the job more difficult or more expensive than originally estimated. Fluctuating prices in fuel, aggregates, black top and other products can cause changes in the original estimated amount too. Prior to any price change we will contact you to discuss options or alternatives.

- All permits, inspections and other owner, county and township requirements are the responsibility of the IB Abel or acting agent for corporate, state, or federal owners or agent handling bids.
- General Contractor or IB Abel is responsible for calling PA One call prior to start of work.
- All measurements are estimates.
- Delays in job (not the result of PCEP) for engineering delays, inspections, testing, spec changes, etc. will result in additional costs.
- The discovery of limestone or any stone/rock that our on-site equipment is unable to move which requires supplementary equipment and/or contracting a blasting company, will result in additional costs.

- Payment is due within thirty (30) days of the date invoiced. All payments, not made by the agreed upon date, will incur late fees of 18% per month or maximum amount permitted by law.
- All legal fees, filing fees, and any other costs incurred to collect amounts due will be the responsibility of the IB Abel.

Concrete Supplier rules and fees

- The concrete included herein does not include any admixtures, ice or special aggregates.
- The quoted concrete prices do not include the testing of cement, aggregates, trial mixes, test cores, or cylinders.
- Concrete price allows unloading time for 1st cu. yd. - 15Min. Unloading time for each additional cu. yd. - 5 Min. Extended unloading time charge \$3.00/minute
- HOLD TIME CHARGES: Orders that deviate from their scheduled time will be subject to a hold time charge. If an order is placed for a specified time and is not released within 45 minutes of that scheduled time, a hold charge will be billed. The hold time charge is \$175.00 per hour per truck. There will also be a plant charge, if no other orders are scheduled at that specific plant while in a hold status. The plant charge is \$150.00 per hour.
- If an order is cancelled less than 2 hours of the scheduled order time, a cancellation charge will be billed in the amount of \$500.00.

Value Added Charges per CY.			
Non-Chloride per %	\$8.00	Front Discharge	\$5.00
Chloride Accel per %	\$6.00	Ice per 40 lbs. Bag	\$30.00
Retarder per %	\$4.00	#8 Stone	\$6.00
Pump Mix 6"-8" slump	\$6.00	Environmental S/C	\$25.00
Microfiber	\$9.00	Test Cylinders	\$25.00 ea.
Exposed Agg ½" or ¾"	\$130.00	Cylinder Breaks	\$35.00
River Jack	\$130.00	Dye Clean Out	\$85.00 per load
Winter Concrete	\$9.00	Fuel S/C	\$50.00 per load
Straight Cement	\$6.00		

Tara Dawn Hazen

Tara Dawn Hazen/ President - Hauler

Tara-Dawn Hazen

Printed Name

January 11, 2026

Date

Authorized Signature – Contractor

Printed Name of Authorized Signer

Date

Page 2 of 2

**SDB/SB/HSV/SAP #379919 * DBE/SBE #20860725 * WBE #2302026 * WOSB & EDWOSB #231254
HIC# 070075**

CAGE CODE #9JTX5 / UEI #CL2QKZR6JJP

3297 Cold Storage Rd., New Bloomfield, PA 17068 * 717-645-7608 * 717-589-4069 Fax * pcep@pa.net



Manna Supply, Inc
PO Box 4601
Lancaster, PA 17604
+16102224775
billing@mannasupply.com
www.mannasupply.com

MBE and WBE Certified Small Business

Quote

ADDRESS

Abel, I.B., Inc.
I.B. Abel, Inc.
2745 Black Bridge Rd
York, PA 17406

SHIP TO

Abel, I.B., Inc.
I.B. Abel, Inc.
2745 Black Bridge Rd
York, PA 17406

QUOTE #	DATE	
10796	01/19/2026	

SHIP VIA
Best Way

PRODUCT/VENDOR
Gear Update

PROJECT NAME
DGS Capitol Complex Central Pla

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
MBE/WBE/DBE	Manna Supply, Inc. is a certified Minority Business Enterprise (MBE), Women Business Enterprise (WBE) and Disadvantaged Business Enterprise (DBE). See attached certificates.	0	0.00	0.00T
Space		0	0.00	0.00
Gear (26)	Lot Electrical Distribution Equipment - BASE BID #1 Note: See below breakouts for UPS and VFD's	1	4,069,500.00	4,069,500.00T
Gear (26)	Lot Electrical Distribution Equipment - BASE BID #2/#3	0	4,430,500.00	0.00T
Gear (26)	Lot Electrical Distribution Equipment - BASE BID #4	0	5,166,300.00	0.00T
Space		0	0.00	0.00
Space		1	0.00	0.00
MV Swgr	MV Switchgear (MDS15) - Base Bid #1- #4 Siemens (1) 15kV Main-Tie-Main, 1200A Metal Clad Swgr, N1, 15kV, 50kA, N1, with ATO, Meters and Relays Lead Time: 38-40 weeks	1	0.00	0.00T
MV Swgr	MV Switchgear (MDS5) - Base Bid #1- #4 Siemens (1) 5kV, Main-Main, Metal Clad/Metal, 2000A Enclosed Swgr, 5kV, 25kA, with Key Interlocked Vacuum Main Breakers and Fused Feeder Switches, and meters and relays Lead Time: 38-40 weeks	1	0.00	0.00T
Busway	Non-Segregated Busway (MV) - Existing T3/T4 to new MDS5 - Base Bid #1- #4 Siemens OEM COPPER BUSBAR WITH TIN PLATING AT CONNECTION PARTS & EXTRUDED ALUMINUM	135	0.00	0.00T

THANK YOU FOR YOUR ORDER!

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Battery Sys (26)	HOUSING (60ft) T3 to MDS5: 2000A (2) Horizontal Elbow (2) Vertical Elbow (2) Flange End Box (2) Wall Flange (75ft) T4 to MDS5: 2000A (2) Horizontal Elbow (2) Vertical Elbow (2) Flange End Box (2) Wall Flange Lead Time: 20-22 weeks			
	Lot Station Battery System - For MDS15 and MDS5 - Base Bid #1- #4 Hoppecke (1) 48VDC Battery Cells to support both 15kV and 5kV Swgr (1) Battery Rack (1) Battery Rack Spill Kit (1) Battery Charger (1) Battery Isolation Switch (1) DC Panel (1) Freight (1) Installation Inspection Lead Time: 8-10 weeks	1	0.00	0.00T
Trans-Sub	Substation Transformer (T5 and T6) - Base Bid #1- #4 Hitachi (2) 3500kVA, VPI Transformers, 80 Dg C Rise, Copper Windings, 12.47kV to 480/277V, N1 3 Phase 60 Hertz, 80/80 Degree C Rise, AN/Future AF HIGH VOLTAGE 12470 Delta 95 kV BIL Copper Conductor Termination in ANSI segment 2 Primary Cable Connection - HV 15 kV 12.7 MCOV Distribution Class Polymer Surge Arresters (Set of 3) - HV LOW VOLTAGE 480Y/277 Copper Conductor Braided Flex Connectors - LV Lead Time: 20-22 weeks	2	0.00	0.00T
Switchgear	Switchgear (T5 and T6) - Base Bid #1- #4 Siemens (1) 5000A DO Main Breakers, 480/277V, N1 (1) 5000A/100A DO Main Breakers, 480/277V, N1 Lead Time: 30-32 weeks	2	0.00	0.00T
Switchboard	Switchboard (MTM1) - Base Bid #1 Siemens (1) 3200A Main-Tie-Main, 480/277V, 65kA, N1, Fixed Breakers, UL891, with PQ Metering Lead Time: 20-24 weeks	1	0.00	0.00T
Switchgear	Switchgear (MTM1) - Base Bid #2- #4 Siemens (1) 3200A Main-Tie-Main, 480/277V, 65kA, N1, DO	1	0.00	0.00T

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Switchgear	Breakers, UL1558, with PQ Metering Lead Time: 30-32 weeks Switchgear (MTM2) - Base Bid #1- #4 Siemens (1) 5000A Main-Tie-Main, 480/277V, 100kA, N1, DO Breakers, UL1558, with PQ Metering Lead Time: 30-32 weeks	1	0.00	0.00T
Busway	Busway (LV) - Base Bid #1- #4 Siemens (140ft) MTM1 to MDS1: 2500A (120ft) MTM1 to MDS2: 2500A 19 - Elbow: SX425C14ES 26 - Trapeze Hanger: SXTH2 2 - Flanged End: SX425C14FRND Lead Time: 34-40 weeks	260	0.00	0.00T
Busway	Busway (LV) - Base Bid #4 Siemens (170ft) T1 to MTM1: 2500A (180ft) T2 to MTM1: 2500A 20 - Elbow: SX425C14ES 70 - Trapeze Hanger: SXTH2 2 - Flanged End: SX425C14FRND Lead Time: 34-40 weeks	350	0.00	0.00T
Busway	Busway (LV) - Base Bid #4 Siemens (210ft) T5 to MTM2: 5000A (200ft) T6 to MTM2: 5000A 15 - Elbow: SX450C14ES 2 - Flanged End: SX450C14FRND 82 - Trapeze Hanger: SXTH1 Lead Time: 34-40 weeks	410	0.00	0.00T
UPS	Uninterruptible Power Supply (UPS) - Base Bid #1- #4 Named Mfg (1) 75kVA/kW UPS with 3-Breaker Main ByPass and 8-min battery system Includes: - Start-up - Extended Warranty - Load Bank Test - PM Note: We have excluded "Additional Battery Monitoring" called out in 263353-1 section 2.15 as this is not applicable/appropriate to this small size UPS Lead Time: 18-20 weeks	1	107,500.00	107,500.00T
VFD	Variable Frequency Drives (VFD's) - Base Bid #1- #4 (8) ABB VFD's Tags: CHWP-1, 3, 4 Model: (3) ACH580-3PCR-302A-4 Ultra Low Harmonic (ULH) Input Voltage: 480 VAC Three Phase Rated Output Current: 302A Enclosure: UL (NEMA) Type 1 Nominal Horsepower: 250 HP	1	390,900.00	390,900.00T

THANK YOU FOR YOUR ORDER!

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
	Frame Size: R11 Input Disconnecting Means: Circuit Breaker Bypass: None Input Impedance: 10% LCL High Frequency Filter Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP) Includes freight and start-up Tags: CTF-1, 2, 3 Model: (3) ACH580-3BCR-180A-4+F267+G390 Ultra Low Harmonic (ULH) Input Voltage: 480 VAC Three Phase Rated Output Current: 180A Enclosure: UL (NEMA) Type 1 Nominal Horsepower: 150 HP Frame Size: R8 Input Disconnecting Means: Circuit Breaker Bypass: E-Clipse Soft Start Bypass (Box) Input Impedance: 10% LCL High Frequency Filter Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP) Other Options: Service Switch Tags: EF-1, 2 Model: (2) ACH580-BCR-04A8-4+F267 Six Pulse Input Voltage: 480 VAC Three Phase Rated Output Current: 4.8A Enclosure: UL (NEMA) Type 1 Nominal Horsepower: 3 HP Frame Size: R1 Input Disconnecting Means: Circuit Breaker Bypass: E-Clipse Bypass (Box) Input Impedance: 5% equivalent impedance Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP) Other Options: Service Switch Includes: Start-up and 30 month warranty Lead Time: 18-20 weeks			
Panel	Panelboard - (HP, RP, NE2, MDP-NE, NE, N/E, CP, CP-1, V-1, V1A, LR, LP-LH, PPA, PP & Welder) Base Bid #1- #4 Siemens	15	0.00	0.00T
Trans-LV	LV Distribution Transformer - Base Bid #1- #4 Siemens (1) 30kVA, 480V to 208/120V, Cu, N1	1	0.00	0.00T
Study	Base Bid #1- #4 Electrical Engineering Study to include: 1) Short Circuit Study, 2) Coordination Study and 3) Arc Fault Analysis in a Study Report, including providing Arc Flash Labels for field installation. Existing Construction: Back to two levels prior to new equipment, unless previous study can be provided New Equipment: Back to the incoming normal and emergency service	1	0.00	0.00

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Gear Start-up	Data Collection: By others Mfg Start-up for MV Swgr and LV Swgr	1	0.00	0.00
Comments	Comments and Notes - Gear BOM does not include any temporary equipment for the Chiller plant including: - 5kV LIS - 1500kVA Transformer - 2000A Swbd	0	0.00	0.00
Comments	Comments and Notes - VFD Comments: Not Included Items and Clarifications: Harmonic analysis Field harmonic testing Additional harmonic filtration beyond what is mentioned above Passive filter / Output filter AC Line reactor - 6 Pulse VFDs come with 5% DC Bus Choke as standard LonWorks or BACnet IP communication cards Digital input interface Hauling, rigging, piping, wiring and installation Emergency service or regular maintenance Manual service switch provided in place of 3rd contactor in bypass configurations 18 Pulse Architecture - ULH Provided as Modern Solution (See Technical Note 032) VFDs come standard with built in overcurrent and overload protection (no external MPR), as well as motor I^2t (See Technical Note 072)	1	0.00	0.00
Prog Bill	Progress billing schedule: 20% - Receipt of approved submittals 30% - Equipment released to factory 50% - Shipment from factory	0	0.00	0.00
Space		0	0.00	0.00
Space		1	0.00	0.00
Optional	Optional Equipment/Services	0	0.00	0.00
Gear (26)	OPTIONAL ADDER TO BASE QUOTES Modifications to existing substation transformers T1/T2 and T3/T4: Bill of Material (BOM) and summary work scope for modifications to Transformers T1, T2, T3, and T4 based on the provided one-line diagrams and project specifications for relays and metering. Engineering and Design: • A short outage will be required in order to gather all information related to providing these modifications. After completion of this site visit, Vendor to design and integrate new relay and metering cubicles for T3 and T4. • We will develop updated one-line and three-line drawings reflecting added sections. • Relay settings for T3 and T4 (overcurrent, ground, voltage, frequency, negative sequence), to be	0	619,990.00	0.00T

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Trans-MV	provided by others. RESA Power will provide programming based on provided settings. • Configure meter scaling, CT/PT ratios, and communication protocols. Lead Time: 10-12 weeks after approvals. MV Transformer (T1 and T2) (2) Add Meter to vacuum breaker per notes on dwgs Transformers T1 and T2 (1500 kVA Substations) Bill of Material (BOM): 1. LV Power Meter Schneider Electric PM8000 (Type M2) or ION8650 2. 480 V Metering CT's 3. CT Shorting Terminal Block & Fusing 4. Communications Interface Module Material Summary Totals: • MV Relay & Metering Cubicles: 2 (T3, T4) • Protective Relays: 2 required (T3, T4). • Meters: 4 total (T1–T4) • CT Sets: 6 total (4 MV for T3/T4, 2 LV for T1/T2) • PT/VT Sets: 2 total (T3, T4) • Communications Interfaces: 4 total Field Installation - T1 and T2: • Install LV power meters on 2500 A mains. • Install CTs, voltage references, and communication wiring. Testing and Commissioning: • Perform ratio, polarity, and insulation testing of new CTs and PTs. • Verify metering accuracy, phase rotation, and demand functions. • Confirm SCADA/monitoring communications. Actual SCADA set up and testing by others. Documentation: • Provide as-left settings, test reports, and updated one-line diagrams. • Label all new cubicles and devices and update equipment records.	2	0.00	0.00T
Trans-MV	MV Transformer (T3 and T4) (2) Add Meters, Relays and PT's per note 1 on the dwg This scope includes an additional medium-voltage cubicle that will be added to Transformers T3 and T4 to house protective relays, metering, CTs, and PTs. T3 and T4 will be equipped with multifunction protective relays providing the following functions: • 51 / 51G – Phase and Ground Overcurrent • 27 / 59 – Under/Overtovoltage • 47 – Negative Sequence / Phase Loss • 81 – Under/Over Frequency • Metering (M2) Bill of Material (BOM): Transformers T3 and T4 (10 MVA Unit Substations – With Added Cubicles) Item Description: 1. Medium-Voltage Relay & Metering Cubicle, Custom	2	0.00	0.00T

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
	auxiliary section includes structure, bus extension, barriers 2. Feeder/Main Protective Relay Eaton EDR-5000 (or equal) 1 2 51, 51G, 27, 59, 47, 81, metering 3. MV Power Quality / Revenue Meter Schneider Electric ION9000 or PM8000 1 2 Ethernet-enabled 4. MV CT Set (Protection + Metering) Mounted in added cubicle 5. MV PT/VT 12.47 kV / 120 V Fused, drawout or fixed 6. Relay Test Switch & Terminal Hardware Various FT-style or equivalent 7. Communications Interface / Cabling for SCADA/monitoring Field Installation - T3 and T4: • De-energize and implement lockout/tagout procedures. • Provide assistance to contractor to remove end plates and extend lineup to install new cubicles. • Install CTs, PTs, protective relays, meters, and terminal blocks within new sections. • Extend bus, control wiring, and grounding to new cubicles. Testing and Commissioning: • Perform secondary injection testing on T3 and T4 protective relays. • Perform ratio, polarity, and insulation testing of new CTs and PTs. • Verify metering accuracy, phase rotation, and demand functions. • Confirm SCADA/monitoring communications. Actual SCADA set up and testing by others. Documentation: • Provide as-left settings, test reports, and updated one-line diagrams. • Label all new cubicles and devices and update equipment records.			
Space		0	0.00	0.00
Space		0	0.00	0.00
Price-30	Price valid for 30 days only due to changing market conditions and fluctuations, including both commodities and Tariffs. Equipment must also be released in a timely manner in accordance with each manufacturers requirements. Tariff increases may be assessed by mfgs at the time of shipment without prior notification or acceptance. Siemens has an announced price increase effective 1/1/2026, so all quotes must be executed prior to that date to be effective.	0	0.00	0.00
Tariff	Tariffs and Surcharges: Prices quoted include only current tariffs, duties, or government-imposed surcharges. If any such tariffs, duties, or surcharges are imposed or modified after the issuance of a quote, purchase order, or agreement, the additional costs will be the responsibility of the purchaser and will be	0	0.00	0.00

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
	added to the final invoice. Manna Supply reserves the right to adjust pricing accordingly to reflect these costs. This policy applies to all products and services offered and will remain in effect unless explicitly stated otherwise in writing by an authorized representative of Company.			

Thank you for your business! If you would like to pay by card, please note there will be an additional fee (outlined in your invoice).	SUBTOTAL	4,567,900.00
Thank you for the opportunity to support you on this project.	TAX	0.00
	TOTAL	\$4,567,900.00

Manna Supply, Inc. Terms:

- 1) Payments will be due 30 days after shipment of products or completion of services on all Invoices
- 2) Standard Freight is FOB Factory
- 3) Retainages will not be accepted
- 4) No payment discounts, unless agreed to in writing
- 5) Complete Manna Supply Terms and Conditions of Sales are available to review and download at www.mannasupply.com.
- 6) Sales and Use Tax to be determined upon acceptance of order.
- 7) All Quotes are valid for 30 days only, due to volatile market conditions.
- 8) Tariffs, known and unknown, may impact mfg's prices up to including at time of shipment, which may differ than what was quoted previously.

Accepted By

Accepted Date

THANK YOU FOR YOUR ORDER!

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Keystone Electrical Supply
237 Pillow St.
Butler, PA 16001
Robstern7@aol.com
PH# 724-822-3508



Brian DeCesare
305 Gregson Drive
Cary, North Carolina 27511
Brian.DeCesare@us.abb.com
+1 215-384-6999

ABB

January 07, 2026

Quote No.: UAP-00000560

Doc Rev. 0

Project: Capital Complex Central Plant Chiller

Quote Version: Field quote with temporary

Quote Expiration: 02/07/2026

Dear Valued Customer,

Thank you for your inquiry for **Capital Complex Central Plant Chiller**. We are pleased to respond with our proposal based on the requirements of your inquiry. Please contact us with any questions. We look forward to working with you on this opportunity.

Best Regards,

Brian DeCesare
ABB

Notes

Project Level

a. Referenced Document(s)

Commonwealth of Pennsylvania
Department of General Services
Project No. DGS C-0948-0090 Phase 003
Drawings dated 27 August 2025...
E001, E100, E200, E201.D, E202.D, E401, E601, E604, E703, E704, E706,

Addendum 5 Drawings dated December 15, 2025...
E501.A, E501.D, E705

DGS-C-1101-0055 PHASE 1 specifications...
262200, 262816

DGS C-0948-0090 PHASE 3 specifications...
261116, 261323, 262300, 262413, 262416, 262500, 262713, 264313, 262813

b. Comment(s)

IMPORTANT NOTICE:

Any contract to sell the subject matter of the proposal shall be subject to prior mutual agreement as to price (which may be different than that shown herein), schedule, scope of work and terms.

Due to confusion on the drawings and specifications, we are quoting per this scope only.
As changes are requested, or as the design progresses, we are happy to revise our proposal and pricing.

Standard GE by ABB Design & Construction
GE/ABB to provide standard one-line nameplates.

Standard ABB lug size and quantities are provided based on amperage of the breaker(s) & equipment as shown in this proposal.

Cable length & voltage drop has not been considered.

Modifications may incur an adder/change order.

Only Standard Test Reports Provided, unless noted otherwise in this Bill of Material

Quoting standard GE by ABB Warranty - 1 year from energization or 18 months whichever occurs first.

For Extended Warranty see information at the end of the BOM.

Standard Terms and Conditions apply, including but not limited to FCA Factory, Progress Payments. (See terms at end of proposal)

ABB does not and will not represent, certify, or warrant that the products proposed herein satisfy any U.S. domestic preference requirement such as the Pennsylvania Steel Products Procurement Act. Purchaser agrees it is solely responsible for its obligations to its customer, such as adherence to any U.S. domestic preference requirement or requesting and obtaining an agency waiver, providing an equitable adjustment in scope, schedule, price, and other provisions to change ABB manufacturing location, manufacturing processes, and acquisition of components if mutually agreed to by ABB and Purchaser, or the supply and replacement of substitution products, and will defend and indemnify ABB from and against all liability resulting from any variance between the terms of this proposal and any of its contract terms with its customer. In no event shall Purchaser withhold payment due to ABB for any dispute or liability incurred between Purchaser and its customer. ST forms also will not be provided."

Country of Origin for the products in this proposal:

- Lighting panelboards=USA and Mexico
- Lighting panelboard outdoor enclosures=Mexico
- Power panelboards=Mexico
- Switchboards=Mexico
- LV Transformers=Mexico
- Tranquell Surge Protective devices=Mexico
- Disconnects and fuses = Mexico
- MV Switchgear Load Interrupter Switches = Mexico
- Breakmaster Load Interrupter Switches = Mexico
- Liquid filled substation Transformers = USA and Mexico
- Dry Type substation Transformers = USA
- Low Voltage Switchgear = USA
- Medium Voltage Switchgear = USA
- LV Busway = USA
- MV Busway = USA

Power Systems Studies specifications indicate studies are to be prepared by a PE who is a full time employee of the equipment manufacturer.

Specifications also indicate the study preparer is to provide Arc Flash Training certified for continuing education units.

Exception: We are including Power System Studies by a third party, who is a PE. (Not a Full Time Employee of ABB)

Exception: We are NOT including Training.

Any changes required as a result of Power Studies, may require revision of our proposal and pricing.

MV Switchgear specifications indicate to provide Arc-Resistant construction.

However, the room layouts do not appear to allow for venting to the outside.

We suspect that the specifications need to be edited.

We are quoting Fusible Load Interrupter SWGR as NON-Arc-Resistant.

We are quoting Primary and Secondary Unit Substation Breakers as NON-Arc-Resistant.

The 12.4kV Switchgear MDS15 is quoted with arc-resistant design features at the exterior (front, rear, and sides) and arc protection to the low voltage compartment (Type 2B). This means arcing does not cause holes in the walls isolating the low voltage instrument compartments.

Switchboard specifications call for Pull Boxes and Cable Supports.

Since all connections are via Busway, we are not providing either of these features.

Switchboard specifications call for Key Interlocks, and Mechanical Interlocks.
Since we are providing an Automatic Throw Over, we are not providing these features.

Panelboard specifications call for Main lug interiors up to 400A to be field convertible to Main Breaker (Not offered)

Panelboard specifications call for Interior Phase bus to be pre-drilled to accomodate field installable options (Sub-feed lugs, Sub-feed breakers, Thru-Feed Lugs) (Not offered)

Panelboard specifications call for Mono-Flat Front. (Not offered)

We take exception to these requirements.

Panelboard specification for Breakers appears to be un-edited.

We are only quoting breaker features as indicated on the plans.

c. Exclusion(s)

1. Programming of Schneider PM8000 meters, Programming of existing Power Monitoring System, Battery System for LV SWGR, UPS, VFD's, SPD for Panel "DC", Spare Fuses, Spare Fuse Cabinet, Starters, Temporary Trailer, Modifications to existing equipment. ****Quoting HV & LV Swgr on transformers T3 & T4 as New.****

Disconnects are included only if they are shown on the One-line drawings.

Busway Product Family - Notes

a. Comment(s)

1. The quoted Bill of Material (BOM) is based on estimates at the time of quote configuration. The actual footage/fitting quantities will be determined when the fully dimensioned ABB drawings are available. As a result, if there is a change in actual quantities verses quoted quantities the adder will be provided for the additional material released on the project at this time. The Change Order PO must be issued before ABB will proceed with completion of the busway project.

Low Voltage Switchgear Product Family - Notes

a. Comment(s)

1. This job is planned to be built in Mebane, North Carolina, USA. Please verify that this will be acceptable to end user.
2. ABB Low Voltage Switchgear It is designed and tested in conformance with applicable standards of UL 1558 , CSA C22.2 NO 31 , ANSI/IEEE 37.20.1, ANSI C37.51. Any equipment requiring a UL 1558 or CSA labeling will be provided with a cUL us label. The switchgear is manufactured in an ISO 9001-certified facility.
3. Unless negotiated differently Drawings (Submittals), Testing, Quality, Warranty, Delivery and Transportation are as outlined below.
4. OPTIONAL MAINTENANCE & SAFETY FEATURES:
 - Ekip T&P - Programming and Test Unit \$2,904.00 net each
 - Breaker Remote Racker \$13,957.00 net each
 - Breaker Remote Racker Plate (Reliagear)..... \$966.00 net each
 - Portable Breaker Hoist (Crane) \$1,792.00 net each
 - Breaker Transfer Cart \$978.00 net each
 - Electrically Operated Breaker Test Box \$5,789.00 net each
5. TYPICAL ADDERS:
 - Visual Inspection of Equipment \$3,500.00 net (per 8 hr day)
 - Customer Witness Tests \$5,500.00 net (per 8 hr day)(adds 1 week To ship cycle) Please note, If the customer does Not purchase Witness Test at time of equipment order placement, price must be negotiated with Project Management Team and a revised ship schedule will be established based on current factory capacity/loading.
 - Open Top Truck(NYC & Chicago) \$1,750.00 per truck

(maximum of 10 vertical sections per truck)

6. SPARE PARTS:

Spare parts are not included in current quote. A list can be made available after order is released from engineering to manufacturing. Seller takes exception to any non-standard format or requirements for this list.

7. TYPICAL START UP SPARE PACKAGE:

Startup package includes the following items for a single ended substation. If line-up should have multiple sources, buyer may choose to add one package for each source of incoming power.

=> Typical start up package \$1,750.00 net each

- 100% replacement fuses for primary of CPT and PT circuits
- 20% replacement secondary control fuses
- Qty 5 interconnect terminal blocks/plugs
- Qty 5 customer access terminal blocks
- 100 ft of SIS control wire
- Qty 10 spare lamps for indicating lights (5 for red, 5 for green)
- Qty 20 control wiring terminals

8. Factory equipment quotation does not provide programming of customer settings for protective devices (relay/trip unit) Or communication mapping. These items, selective coordination, And all system studies should be quoted And provided by ABB Lifecycle Solutions (Engineering Services) Or the installing contractor. Items mentioned above are Not included In quotation BOM Or pricing.

9. FACTORY TESTS:

Contact Low Voltage Proposals Group for prices on special tests not listed below.

Standard tests performed during factory testing and Witness Test (optional):

- Device check
- Control lead check
- Stationary instrument transformer ground test
- Meter check (3-phase) & polarity check
- Control power check (sequence tests)
- Heater, lights, receptacle, and fan check
- Bus check - visual check of phases, neutral, and ground per drawing.
- Clearance check - inspection of bus, neutral, and devices for proper clearance
- Connection tightness
- Nameplate check
- Current/voltage transformer polarity check (visual)

The following tests are also performed during standard factory testing.

- Secondary hi-pot of control wiring (1500vac for 1 minute)
- Primary hi-pot of primary bus (2200v, 19kv or 36kv as required)

An adder Is required If hi-pot tests are required To be performed during Customer Witness tests.

ABB does not allow for witness or hold points in the manufacturing process. Should the customer like to inspect the equipment at any point during the manufacturing cycle, the factory will advise within five working days in advance when those milestone dates are approached. Customer will have responsibility to make necessary arrangements to attend inspection dates as communicated. Customer inspection(CI) requirements must be established at the time Of the order, Or through a formal change order process If CI requirements arise later In the execution Of the order.

10. The ABB Standard Documentation Package includes:

** For Approval (when required)

- a) Front View/Floor Plan - Arrangement with basic dimensions, device locations, 1-line, cable space, shipping sections, etc. This Is Not certified For construction.
- b) Summary (Bill of Material) - Breaker, device and nameplates.
- c) Elementary Drawing - 3-line schematic of current, potential and control circuits. Preliminary - no terminal numbers.

** Final Drawings

- a) Front View/Floor Plan - Final dimensions for construction.
- b) Summary - Final breaker, device and nameplate list.
- c) Final Elementary Drawing - 3-line schematic of all circuits with terminal numbers.
- d) Connection Diagram - Internal unit wiring diagrams.
- e) Interconnect Drawings - External and inter-unit connections.
- f) Instruction Books - For switchgear and all major items.

(Relay instruction books include time curves.)

g) Installation Drawings - Foundation requirements, loading/unloading And installation methods.

h) Certified Test Reports (If ordered)

If changes are made during factory testing, the affected sheets of the final drawings are reissued.

11. For Low voltage switchgear, the standard practice for LV breakers is for them to arrive after the gear ships from the factory. This is to allow customers to have time to set the gear, pull cables, make inter-unit connections, and not have breakers in the way where they may get damaged. If breakers are required on site at the same time of the switchgear, they will be shipped external to the switchgear, and an adder will be required.
12. Clarification to job scope, many assumptions were made with this specification provided. This quote is only limited to the attached BOM. If any deviation is required, then Seller reserves the right to update BOM and price accordingly.
13. In the event of conflicting information in the documents provided, seller is using the following order: DATA SHEET, DRAWING, SPECIFICATION.
14. Proposed switchgear is in conformance with applicable standards of ANSI, IEEE, NEMA & UL. Exception is taken to all other codes & standards. Note that NEC & NFPA refer to the actual installation, operation & maintenance of the equipment, not the design of the equipment. Seller has reviewed the NFPA standards, only NFPA 70 (the NEC Code), NFPA 70B (Recommended Practice for Electrical Equipment Maintenance) and NFPA 70E (Standard for Electrical Safety Requirements for Employee Workplaces) have any relevance to our product. 70B and 70E both apply directly to the safety and use of electrical equip. NFPA 70, is commonly called the NEC Code.
15. Seller is quoting Switchgear which is provided with Trip Units and/or solid state relays. Most relay functions such as Ammeter, Ammeter Switch, Voltmeter, Voltmeter Switch and Demand are performed by the trip unit integrated into the front of each Breaker. Seller is taking exception to providing a dedicated device for these functions if they are required.
16. Seller is quoting standard factory lead times. If customer requires lead times sooner than these estimates field sales will need to prenegotiate with factory.
17. Seller is quoting standard factory Switchgear submittals which will be per the SHIPMENT AND DRAWING SCHEDULE section below. If customer requires a shipment sooner than these estimates field sales will need to prenegotiate with factory. Optional price adders have been provided below and can be added at order entry.
18. Switchgear will be shipped per the DELIVERY AND TRANSPORTATION section below. All exception is taken to any shipping methods. Optional price adders have been provided below and can be added at order entry. Any STORAGE AND HANDLING is to be quoted and provided by others.
19. Seller is quoting standard ABB Terms and Conditions per section below. All exception is taken to any other T&C's and Liquidated Damages. If buyer finds seller's proposal competitive, seller will be glad to negotiate, in good faith, a mutually agreeable set of terms & conditions before the order is placed.
20. Any possible execution of field services, site coordination between switchgear and other products/devices, performance bonding, testing & training, short circuit studies or preliminary trip unit/relay settings are to be quoted and provided by others.
21. If required, any DC voltage to be quoted and provided by others.
22. Seller has provided an option for remote racking. The remote racking device for Emax2 breaker requires a plate to be mounted on the face of the breaker for operation. Seller has provided one plate for each main and tie breaker and an additional plate that can be utilized for the feeders and moved from breaker to breaker. If a mounting plate is required for each feeder, seller would gladly revise the bill of material and price accordingly.

23. TPHE Series SPD

Providing an ABB TPHE Series SPD per the BOM in our bid. The TPHE Series SPD is engineered for reliability, flexibility, and long surge life in the most extreme transient surge environments. The true maximum single surge current ratings are not limited by fusing or other serial components within the

surge discharge path like some other manufacturer's SPD devices.

The full TPHE assembly, including all fusing and components, is 3rd party tested to confirm that it is capable of surviving a single IEEE 8x20us surge current impulse per each mode, up to *200kA. The TPHE protects all available modes of the power system (L-N, L-G, L-L and N-G) and is offered in per mode ratings of 125kA, 150kA, 200kA or 300kA per mode (equal to 250kA, 300kA, 400kA And 600kA per phase). Per phase ratings are the aggregate sum of the combined L-N and L-G tested modes and are provided for comparison only since per phase ratings are not specifically endorsed by standards organizations within the SPD industry.

ABB has not included a circuit breaker to feed the SPD device due to its additional impedance. The provided SPD comes with a surge rated 4-pole disconnect which allows the SPD to be 'turned off'.

b. Deviation(s)

1. The Project Specification Review attachment references important clarifications and deviations to customer's specifications and/or drawings that shall be applied in the equipment to be manufactured and offered in this quote. In case of discrepancy and/or clarification, notify and review with your sales representative.

Uploading in Empower saves a record of your original CDE file on the quote version for reference as needed. File attachment in empower cannot be edited or deleted by anyone but the file creator!

Medium Voltage Switchgear Product Family - Notes

a. Comment(s)

1. Material shortage clause

"The Parties are aware of the shortage of raw materials, electronic components worldwide which is likely to last for the foreseeable future, as well as of market fluctuations in the availability and cost of other raw materials, commodities, other critical components and transportation capacities. Notwithstanding anything to the contrary in the contract/terms and conditions/purchase order, if after the date of ABB's proposal / offer or during the term of the performance of the contract/purchase order there are any changes to availability and / or market conditions for electronic components, raw materials, commodities and transportation capabilities directly or indirectly affecting ABB's performance, ABB shall be entitled to relief in the schedule of the performance or delivery of the directly or indirectly affected scope of work under the contract/purchase order. In such circumstances, the Parties shall meet without delay and discuss in good faith to find a mutually agreeable solution, with equitable adjustment to the contract/purchase order date of delivery or completion. Customer hereby acknowledges and agrees that in said circumstances ABB may not be able to comply with the originally agreed delivery or completion schedule and that ABB shall not be liable for any liquidated or actual damages in connection thereto."

Transportation cost clause

"The offer is based on [CPT (Carriage Paid To) Destination: Switchgear is loaded onto truck and shipped to named destination. Offer does not include offloading of switchgear. ABB Standard inland packing applies]. Due to current fluctuations in transportation cost, the transportation cost is given as a separate line item and is to be considered a non-binding estimate based on current market prices. At the time of delivery, ABB will use reasonable efforts to get optimum transport arrangements, and the actual cost will be invoiced by ABB to the Purchaser. In no case will ABB be liable for any increase in transportation cost at the time of delivery."

Price escalation clause

Prices are firm until [30 days] except they are subject to adjustment as follows: On the day the Purchase Order is received, the prices are subject to adjustment if the cost of labor, copper and/or steel has increased by more than 2% since the date of bid submission or last price adjustment based on local labor index from the country of manufacture, London Metal Exchange (www.lme.com) LME Copper rates for copper and CRU Group (<https://cruonline.crugroup.com>) for steel. In such case ABB reserves the right to adjust the price to include the respective increase.

Standard Price Adjustment Clause 7A

The prices stated herein are subject to adjustment to reflect changes in the Producer Price Index, PPI, and the date of release for manufacture. The adjustment hereunder shall be determined from Bureau of Labor Statistics data.

1. Definitions

For the purpose of this provision the following definitions apply:

- a. The "Switchgear and Switchboard Apparatus Manufacturer Index" (Series Id: pcu335313335313) as determined and published monthly by the Bureau of Labor Statistics of the U.S. Department of Labor

in "Producer Prices and Price Indexes" will be applied to all products.

b. The "Base Switchgear and Switchboard Apparatus Manufacturer Index" shall be the latest final Switchgear and Switchboard Apparatus Manufacturer Index that is published on the date 12/17/2025. An index is "published" when it appears in an issue of "Monthly Labor Review" or "Producer Prices and Price Indexes", as applicable, which can be obtained from the Washington office of the Bureau of Labor Statistics.

c. An index is "final" when it appears in the appropriate publication given in (c) above, without a superscript "p" which identifies it as preliminary.

2. Adjustment for Increased of Index Costs:

a. Each payment shall be adjusted for any change relevant Index. The adjustment shall be equal to the percent by which the latest final Index, which is published at the time of release, is greater than the Baseline Index (Outlined above in 1 b), subject to the following bounds.

MV SWGR

Escalation Bounds: (Based on Standard Lead Time release to manufacturing date/drawing approval date when a PO is received by Planned Order Date - TBD)

Approval occurs:

1. Planned Order Date through Required Drawing Approval Date; Fixed Price

2. Required Drawing approval date through 30 days after required drawing approval date; the greater of the following:

- 2% increase over base price or;
 - Adjustment as defined in (a) above
3. Greater than 30 days from required drawing approval date;
- Remaining unreleased material to be repriced at market value

3. General

a. The Base Switchgear and Switchboard Apparatus Manufacturer Index shall be determined to the nearest first decimal place. In either case, if the next succeeding place is five or more, the preceding decimal place shall be raised to the next highest figure.

b. Should the indexes specified in the above paragraphs be discontinued, or should the basis of their calculation be modified, the Company shall substitute equivalent indexes.

c. Above Price Adjustment clause does not negate the need for schedule adjustments. Any delay in drawing approval can impact delivery schedule.

Reference Links

Producer Price Index SWGR - https://data.bls.gov/timeseries/PCU335313335313?data_tool=XGtable

Base Switchgear and Switchboard Apparatus Manufacturer Index

Series Id: pcu335313335313

Tarif Price Adjustment

Seller shall have the right to adjust the Agreement Price in the event of a Change in Law affecting the cost of materials, labor, or other contributory costs that are put into effect after the Effective Date of this Agreement which are beyond the reasonable control of the Seller. Such Change in Law events shall include, but not limited to, a change in national tariffs, tax treaties, or trade agreements. In the event of a Change in Law, Seller shall be entitled to a Change Order, in accordance with the terms of this Agreement, with an equitable adjustment to the Agreement Price and/or the schedule for performance.

Hyperinflation

In the event of unusual and significant changes in the raw material costs of produced products, due to hyperinflationary circumstances not captured by the Switchgear and Switchboard Apparatus Manufacturer Index, the Power and Distribution Transformers Manufacturer Index, or the Comex CU Spot Price, the Seller may adjust the discount multipliers by a factor other than the index as described in 1A above.

Unusual Market Volatility

The Parties are aware of the challenges related to outbreaks, epidemics, government regulations and acts of governmental authorities (including sanctions), civil unrest, and general shortages of electronic components and elements, market volatility, availability and cost of raw materials, commodities, costs and capacities that may impact the normal business activity and the delivery dates and/or the execution of the scope, the impacts of which are currently unknown. Notwithstanding anything in the proposal to the contrary, if as a result of any of the above aforementioned events, the costs of ABB's performance

increase or ABB's performance obligations are materially adversely affected or delayed, the Parties in the spirit of cooperation, will work together in good faith and within a reasonable time after the invocation of this Clause, to negotiate alternative contractual terms in terms of equitable adjustments to delivery and/or possible reductions of the contractually owed quantity of the Goods to be delivered to the Buyer. The aforementioned shall be performed with a view to employing reasonable efforts to ensure that the PO can be at least fulfilled in part.

Delivery Schedule:

Contract drawings, information submittals, manufacturing, and shipment schedules will follow the outline below and are contingent on customer approval in the timeframe indicated:

Approval Drawings – Class I & II: 10 - 12 weeks after receipt of purchase order.

Customer drawing approval time: 2 weeks to keep order timeline on schedule.

Switchgear Ready for Shipment: 28 weeks after return of approved drawings and release to manufacture.

TOTAL Typical LEAD TIME: 40– 42 weeks** (with 2 weeks customer approval)

**Lead time shall be confirmed at the time of Order acknowledgement.

If the approval drawings and all necessary information are not returned approved and released for manufacture within the timeframe specified above, this project becomes subject to delay.

Timeline is based on current production and engineering and shop loading at time of order placement and is subject to change based on loading at the time of order receipt.

Date span from "release for manufacturing" to "shipment" is determined by the lead time on that date.

The scheduled delivery dates shall be presented in the order acknowledgement letter provided by the project manager. If the approval drawings are not returned within the time frame listed above, the time of delay shall be given by the project manager.

To expedite order acceptance, please provide the following information on your purchase order documents:

- Reference to ABB Quote number and date of submittal.
- List items numbers included in the quotation by copying the item list & pricing information.
- Reference to the agreed terms and conditions, delivery terms and payment terms (Net 30). If order amount is greater than \$500,000.00, please include the following milestone payments on the PO
 - o 20% upon delivery of drawings
 - o 30% upon release of equipment
 - o 50% upon shipment
- Freight terms (CPT), "Ship To" address and required delivery date.
- E-mail address for the transmittal of drawings, and file.
- Agreed warranty period (months/years).
- Taxable status – if Tax Exempt, please send certificate with PO documents.
- P. O. must include multiple line items as defined per the ABB offering.
- Requested delivery date.

***For MV SWITCHGEAR COMMENTS and / or CLARIFICATIONS to Customer's Specification (s) and/or Drawing (s) please refer to "CDE-R0_UAP-00000560_MVSWGR.pdf" document attached at Empower quote Tab "Attachments". ***

PROPRIETARY AND CONFIDENTIAL INFORMATION

This document contains confidential and proprietary information. By accepting this document, the recipient agrees not to disclose its contents except to individuals within their organization who are directly involved in evaluating this proposal. No copies may be made without prior written permission. Upon written request, this document must be returned.

Summarized Bill of Material(s)

Quantity	Description	Item(s)	Mark(s)
5	Medium Voltage Switchgear	1	15KV SWGR 'MDS15'
		2	PLENUM
		3	ACCESSORIES
		4	SPARE PARTS
		5	FREIGHT
4	Low Voltage Switchgear	10	MTM1
		11	MTM2 - OPEN
		12	MAIN 1
		13	MAIN 2
2	Secondary Substation Transformer	15	3500 KVA
16	Panelboard	16	MDP-NE
		17	LP-LH
		18	CP
		19	LR
		20	CP-1
		21	V-1 RH
		22	V-1
		23	V1A
		24	PP
		25	WELDER/PLASMA CUTTER
		26	N/E
		27	NE
		28	NE2
		29	RP
		30	HP
		31	DC
1	Transformer	32	T-RP
15	Switches and Disconnects	33	VFD DISCONNECT
		34	ELEVATOR CONTROL SW
		50	450A FUSIBLE DISC
		51	500A FUSIBLE DISC
6	Busway	52	650A FUSIBLE DISC
		35	BUS MTM1-T1
		36	BUS MTM1-T2
		37	BUS MTM1-MDS1
		38	BUS MTM1-MDS2
2	Bus Duct	39	BUS MTM2-T5
		40	BUS MTM2-T6
2	Bus Duct	41	4160V 2000A NSB RUN1
		42	4160V 2000A NSB RUN2
1	Switchboard	49	TEMP SWBD
1	Load Interrupter Switch	53	TEMP CHILLER DISC
2	5kV Drawout Breaker 2000A Close Couple to XFMR with PM8240 Meter	6	
2	5kV Drawout Breaker 2000A Close Couple to LIS7 with PM8240 Meter	7	
2	12.4kV Drawout Breaker 600A Close Couple to XFMR	8	

Quantity	Description	Item(s)	Mark(s)
1	Switchgear "MDS5" - (2) 2000 Drawout Main Breakers, (5) Fusible Branch Switches with Fuses- PM8214	9	
4	Battery System for LV Switchgear	14	BATTERY SYSTEM
1	Power Study - Base Study	43	
1	Power Study - Load Flow Study Adder	44	
1	Power Study - Harmonic Study Adder	45	
1	Startup Assistance - SWGR and SWBD's		
1	Temporary Equipment	47	
1	Temporary 4160V-480V 1500kva XFMR	48	

Total Net Price

The total net price for the item(s) defined in this quotation is:

\$8,995,964. Net Contractor Cost

Quote includes Temporary Chiller 5kV Disconnect, Temporary 4160V Transformer, Temporary Switchboard, or Temporary Chiller Disconnects.

This version includes "MTM1" as LV Switchgear (BB#2, 3, & 4)

Note: They want BB#1 to have MTM1 as a SWBD. (I'm sure they expect the SWBD to be cheaper than the LV SWGR... it is not)

ADDER to Provide "MTM1" as Switchboard \$ 17,850

Includes Power Studies by third party (Not ABB as spec'd)

Does NOT include Arc Flash Training

Includes estimated line items for Substation T3 & T4 Primary and Secondary MV Breakers (Metal-Clad)(I have sent RFQ to Advance SWGR to quote these)

Includes MDS5 with Metal Clad Main Breakers, and Metal Enclosed LIS fused branches with PM8240 on each branch

This includes MV Busway (Contractor to verify lengths)

This includes LV Busway (Contractor to verify lengths).

Does not include VFD's, UPS's, PMCS System, Programming of PM8000's to communicate with PMCS, Loose PM8000's for other existing equipment, SPD for DC Panel (Not offered).

See the attached Marked Up One-Lines for your customer to review Green Items included in proposal, and Red items not included.

Summary of Proposal

Estimated Lead Time

The lead times contained in this proposal are for estimating purposes only and do not include approval drawing cycle, factory holidays/shutdowns, witness testing, or transit time. Lead-times are subject to change and may require staggered shipments beyond stated lead times. Please contact ABB if firm or alternate lead times are required.

Item No.	Product Description	Mark(s)	Estimated Lead Time (Weeks)	Quantity
1	Medium Voltage Switchgear, SafeGear, T2B/15kV/50kA/1200A (A01)	15KV SWGR 'MDS15'	42	1
2	Medium Voltage Switchgear, Plenum, (A02)	PLENUM	42	1
3	Medium Voltage Switchgear, Accessories, (A03)	ACCESSORIES	42	1
4	Medium Voltage Switchgear, Spare Parts, (A04)	SPARE PARTS	42	1
5	Medium Voltage Switchgear, Freight, (A05)	FREIGHT	42	1
6	5kV Drawout Breaker 2000A Close Couple to XFMR with PM8240 Meter		CONTACT ABB SALES	2
7	5kV Drawout Breaker 2000A Close Couple to LIS with PM8240 Meter		CONTACT ABB SALES	2
8	12.4kV Drawout Breaker 600A Close Couple to XFMR		CONTACT ABB SALES	2
9	Switchgear "MDS5" - (2) 2000 Drawout Main Breakers, (5) Fusible Branch Switches with Fuses- PM8214		CONTACT ABB SALES	1
10	Low Voltage Switchgear, Reliagear	MTM1	CONTACT ABB SALES	1
11	Low Voltage Switchgear, Reliagear	MTM2 - OPEN	CONTACT ABB SALES	1
12	Low Voltage Switchgear, Reliagear	MAIN 1	CONTACT ABB SALES	1
13	Low Voltage Switchgear, Reliagear	MAIN 2	CONTACT ABB SALES	1
14	Battery System for LV Switchgear	BATTERY SYSTEM	CONTACT ABB SALES	4
15	SEPS Secondary Substation Transformer, Vent Dry	3500 KVA	CONTACT ABB SALES	2
16	Power Panelboard, ReliaGear neXT	MDP-NE	8	1
17	Lighting Panelboard, ReliaGear RQ	LP-LH	8	1
18	Lighting Panelboard, ReliaGear RQ	CP	8	1
19	Lighting Panelboard, ReliaGear RQ	LR	8	1
20	Lighting Panelboard, ReliaGear RQ	CP-1	8	1
21	Lighting Panelboard, ReliaGear RS	V-1 RH	16	1
22	Lighting Panelboard, ReliaGear RS	V-1	16	1
23	Lighting Panelboard, ReliaGear RS	V1A	16	1
24	Lighting Panelboard, ReliaGear RS	PP	16	1
25	Lighting Panelboard, ReliaGear RS	WELDER/PLASMA CUTTER	16	1
26	Lighting Panelboard, ReliaGear RQ	N/E	8	1
27	Lighting Panelboard, ReliaGear RS	NE	16	1
28	Lighting Panelboard, ReliaGear RS	NE2	16	1
29	Lighting Panelboard, ReliaGear RQ	RP	8	1
30	Lighting Panelboard, ReliaGear RS	HP	16	1
31	Lighting Panelboard, ReliaGear RE	DC	6	1
32	Transformer, Copper, 9T10C1002G32	T-RP	6	1
33	Switches and Disconnects, Heavy Duty Safety Switch, THN3366A1	VFD DISCONNECT	CHECK AVAILABILITY	3
34	Switches and Disconnects, Elevator Disconnect, ES6T48R1KGN1A	ELEVATOR CONTROL SW	8	1
35	Busway, ReliaGear Series Busway	BUS MTM1-T1	28	1
36	Busway, ReliaGear Series Busway	BUS MTM1-T2	28	1
37	Busway, ReliaGear Series Busway	BUS MTM1-MDS1	28	1
38	Busway, ReliaGear Series Busway	BUS MTM1-MDS2	28	1
39	Busway, ReliaGear Series Busway	BUS MTM2-T5	28	1
40	Busway, ReliaGear Series Busway	BUS MTM2-T6	28	1
41	SEPS Bus Duct	4160V 2000A NSB RUN1	CONTACT ABB SALES	1
42	SEPS Bus Duct	4160V 2000A NSB RUN2	CONTACT ABB SALES	1
43	Power Study - Base Study		CONTACT ABB SALES	1
44	Power Study - Load Flow Study Adder		CONTACT ABB SALES	1

Item No.	Product Description	Mark(s)	Estimated Lead Time (Weeks)	Quantity
45	Power Study - Harmonic Study Adder		CONTACT ABB SALES	1
46	Startup Assistance - SWGR and SWBD's		CONTACT ABB SALES	1
47	Temporary Equipment		CONTACT ABB SALES	1
48	Temporary 4160V-480V 1500kva XFMR		CONTACT ABB SALES	1
49	Switchboard, ReliaGear Configured, RG-GM-CBSB-CTO	TEMP SWBD	16	1
50	Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR	450A FUSIBLE DISC	CHECK AVAILABILITY	3
51	Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR	500A FUSIBLE DISC	CHECK AVAILABILITY	5
52	Switches and Disconnects, Heavy Duty Safety Switch, TC72367R	650A FUSIBLE DISC	CHECK AVAILABILITY	3
53	Load Interrupter Switch, VersaRupter	TEMP CHILLER DISC	33	1

Bill of Material(s)

Item No.	Quantity	Description
1	1	Medium Voltage Switchgear, SafeGear, T2B/15kV/50kA/1200A (A01) Marks: 15KV SWGR 'MDS15' SafeGear® Arc-Resistant Metal-Clad Switchgear A/R-Rating Type 2B, 10-cycle arc duration per IEEE C37.20.7 Enclosure: Indoor, ANSI # 61 Light Gray enamel Bus System: 15 kV Max Rated Voltage, 60 Hz System Voltage - 13.80 kV Rated Main Bus Current - 1200 A Short-CircuitCurrent-50 kA 1 System, 3-phase, 3-wire Delta System Switchgear shall be designed and manufactured in accordance with the standards of ANSI / IEEE Dimensions and Weight (Estimated) Height: 95 Inches; Width : 252 Inches; Depth: 85 Inches Weight: 18711 lbs. Bus Insulation: Main Bus Support: Molded Epoxy Primary Bushings: Molded Epoxy Standoff Insulators: Molded Epoxy Bus Material is 98% Copper with silver-plated joints Bus Insulation is fluidized bed baked-on epoxy with vinyl boots over joints Ground Bus, ¼ in x 2 in, solid copper, tin plated, continuous throughout lineup and extended to the rear of the frame Wiring: AC Control Bus is 40 A, 1-ph, 3-wire circuit with #8 AWG connected to power terminal blocks DC Control Bus is 40 A, 2-wire circuit with #8 AWG connected to power terminal blocks Breaker Charging Motor Voltage 125 V dc Breaker Closing Voltage 125 V dc Breaker Opening Voltage 125 V dc All control wire is #14 AWG minimum, multi-stranded extra-flexible, SIS 600 V flame retardant wire gray color for control, green color for ground All CT circuits will be #10 AWG, multi-stranded extra-flexible, SIS 600 V flame retardant, gray wire UL-rated, 600 V, 30 A, 35 mm DIN-rail mount barrier type terminal block For control circuits a maximum of two wires per terminal point 20% additional terminal blocks per frame Ring-tongue, Vinyl pre-insulated Slip-on destination type wire markers, white with black letters Pre-wired harness to terminal block from the following devices: Breaker control secondary, 52TOC switch, CT's & PT's 2 EnRack Plus Pendant Controller, 120/240VAC 2 Cat 5E/6E Ethernet Cable, 50ft, used to connect pendant to cable port on LV door. RJ45 connectors at both ends Additional Features: Circuit breakers will be shipped in bottom breaker compartments. Circuit breakers belonging to top breaker compartments will be shipped separately 1 Breaker Control Transfer Scheme, 3-breaker, close-transition (25 / 27 / 47 / 59) 1 O&M Manuals, via electronic media on compact disc 2 Level 2 - Factory Witness Test (FWT), 3-people for # of days A01 : Frame Sequence 1 (1200A FDRS) 1200A Feeder Breaker - LV Instrument Panel (19") - 1200A Feeder Breaker Breaker A/B: 1 CT Sec Wire Harness, multi ratio, set of (3) 3 CT / PT Production Test Reports 1 CT Sec Wire Harness, multi ratio, set of (3)

Bill of Material(s)

3	CT / PT Production Test Reports
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"A"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Breaker D/E:
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched

Bill of Material(s)

- 1 Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
- 1 EnRack Controller Module, Basic or Plus, 120VAC
- 1 EnRack Plus Relay Module, 120/240VAC
- 1 Racking Motor Overcurrent Relay
- 1 Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
- 1 RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
- 1 Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
- 1 Cable Harness, D-sub connector on top breaker to terminal blocks
- 1 Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
- 1 E90 Class CCFH 2P, 30A, 600V
- 1 Time Delay, 5A, 250V, Type ATDR

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, 2-high, 1.2 kAF Main or Feeder - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R End Panel Assembly - standard depth
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 2 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, End Frame - 1200 A
- 1 Cable Support Assembly
- 1 Cable Support Assembly
- 1 Cable Lug Boot, 3-ph, 1200 A
- 1 Cable Lug Boot, 3-ph, 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V
- 1 Ground Cable Lugs, compression type, #4/0 AWG
- 1 Cable Lugs, compression type, 2-hole, set of (3), up to #4/0 AWG
- 1 Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 19 in high, with MPL Door
- 3 Door Stop Assembly
- 1 DC Control Bus, 40 A 2-wire
- 1 AC Control Bus, 40 A 1ph 3-wire
- 1 DC Control Bus, MCCB, 40 A 250 V dc 2-pole, UL
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 1 Molded Case Circuit Breaker, 40 A 22 kA 480 V 3-pole, UL
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL
- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 2 Indicating Lamp LED
- 2 Indicating Lamp LED
- 4 Test Switch, ABB FT-1, 10-pole
- 2 PM8244 Intermediate Power Meter, DIN rail mount + remote display
- 2 (PM8) Digital I/O Module - 6 digital inputs, 2 relay outputs
 - # Note: All Devices for this frame that cannot be fit in the 19" Instrument
- 1 Compartment Door will be mounted on the adjacent 38" or 57" Instrument Compartment Door.
- 2 # P/N: 751001A1A0X0X85B200 (751#MHJB); SEL-751 Feeder Protection Relay

A01 : Frame Sequence 2 (MAIN 1)

LV Instrument Panel (57") - 1200A Main Breaker

Breaker D/E:

- 1 CT Sec Wire Harness, multi ratio, set of (3)

Bill of Material(s)

3	CT / PT Production Test Reports
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Surge Arrester Mounting Assembly, Dist / Intmed Class
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
1	Surge Arrester, Distribution Class, ABB POLIM-D, 18kV, 15.3kV MCOV (set of 3)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for
1	2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector,
1	Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45
1	connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC
1	and 90-300 VDC, Output 24 VDC / 10 A
1	Selector Switch 2-position, Type M2SS1-10B, 2 Position, Maintained, operator only
1	(needs holder & contact block)
1	Contact Block with Holder For Pilot Device, 1 NO & 1 NC, Type MCBH-11, Front
1	Mounting
1	Contact Block For Pilot Device, 1NC, Type MCB-01 (Without Holder)
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Frames:
1	Shipping Base Assembly - Indoor, set per cubicle
1	A/R type 2 Base Frame, 1-high, 1.2 kAF Main or Feeder - std depth
1	Main Bus, 1200 A, 50 kA, 3-phase, polyester support
1	A/R Rear Panels, Split Bolted with handles
1	A/R type 2B Construction, per frame
1	Front Door Adder - SmartRack Assembly (Electric Racking)
1	A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
1	Cable Support Assembly
1	Cable Lug Boot, 3-ph, 1200 A
1	Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
1	Strip Heater Circuit, Total 300 W applied at 1/2 V
2	Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM
	LV Instrument:
1	A/R type 2 Instrument Compartment - 57 in high, with MPL Door
2	Door Stop Assembly
1	DC Control Bus, 40 A 2-wire

Bill of Material(s)

- 1 AC Control Bus, 40 A 1ph 3-wire
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL
- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 2 Indicating Lamp LED
- 3 Test Switch, ABB FT-1, 10-pole
- 1 ION9200, Power Quality Meter, DIN mount, 7.56"-display, B2B adapter, HW kit
- 1 (9200) Remote Display, color touchscreen, 7.56" x 7.56" window
- 1 (9200) I/O Module, 2 relay outputs, 6 digital inputs
- 1 (86) Lockout Relay, ES - LOR, manual-reset, 2-deck (4)NO, (4)NC
- 1 # P/N: 751401ACACA7085A200 (751#F6C7); SEL-751 Feeder Protection Relay
- 1 # P/N: 2730M0ARAX1111CCCCX0 (2730M#28CN); Managed 24-Port Ethernet
- 1 Switch
- 1 # Lot of CAT6 Ethernet Cable and connectors for Relay and Ethernet Switch
- 1 (internal wiring)
- 1 # Senseor Power Supply
- 1 # Senseor HMI with mounting kit

.
A01 : Frame Sequence 3 (LPTs; BPTs)

Line PT - LV Instrument Panel (19") - Bus PT

PT A/B:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

PT D/E:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, Auxiliary, Tie Transition - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 2 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 19 in high, with MPL Door
 - 3 Door Stop Assembly
 - 1 DC Control Bus, 40 A 2-wire
 - 1 AC Control Bus, 40 A 1ph 3-wire
 - 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
 - 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
 - 1 20% Spare Terminal Blocks
 - 1 Wired to Terminal Block, unused relay contacts
 - 1 Wire Markers - SPECIAL
- .

Bill of Material(s)

A01 : Frame Sequence 4 (TIE)

LV Instrument Panel (57") - 1200A Tie Breaker

Breaker D/E:

- 1 CT Sec Wire Harness, single ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, single ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, multi ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 (C) Motorized truck 125VDC with protection
- 1 # 10 AWG, CT Secondary Wiring
- 1 ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
- 1 Breaker Interrupting Time = 3 cycle
- 1 Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
- 1 Breaker Auxiliary Switch, 16-pole (9a, 7b)
- 3 Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
- 3 Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
- 1 Circuit Breaker Production Test Reports
- 1 A/R type 2 Breaker Compartment, Pos "B" - 1200A (40&50kA) Epoxy
- 1 Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
- 1 (52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
- 3 Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
- 1 Padlock Provisions - Hinged Panel
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
- 1 Breaker Door Interlock with Defeat-Reset Features
- 1 Interlock, door with breaker in disconnect position, defeatable
- 1 Interlock, prevent breaker racking unless door is closed and latched
- 1 EnRack Controller Module, Basic or Plus, 120VAC
- 1 Tie and Transition Phase Bus Assembly, 1200 A
- 1 EnRack Plus Relay Module, 120/240VAC
- 1 Racking Motor Overcurrent Relay
- 1 Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
- 1 RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
- 1 Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
- 1 Cable Harness, D-sub connector on top breaker to terminal blocks
- 1 Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
- 1 E90 Class CCFH 2P, 30A, 600V
- 1 Time Delay, 5A, 250V, Type ATDR

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, 1-high, 1.2 kAF Tie Breaker - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 1 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 57 in high, with MPL Door
- 2 Door Stop Assembly
- 1 DC Control Bus, 40 A 2-wire
- 1 AC Control Bus, 40 A 1ph 3-wire
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL

Bill of Material(s)

- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 2 Indicating Lamp LED
- 3 Test Switch, ABB FT-1, 10-pole
- 2 (86) Lockout Relay, ES - LOR, manual-reset, 10-deck (20)NO, (20)NC
- 1 (86) Lockout Relay, ES - LOR, manual-reset, 2-deck (4)NO, (4)NC
- 1 # P/N: 751401AA0CA7085A200 (751#8MHJ); SEL-751 Feeder Protection Relay
- 1 # SEL M-T-M Quickset Design Template Parametrization
- 2 # P/N: 0587Z0X635312XX (587Z#F93X); SEL-587Z High-Impedance Differential Relay

.

A01 : Frame Sequence 5 (LPTs; BPTs)

Line PT - LV Instrument Panel (19") - Bus PT

PT A/B:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

PT D/E:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, Auxiliary - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 2 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 19 in high, with MPL Door
- 3 Door Stop Assembly
- 1 DC Control Bus, 40 A 2-wire
- 1 AC Control Bus, 40 A 1ph 3-wire
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL

.

A01 : Frame Sequence 6 (MAIN 2)

LV Instrument Panel (57") - 1200A Main Breaker

Breaker D/E:

- 1 CT Sec Wire Harness, multi ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, single ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, multi ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 (C) Motorized truck 125VDC with protection
- 1 # 10 AWG, CT Secondary Wiring
- 1 ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA

Bill of Material(s)

1	Surge Arrester Mounting Assembly, Dist / Intmed Class
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
1	Surge Arrester, Distribution Class, ABB POLIM-D, 18kV, 15.3kV MCOV (set of 3)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
1	Selector Switch 2-position, Type M2SS1-10B, 2 Position, Maintained, operator only (needs holder & contact block)
1	Contact Block with Holder For Pilot Device, 1 NO & 1 NC, Type MCBH-11, Front Mounting
1	Contact Block For Pilot Device, 1NC, Type MCB-01 (Without Holder)
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Frames:
1	Shipping Base Assembly - Indoor, set per cubicle
1	A/R type 2 Base Frame, 1-high, 1.2 kAF Main or Feeder - std depth
1	Main Bus, 1200 A, 50 kA, 3-phase, polyester support
1	A/R Rear Panels, Split Bolted with handles
1	A/R type 2B Construction, per frame
1	Front Door Adder - SmartRack Assembly (Electric Racking)
1	A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
1	Cable Support Assembly
1	Cable Lug Boot, 3-ph, 1200 A
1	Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
1	Strip Heater Circuit, Total 300 W applied at 1/2 V
2	Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM
	LV Instrument:
1	A/R type 2 Instrument Compartment - 57 in high, with MPL Door
2	Door Stop Assembly
1	DC Control Bus, 40 A 2-wire
1	AC Control Bus, 40 A 1ph 3-wire
2	Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
1	Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
1	Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
1	20% Spare Terminal Blocks
1	Wired to Terminal Block, unused relay contacts
1	Wire Markers - SPECIAL
1	Breaker Control Switch, pistol, (1)C & (1)T

Bill of Material(s)

2	Indicating Lamp LED
3	Test Switch, ABB FT-1, 10-pole
1	ION9200, Power Quality Meter, DIN mount, 7.56"-display, B2B adapter, HW kit
1	(9200) Remote Display, color touchscreen, 7.56" x 7.56" window
1	(9200) I/O Module, 2 relay outputs, 6 digital inputs
1	(86) Lockout Relay, ES - LOR, manual-reset, 2-deck (4)NO, (4)NC
1	# P/N: 751401ACACA7085A200 (751#F6C7); SEL-751 Feeder Protection Relay
1	# P/N: 2730M0ARAX1111CCCCX0 (2730M#28CN); Managed 24-Port Ethernet
1	Switch
1	# Lot of CAT6 Ethernet Cable and connectors for Relay and Ethernet Switch
1	(internal wiring)
1	# Sensor HMI with mounting kit
	.
	A01 : Frame Sequence 7 (1200A FDRS)
	1200A Feeder Breaker - LV Instrument Panel (19") - 1200A Feeder Breaker
	Breaker A/B:
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"A"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for
1	2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector,
1	Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45
1	connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC
1	and 90-300 VDC, Output 24 VDC / 10 A
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Breaker D/E:
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports

Bill of Material(s)

1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for
1	2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector,
1	Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45
1	connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC
1	and 90-300 VDC, Output 24 VDC / 10 A
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Frames:
1	Shipping Base Assembly - Indoor, set per cubicle
1	A/R type 2 Base Frame, 2-high, 1.2 kAF Main or Feeder - std depth
1	A/R End Panel Assembly - standard depth
1	A/R Rear Panels, Split Bolted with handles
1	A/R type 2B Construction, per frame
2	Front Door Adder - SmartRack Assembly (Electric Racking)
1	A/R External Plenum Assembly, 36 in W, End Frame - 1200 A
1	Cable Support Assembly
1	Cable Support Assembly
1	Cable Lug Boot, 3-ph, 1200 A
1	Cable Lug Boot, 3-ph, 1200 A
1	Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
1	Strip Heater Circuit, Total 300 W applied at 1/2 V
1	Ground Cable Lugs, compression type, #4/0 AWG
1	Cable Lugs, compression type, 2-hole, set of (3), up to #4/0 AWG
1	Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM
	LV Instrument:
1	A/R type 2 Instrument Compartment - 19 in high, with MPL Door
3	Door Stop Assembly
1	DC Control Bus, 40 A 2-wire
1	AC Control Bus, 40 A 1ph 3-wire
2	Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
2	Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
1	Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
1	Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
1	20% Spare Terminal Blocks
1	Wired to Terminal Block, unused relay contacts
1	Wire Markers - SPECIAL

Bill of Material(s)		
	1	Breaker Control Switch, pistol, (1)C & (1)T
	1	Breaker Control Switch, pistol, (1)C & (1)T
	2	Indicating Lamp LED
	2	Indicating Lamp LED
	4	Test Switch, ABB FT-1, 10-pole
	2	PM8244 Intermediate Power Meter, DIN rail mount + remote display
	2	(PM8) Digital I/O Module - 6 digital inputs, 2 relay outputs
		# Note: All Devices for this frame that cannot be fit in the 19" Instrument
	1	Compartment Door will be mounted on the adjacent 38" or 57" Instrument
		Compartment Door.
	2	# P/N: 751001A1A0X0X85B200 (751#MHJB); SEL-751 Feeder Protection Relay
2	1	Medium Voltage Switchgear, Plenum, (A02)
		Marks: PLENUM
	6	A/R External Plenum Assembly, Straight Run, per foot
	1	A/R External Plenum Assembly, Wall Duct
3	1	Medium Voltage Switchgear, Accessories, (A03)
		Marks: ACCESSORIES
	1	Advac Breaker Accessory Kit
	1	CB Test Jumper, dual plug
	1	CB Test Station, dual plug, single trip, wall mounted (Advac, Amvac)
	1	Electric Racking Device, ABB SmartRack, 120V AC w/ 25ft cord
	1	Breaker Lift Truck - hydraulic operated (AD/SFG bolted or turn handle doors)
4	1	Medium Voltage Switchgear, Spare Parts, (A04)
		Marks: SPARE PARTS
	1	Lubricant, NO-OX-ID (1-pint can)
	3	Touch-Up Paint, 12 oz can, ANSI # 61 or ANSI # 70
	1	Test Plug, ABB type FT-1, current circuits
	1	Test Plug, ABB type FT-1, potential circuits
	12	Spare Indicating Lamp Assy w/ LED Bulb & color cap
	12	Spare Lamp Bulb, LED
	1	Spare Fuses, Breaker Control, 250V DC (box of 10)
	1	Spare PT Secondary Fuse, 250V AC (box of 10)
	6	Spare PT Primary Fuse, CLE-PT 8.25kV or 15kV
5	1	Medium Voltage Switchgear, Freight, (A05)
		Marks: FREIGHT
	1	INCO-Terms: CPT (Carriage Paid To) Destination: Switchgear is loaded onto truck and shipped to named destination. The offer does not include offloading of switchgear. Term: Carriage Paid To Place of Destination: Harrisburg, PA
6	2	5kV Drawout Breaker 2000A Close Couple to XFMR with PM8240 Meter
7	2	5kV Drawout Breaker 2000A Close Couple to LIS with PM8240 Meter
8	2	12.4kV Drawout Breaker 600A Close Couple to XFMR
9	1	Switchgear "MDS5" - (2) 2000 Drawout Main Breakers, (5) Fusible Branch Switches with Fuses- PM8214
10	1	Low Voltage Switchgear, Reliagear
		Marks: MTM1

Bill of Material(s)

5 Section(s), NEMA 1 Enclosure
3200 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 65 kA
Breaker Min Withstand Rating: 65 kA
Bus Bracing Rating: 65 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 152 in, Depth: 64.33 in, Weight: 13375 lbs

Main Breaker 1

2 E4.2S-A 3200 Ekip Hi-Touch LSIG
2 AUX 4Q 400 V E2.2...E6.2
2 YC E1.2..E6.2 110-120 V AC/DC
2 M E2.2...E6.2 100-130 V AC/DC
2 YO E1.2..E6.2 110-120 V AC/DC
2 UVR E1.2..E6.2 110-120 V AC/DC
2 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
2 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
2 Disabling Bluetooth
2 PLP Position padlock D=4/6/8mmE2.2..E6.2
2 None - Push Button Locking Options
2 MOC E2.2..E6.2
2 Breaker Compartment
2 Ekip Com Modbus RS-485 E1.2..E6.2
2 RELT
2 E4.2-A W Cradle UL
2 AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
2 RELT Switch

Tie Breaker 2

1 E4.2S-A 3200 Ekip Hi-Touch LSIG
1 AUX 4Q 400 V E2.2...E6.2
1 YC E1.2..E6.2 110-120 V AC/DC
1 M E2.2...E6.2 100-130 V AC/DC
1 YO E1.2..E6.2 110-120 V AC/DC
1 UVR E1.2..E6.2 110-120 V AC/DC
1 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1 Disabling Bluetooth
1 PLP Position padlock D=4/6/8mmE2.2..E6.2
1 None - Push Button Locking Options
1 MOC E2.2..E6.2
1 Breaker Compartment
1 Ekip Com Modbus RS-485 E1.2..E6.2
1 RELT
1 E4.2-A W Cradle UL
1 AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
1 RELT Switch

Feed Breaker 3

2 E4.2S-A 3200 Ekip Hi-Touch LSIG
2 AUX 4Q 400 V E2.2...E6.2
2 YC E1.2..E6.2 110-120 V AC/DC
2 M E2.2...E6.2 100-130 V AC/DC
2 YO E1.2..E6.2 110-120 V AC/DC
2 UVR E1.2..E6.2 110-120 V AC/DC
2 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
2 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
2 Disabling Bluetooth
2 PLP Position padlock D=4/6/8mmE2.2..E6.2
2 None - Push Button Locking Options
2 MOC E2.2..E6.2

Bill of Material(s)

2	Breaker Compartment
2	Ekip Com Modbus RS-485 E1.2..E6.2
2	RELT
2	E4.2-A W Cradle UL
2	None - AUP
2	RELT Switch
	Item Options
10	Wire Tags, Origin and/or Destination
3	Special #16 AWG SIS Control Wire
5	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
5	Shutters (3200A)
5	Bus Plating
5	Cable Supports
5	Rear Door Full Height, Bolted without Key
5	Rear Padlocking
2	Side Barrier Between Sections
5	Rail Padlock
1	UL Service Entrance Label/IL Isolation
1	Pull Box
5	Nameplate -
1	PRINT HOLDER
	Lineup
5	100% Neutral 30 in Stack
1	30 in 1-High Tie Breaker Stack
5	30 in Ground Bus 800A CU
5	Auxiliary Compartment (30 in W x 21 in H)
5	Auxiliary Compartment (30 in W x 42 in H)
5	Bus Construction -Bus Isolation/Insulation
1	GE Busway 30 in Aux Stack
1	GE Busway 30 in Aux Stack
1	GE Busway 30 in Aux Stack
1	GE Busway 30 in Aux Stack
1	Shipping Split
2	SPECTRA Riser 3200A-4W (F)
2	SPECTRA Riser 3200A-4W (R)
	Devices
1	10-Trip Selector Switch 4 POS
1	110V Remote Racker
12	288/120 Singe Phase PT
1	43-Auto/Manual Switch
2	ABB FT-1 Test Plug
6	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
3	Breaker Control Switch ATO
1	Breaker Lifting Spreader E2.2-E4.2
1	Breaker Portable Lift Truck
2	CPT 5KVA
1	CPT T/O Contactor
1	CPT T/O UV Relay
3	CT-3200/5A
12	CT-3200/5A
2	E4.2/E6.2 Neutral Sensor 1% Main/Tie
1	Ekip Programming Kit
1	Emax 2 racking handle E2.2-E6.2
4	Emax 2 Racking Plate
20	Fuse Block - 30A
2	Fuse Block-2P 30A
4	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
2	GE SPD TPHE277Y20SG w/Disc
11	IL-P9 LED (Std)

Bill of Material(s)

4	Infrared Viewport
1	Lifting Plate
1	MOXA-Serial to Ethernet
5	Pilot Light - Green
5	Pilot Light - Red
9	Relay- Aux-Light Duty 4NO
5	RELT Switch-Lighted
2	Schweitzer SEL-751 Relay
4	SCTB-4 pole
3	SP - PM 8214 Meter
1	SP - PM 8214 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
2	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil
1	Three Bkr Transfer (Relay)

11 1 Low Voltage Switchgear, Reliagear
Marks: MTM2 - OPEN

5 Section(s), NEMA 1 Enclosure
5000 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 100 kA
Breaker Min Withstand Rating: 85 kA
Bus Bracing Rating: 100 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 160 in, Depth: 71.33 in, Weight: 15344 lbs

Main Breaker 1

2	E6.2V-A 5000 Ekip Hi-Touch LSIG
2	AUX 4Q 400 V E2.2...E6.2
2	YC E1.2..E6.2 110-120 V AC/DC
2	M E2.2...E6.2 100-130 V AC/DC
2	YO E1.2..E6.2 110-120 V AC/DC
2	UVR E1.2..E6.2 110-120 V AC/DC
2	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
2	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
2	Disabling Bluetooth
2	PLP Position padlock D=4/6/8mmE2.2..E6.2
2	None - Push Button Locking Options
2	MOC E2.2..E6.2
2	Breaker Compartment
2	Ekip Com Modbus RS-485 E1.2..E6.2
2	RELT
2	E6.2-A W Cradle UL
2	AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
2	RELT Switch

Tie Breaker 2

1	E6.2V-A 5000 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	YC E1.2..E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2..E6.2 110-120 V AC/DC
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2

Bill of Material(s)

1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E6.2-A W Cradle UL
1	AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
1	RELT Switch
	Feed Breaker 3
4	E2.2V-A 1600 Ekip Hi-Touch LSIG
4	AUX 4Q 400 V E2.2...E6.2
4	YC E1.2..E6.2 110-120 V AC/DC
4	M E2.2...E6.2 100-130 V AC/DC
4	YO E1.2..E6.2 110-120 V AC/DC
4	UVR E1.2..E6.2 110-120 V AC/DC
4	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
4	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
4	Disabling Bluetooth
4	PLP Position padlock D=4/6/8mmE2.2..E6.2
4	None - Push Button Locking Options
4	MOC E2.2..E6.2
4	Breaker Compartment
4	Ekip Com Modbus RS-485 E1.2..E6.2
4	RELT
4	E2.2-A W Cradle UL
4	None - AUP
4	RELT Switch
	Feed Breaker 4
1	E2.2V-A 1600 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	YC E1.2..E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2..E6.2 110-120 V AC/DC
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E2.2-A W Cradle UL
1	None - AUP
1	RELT Switch
	Feed Breaker 5
1	E2.2V-A 800 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	YC E1.2..E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2..E6.2 110-120 V AC/DC
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E2.2-A W Cradle UL

Bill of Material(s)

1	None - AUP
1	RELT Switch
	Item Options
11	Wire Tags, Origin and/or Destination
9	Special #16 AWG SIS Control Wire
9	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
1	Shutters (800A)
5	Shutters (1600A)
3	Shutters (5000A)
5	Bus Plating
5	Cable Supports
5	Rear Door Full Height, Bolted without Key
5	Rear Padlocking
4	Side Barrier Between Sections
9	Rail Padlock
1	UL Service Entrance Label/IL Isolation
3	Pull Box
5	Nameplate -
	Lineup
2	100% Neutral 22 in Stack
3	100% Neutral 38 in Stack
1	22 in 3-High Feeder Stack
1	22 in 3-High Feeder Stack
2	22 in Ground Bus 800A CU
1	38 in 1-High Tie Breaker Stack
3	38 in Ground Bus 800A CU
2	45 in Cable Compartment (22 in Stks)
3	45 in Cable Compartment (38 in Stks)
2	Auxiliary Compartment (22 in W x 21 in H)
3	Auxiliary Compartment (38 in W x 14 in H)
3	Auxiliary Compartment (38 in W x 42 in H)
3	Auxiliary Compartment (38 in W x 7 in H)
5	Bus Bracing 100,000 Amps
5	Bus Construction -Bus Isolation/Insulation
1	GE Busway 38 in Aux Stack
1	GE Busway 38 in Aux Stack
2	Shipping Split
1	SPECTRA Riser 5000A-4W (F)
1	SPECTRA Riser 5000A-4W (R)
	Devices
1	110V Remote Racker
1	25-Sync Check Relay, Basler BE1
2	27 UV Relay, Basler (ES)
12	288/120 Singe Phase PT
1	43-Auto/Manual Switch
2	47-PHASE BALANCE RELAY (ES)
3	5000A Fan Package
2	ABB FT-1 Test Plug
6	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
3	Breaker Control Switch ATO
1	Breaker Lifting Spreader E2.2-E4.2
1	Breaker Lifting Spreader E6.2
1	Breaker Portable Lift Truck
2	CPT 5KVA
1	CPT T/O Contactor
1	CPT T/O UV Relay
15	CT-1600/5A
12	CT-5000/5A
3	CT-5000/5A
3	CT-800/5A

Bill of Material(s)

6	E2.2 Neutral Sensor 1% Feeder
1	Ekip Programming Kit
2	Emax 2 racking handle E2.2-E6.2
4	Emax 2 Racking Plate
36	Fuse Block - 30A
2	Fuse Block-2P 30A
4	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
11	IL-P9 LED (Std)
8	Infrared Viewport
2	Lifting Plate
1	MOXA-Serial to Ethernet
9	Pilot Light - Green
9	Pilot Light - Red
9	Relay- Aux-Light Duty 4NO
9	RELT Switch-Lighted
2	Schweitzer SEL-751 Relay
10	SCTB-4 pole
8	SP - PM 8214 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
2	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil
44	THOMAS&BETTS CRIMP TERM FOR CU Cable 500kcmil
1	Three Bkr Transfer (Relay)
2	Timer-TDDO, Agastat
2	Timer-TDPU, Agastat

12 1 Low Voltage Switchgear, Reliagear Marks: MAIN 1

3 Section(s), NEMA 1 Enclosure
5000 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 100 kA
Breaker Min Withstand Rating: 85 kA
Bus Bracing Rating: 100 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 83 in, Depth: 71.33 in, Weight: 6898 lbs

Main Breaker 1

1	E6.2V-A 5000 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	None - Closing Coil (YC) and Redundant Closing Coil (YC2)
1	None - Spring Charging Motor (M) and Ekip Com Actuator
1	None - Opening Coil (YO)
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply 110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and Disabling Bluetooth
1	PLP Position padlock D=4/6/8mm E2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E6.2-A W Cradle UL
1	None - AUP
1	RELT Switch

Bill of Material(s)

Feed Breaker 2

1	E2.2V-A 800 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2..E6.2
1	YC E1.2..E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2..E6.2 110-120 V AC/DC
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E2.2-A W Cradle UL
1	None - AUP
1	RELT Switch

Item Options

7	Wire Tags, Origin and/or Destination
2	Special #16 AWG SIS Control Wire
2	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
1	Shutters (5000A)
1	Shutters (800A)
3	Bus Plating
2	Cable Supports
2	Rear Door Full Height, Bolted without Key
3	Rear Padlocking
1	Side Barrier Between Sections
2	Rail Padlock
1	Pull Box
3	Nameplate -

Lineup

2	100% Neutral 22 in Stack
1	100% Neutral 38 in Stack
1	22 in 1-High Feeder Stack
2	22 in Ground Bus 800A CU
1	38 in Ground Bus 800A CU
1	45 in Cable Compartment (22 in Stks)
1	45 in Cable Compartment (38 in Stks)
1	53 in Transition Rear Compt (22 in Stks)
1	Auxiliary Compartment (22 in W x 21 in H)
3	Auxiliary Compartment (22 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 14 in H)
1	Auxiliary Compartment (38 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 7 in H)
3	Bus Bracing 100,000 Amps
2	Bus Construction -Bus Isolation/Insulation
1	GE Busway 38 in Aux Stack
1	GE/EPO Transformer Transition
1	SPECTRA Riser 5000A-4W (R)

Devices

1	110V Remote Racker
3	288/120 Singe Phase PT
1	5000A Fan Package
2	ABB FT-1 Test Plug
6	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
1	Breaker Lifting Spreader E2.2-E4.2
1	Breaker Lifting Spreader E6.2

Bill of Material(s)

1	Breaker Portable Lift Truck
1	CPT 5KVA
4	CT-5000/5A
3	CT-5000/5A
3	CT-800/5A
1	E2.2 Neutral Sensor 1% Feeder
1	Ekip Programming Kit
2	Emax 2 racking handle E2.2-E6.2
2	Emax 2 Racking Plate
6	Fuse Block - 30A
1	Fuse Block-2P 30A
1	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
3	Infrared Viewport
2	Lifting Plate
1	MOXA-Serial to Ethernet
2	Pilot Light - Green
2	Pilot Light - Red
2	RELT Switch-Lighted
3	SCTB-4 pole
3	SP - PM 8214 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
1	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil
4	THOMAS&BETTS CRIMP TERM FOR CU Cable 500kcmil

13 **1** **Low Voltage Switchgear, Reliagear**
Marks: MAIN 2

2 Section(s), NEMA 1 Enclosure
5000 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 100 kA
Breaker Min Withstand Rating: 85 kA
Bus Bracing Rating: 100 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 61 in, Depth: 71.33 in, Weight: 5283 lbs

Main Breaker 1

1	E6.2V-A 5000 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	None - Closing Coil (YC) and Redundant Closing Coil (YC2)
1	None - Spring Charging Motor (M) and Ekip Com Actuator
1	None - Opening Coil (YO)
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E6.2-A W Cradle UL
1	None - AUP
1	RELT Switch

Item Options

Bill of Material(s)

5	Wire Tags, Origin and/or Destination
1	Special #16 AWG SIS Control Wire
1	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
1	Shutters (5000A)
2	Bus Plating
1	Cable Supports
1	Rear Door Full Height, Bolted without Key
2	Rear Padlocking
	Side Barrier Between Sections
1	Rail Padlock
2	Nameplate -
	Lineup
1	100% Neutral 22 in Stack
1	100% Neutral 38 in Stack
1	22 in Ground Bus 800A CU
1	38 in Ground Bus 800A CU
1	45 in Cable Compartment (38 in Stks)
1	53 in Transition Rear Compt (22 in Stks)
2	Auxiliary Compartment (22 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 14 in H)
1	Auxiliary Compartment (38 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 7 in H)
2	Bus Bracing 100,000 Amps
1	Bus Construction -Bus Isolation/Insulation
1	GE Busway 38 in Aux Stack
1	GE/EPO Transformer Transition
1	SPECTRA Riser 5000A-4W (R)
	Devices
1	110V Remote Racker
3	288/120 Singe Phase PT
1	5000A Fan Package
1	ABB FT-1 Test Plug
1	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
1	Breaker Lifting Spreader E6.2
1	Breaker Portable Lift Truck
1	CPT 5KVA
1	CT-5000/5A
3	CT-5000/5A
1	Ekip Programming Kit
1	Emax 2 racking handle E2.2-E6.2
1	Emax 2 Racking Plate
2	Fuse Block - 30A
1	Fuse Block-2P 30A
1	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
2	Infrared Viewport
1	Lifting Plate
1	MOXA-Serial to Ethernet
1	Pilot Light - Green
1	Pilot Light - Red
1	RELT Switch-Lighted
2	SCTB-4 pole
1	SP - PM 8000 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
1	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil

Bill of Material(s)		
14	4	Battery System for LV Switchgear Marks: BATTERY SYSTEM
15	2	SEPS Secondary Substation Transformer, Vent Dry Marks: 3500 KVA VPI/3500 KVA/12470 HV/480Y LV/CU/80Deg
16	1	Power Panelboard, ReliaGear neXT Marks: MDP-NE 1 Section(s), Nema 1 Enclosure 600 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz Minimum Interrupt Rating: 35kA Fully Rated Incoming Feed: Bottom Surface Mounted UL67 Certified Height: 72 Inches; Width: 40 Inches; Depth: 11 Inches; Est. Weight: 531 lbs 1 600 Amps Main Breaker XT5NU360BBYN000XXX 1 TMA Horiz. XT5 (2) 2/0-500 mcm, No Feed Through Lugs Main Option Details 1 Silver Plated Copper Bus Heat Rated 1 100% Rated Neutral 1 CU Neutral, Mech (CU Cables) 1 NEMA 1 Enclosure Feeders 3 Breaker Device 20 Amps 3 Poles XT1SU3020AYD000XXX 3 TMF 3 (1) 10 - 2/0 AWG 1 Breaker Device 50 Amps 3 Poles XT1SU3050AYD000XXX 1 TMF 1 (1) 10 - 2/0 AWG 1 Breaker Device 125 Amps 3 Poles XT1SU3125AYD000XXX 1 TMF 1 (1) 10 - 2/0 AWG 1 Breaker Device 225 Amps 3 Poles XT4SU3225AYJ000XXX 1 TMF 1 (1) 4 AWG-300 MCM 8 Breaker Space Device 20 Amps 3 Poles XT1SU3020AYD000XXX 8 TMF 8 (1) 10 - 2/0 AWG Modifications 1 Door within Door 1 Nameplates (75C141109P109) 1 Key Lock 1 Ground: GDBG47CU 1 Interior Bus Stack: IN2406NN3H2 1 Neutral: NL12IONSTNDCU 1 Enclosure: ER7240B 1 Interior Frame: IF2440F 1 Door within Door Deadfront: DD4072AHFS 1 Door within Door Filler 1: DDFIL404509SF 1 Door within Door Filler 2: DDFIL404515SF 1 Door within Door Filler Support: DDSUP24 1 Surge Protection: RGPPSP277Y08T2 1 1X Filler & Blank: SR01BF 1 1X Blank only: SR01BB 1 5 XT1 Mtg Kit, Narrow: SR5XBR 1 5 XT1 Mtg Kit, Wide: SR5XBF 1 2 XT1 Mtg Kit, Wide: SR2XBF 1 1 XT1 Mtg Kit, Narrow: SR1XBR

Bill of Material(s)		
		8 XT1 Blank only: SRT1BB 1 Lifting Bar: IL40F 1 Circuit Directory Kit, Metal: RGRPCDKM 1 Nameplates: 75C141109P109 1 Disconnect for SPD: XT1SU3030AYD000XXX 1 SPD Disc XT1 Mtg Kit: SR1XBR 1 PPXT FA INT 1 PPXT FA BOX
17	1	Lighting Panelboard, ReliaGear RQ Marks: LP-LH 1 Section(s), Nema 1 Enclosure 400 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz Minimum Interrupt Rating: 22kA Fully Rated Incoming Feed: Bottom Surface Mounted 42 Circuits UL67 / CSA C22.2 No. 29 Certified cULus Certified Height: 64.5 Inches; Width: 20 Inches; Depth: 5.75 Inches 1 400 Amps Main Lugs 1-lug/phase 1-cable/lug #4 -600 kcmil Or 1-lug/phase 2-cable/lug 1/0 -250 kcmil Main Option Details 1 Copper Bus Heat Rated 4 Ground-Cu box bonded TGC2 1 Ground main lug TGL20 1 100% Rated Neutral 1 NEMA 1 Enclosure Feeders 5 Breaker Device 30 Amps 1 Poles THHQB 1 Breaker Device 30 Amps 3 Poles THHQB 1 Breaker Device 20 Amps 3 Poles THHQB 27 Breaker Device 20 Amps 1 Poles THHQB 4 Breaker Space Device 20 Amps 1 Poles THHQB Modifications 1 Front Hinged To Box 1 Metal Directory Card Hldr 1 Screw-On Nameplate 1 ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2) 1 Interior: AQF3424MBX AXT6B7 1 Box: AB64B 1 Front: AF64SDUM
18	1	Lighting Panelboard, ReliaGear RQ Marks: CP 1 Section(s), Nema 1 Enclosure 225 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz Minimum Interrupt Rating: 10kA Fully Rated Incoming Feed: Bottom Surface Mounted 42 Circuits UL67 / CSA C22.2 No. 29 Certified cULus Certified Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches 1 175 Amps Main Breaker A2A225 Al - 1-lug/phase 1-cable/lug 2/0 -300 kcmil Or Cu - 1-lug/phase 1-cable/lug #1 -250 kcmil Main Option Details 1 Copper Bus Heat Rated 4 Ground-Cu box bonded TGC2

Bill of Material(s)		
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	1	Breaker Device 100 Amps 3 Poles THQB
	39	Breaker Device 20 Amps 1 Poles THQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3422ABX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDUM
19	1	Lighting Panelboard, ReliaGear RQ
		Marks: LR
		1 Section(s), Nema 1 Enclosure
		400 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 22kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		60 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 82.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	300 Amps Main Breaker XT5N400
	1	TMA
		1-lug/phase 2-cable/lug 2/0 -500 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	5	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	10	Breaker Device 30 Amps 1 Poles THHQB
	1	Breaker Device 20 Amps 3 Poles THHQB
	47	Breaker Device 20 Amps 1 Poles THHQB
		Modifications
	1	Power Distribution Panel
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Quarter Turn Latch
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3604JBX AXT6B7
	1	Box: AB82B
	1	Front: AF82SDTUM
20	1	Lighting Panelboard, ReliaGear RQ
		Marks: CP-1
		1 Section(s), Nema 1 Enclosure
		250 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 10kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		24 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches

Bill of Material(s)		
	1	100 Amps Main Breaker XT4N250
	1	TMF
		1-lug/phase 1-cable/lug #4 -300 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	2	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	1	Breaker Device 40 Amps 2 Poles THQB
	1	Breaker Device 50 Amps 2 Poles THQB
	20	Breaker Device 20 Amps 1 Poles THQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3242JBX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDUM
21	1	Lighting Panelboard, ReliaGear RS
		Marks: V-1 RH
		1 Section(s), Nema 1 Enclosure
		225 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		48 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	225 Amps Main Lugs
		1-lug/phase 1-cable/lug #6 -350 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	4	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	10	Breaker Device 20 Amps 3 Poles TEYD
	4	Breaker Device 20 Amps 1 Poles TEYD
	14	Breaker Space Device 20 Amps 1 Poles TEYD
		Modifications
	1	Power Distribution Panel
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3482MBX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDLUM
22	1	Lighting Panelboard, ReliaGear RS
		Marks: V-1
		1 Section(s), Nema 1 Enclosure
		125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated

Bill of Material(s)

- Incoming Feed: Bottom
Surface Mounted
12 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 31.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 125 Amps Main Breaker TEYD
1-lug/phase 1-cable/lug #14 -1/0
- Main Option Details**
- 1 Copper Bus Heat Rated
2 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 3 Breaker Device 20 Amps 3 Poles TEYD
1 Breaker Device 60 Amps 3 Poles TEYD
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Corbin Latch Bolt 15767
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3121BBX AXT6B7
1 Box: AB31B
1 Front: AF31SDLUM

23 1 Lighting Panelboard, ReliaGear RS
Marks: V1A

- 1 Section(s), Nema 1 Enclosure
125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 25kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
30 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 43.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 125 Amps Main Lugs
1-lug/phase 1-cable/lug #14 -2/0
- Main Option Details**
- 1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 4 Breaker Device 20 Amps 3 Poles TEYD
1 Breaker Device 20 Amps 2 Poles TEYD
16 Breaker Space Device 20 Amps 1 Poles TEYD
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Corbin Latch Bolt 15767
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3301MBX AXT6B7
1 Box: AB43B
1 Front: AF43SDLUM

24 1 Lighting Panelboard, ReliaGear RS
Marks: PP

Bill of Material(s)

1 Section(s), Nema 1 Enclosure
400 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 42kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
48 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 76.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
1 300 Amps Main Breaker XT5S400
1 TMA
1-lug/phase 2-cable/lug 2/0 -500 kcmil
Main Option Details
1 Copper Bus Heat Rated
4 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
3 Breaker Device 20 Amps 3 Poles TEYL
4 Breaker Device 40 Amps 3 Poles TEYL
6 Breaker Space Device 20 Amps 1 Poles TEYL
1 Breaker Device 60 Amps 3 Poles TEYL
14 Breaker Device 20 Amps 1 Poles TEYL
Modifications
1 Power Distribution Panel
1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Quarter Turn Latch
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3484KBX AXT6B7
1 Box: AB76B
1 Front: AF76SDTUM

25 1 Lighting Panelboard, ReliaGear RS
Marks: WELDER/PLASMA CUTTER

1 Section(s), Nema 1 Enclosure
400 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 35kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
30 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
1 400 Amps Main Lugs
1-lug/phase 1-cable/lug #4 -600 kcmil
Or 1-lug/phase 2-cable/lug 1/0 -250 kcmil
Main Option Details
1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
1 Breaker Device 20 Amps 3 Poles TEYH
2 Breaker Device 30 Amps 3 Poles TEYH
12 Breaker Space Device 20 Amps 1 Poles TEYH
1 Breaker Device 60 Amps 3 Poles TEYH
2 Breaker Device 50 Amps 3 Poles TEYH

Bill of Material(s)		
		Modifications 1 Front Hinged To Box 1 Metal Directory Card Hldr 1 Screw-On Nameplate 1 Corbin Latch Bolt 15767 1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2) 1 Interior: ASF3304MBX AXT6B7 1 Box: AB55B 1 Front: AF55SDLUM
26	1	Lighting Panelboard, ReliaGear RQ Marks: N/E 1 Section(s), Nema 1 Enclosure 225 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz Minimum Interrupt Rating: 10kA Fully Rated Incoming Feed: Bottom Surface Mounted 30 Circuits UL67 / CSA C22.2 No. 29 Certified cULus Certified Height: 49.5 Inches; Width: 20 Inches; Depth: 5.75 Inches 1 225 Amps Main Lugs 1-lug/phase 1-cable/lug #6 -350 kcmil Main Option Details 1 Copper Bus Heat Rated 3 Ground-Cu box bonded TGC2 1 Ground main lug TGL20 1 100% Rated Neutral 1 NEMA 1 Enclosure Feeders 1 Breaker Device 25 Amps 2 Poles THQB 1 Breaker Device 20 Amps 2 Poles THQB 26 Breaker Device 20 Amps 1 Poles THQB Modifications 1 Front Hinged To Box 1 Metal Directory Card Hldr 1 Screw-On Nameplate 1 ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2) 1 Interior: AQF3302MBX AXT6B7 1 Box: AB49B 1 Front: AF49SDUM
27	1	Lighting Panelboard, ReliaGear RS Marks: NE 1 Section(s), Nema 1 Enclosure 250 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz Minimum Interrupt Rating: 25kA Fully Rated Incoming Feed: Bottom Surface Mounted 42 Circuits UL67 / CSA C22.2 No. 29 Certified cULus Certified Height: 64.5 Inches; Width: 20 Inches; Depth: 5.75 Inches 1 225 Amps Main Breaker XT4N250 1 TMF 1-lug/phase 1-cable/lug #4 -300 kcmil Main Option Details 1 Copper Bus Heat Rated 4 Ground-Cu box bonded TGC2 1 Ground main lug TGL20 1 100% Rated Neutral

Bill of Material(s)		
	1	NEMA 1 Enclosure
		Feeders
	2	Breaker Device 30 Amps 3 Poles TEYD
	2	Breaker Device 20 Amps 2 Poles TEYD
	4	Breaker Device 20 Amps 3 Poles TEYD
	1	Breaker Device 50 Amps 3 Poles TEYD
	2	Breaker Device 15 Amps 3 Poles TEYD
	1	Breaker Device 30 Amps 1 Poles TEYD
	10	Breaker Device 20 Amps 1 Poles TEYD
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3422KBX AXT6B7
	1	Box: AB64B
	1	Front: AF64SDLUM
28	1	Lighting Panelboard, ReliaGear RS
		Marks: NE2
		1 Section(s), Nema 1 Enclosure
		125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		24 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 37.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	50 Amps Main Breaker TEYD
		1-lug/phase 1-cable/lug #14 -1/0
		Main Option Details
	1	Copper Bus Heat Rated
	2	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	4	Breaker Device 20 Amps 3 Poles TEYD
	12	Breaker Device 20 Amps 1 Poles TEYD
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3241BBX AXT6B7
	1	Box: AB37B
	1	Front: AF37SDLUM
29	1	Lighting Panelboard, ReliaGear RQ
		Marks: RP
		1 Section(s), Nema 1 Enclosure
		125 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 22kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		30 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified

Bill of Material(s)

- Height: 43.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 100 Amps Main Breaker THHQB
1-lug/phase 1-cable/lug #14 -1/0
- Main Option Details**
- 1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 30 Breaker Device 20 Amps 1 Poles THHQB
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
1 Interior: AQF3301CBX AXT6B7
1 Box: AB43B
1 Front: AF43SDUM

30 1 Lighting Panelboard, ReliaGear RS
Marks: HP

- 1 Section(s), Nema 1 Enclosure
125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 35kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
30 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 43.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 100 Amps Main Breaker TEYH
1-lug/phase 1-cable/lug #14 -1/0
- Main Option Details**
- 1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 8 Breaker Device 20 Amps 3 Poles TEYH
6 Breaker Device 20 Amps 1 Poles TEYH
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Corbin Latch Bolt 15767
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3301BBX AXT6B7
1 Box: AB43B
1 Front: AF43SDLUM

31 1 Lighting Panelboard, ReliaGear RE
Marks: DC

- 1 Section(s), Nema 1 Enclosure
125 Amps, 3 Wire 125/250V DC, 50/60 Hz, 1 & 2 Pole
Minimum Interrupt Rating: 10kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
42 Circuits
UL67 / CSA C22.2 No. 29 Certified

Bill of Material(s)

- 1 cULus Certified
Height: 37.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
125 Amps Main Lugs
1-lug/phase 1-cable/lug #14 -2/0
Main Option Details
1 Copper Bus Heat Rated
4 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
20 Breaker Device 15 Amps 2 Poles TEYF
Modifications
1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Interior: AEF1421MBX AXB7
1 Box: AB37B
1 Front: AF37SDUM

32 1 Transformer, Copper, 9T10C1002G32
Marks: T-RP

- 1 3 Phase, 60 Hz, 30 kVA
Ambient Temperature : 40°C
Coil Material : Copper
Primary Voltage : 480, Primary Connection : Delta
Secondary Voltage : 208Y/120, Secondary Connection : Wye
Temperature Rise : 115
Energy Efficiency : DOE 2016 (Std)
Enclosure : NEMA 1/NEMA 2
Taps(Nominal) : 2 above 4 below 2.5%
Impedance (+/- 7.5%) : 3.7%
K Factor : K1
Sound Level : -3dB(42dB)
UL : Yes, cUL : No, CE : No,
Accessories :
1 9T18Y1072G10 Lug Kit included
1 9T18Y1071G11 Ground Bar Kit included
Factory Individualized Transformer Test Reports :
1 NEMA ST-20 Sound Level Test Report
IEEE std C57.12.91 Electrical Test Performance Report - Not Required

33 3 Switches and Disconnects, Heavy Duty Safety Switch, THN3366A1
Marks: VFD DISCONNECT

- 1 Suitable for use as Service Equipment
Heavy Duty 600 Amps
No Fuse 3 Poles 600VAC/250VDC
NEMA 1 (Indoor)
For Use Size With (2) 4-600* Copper or Size (2) 4-600* Aluminum wire
*600MCM restricted to side entry only
Height1: 49.39, Height2: 49.39, Width1: 23.65, Width2: 24.5, Depth1: 8.51, Depth2: 13.26, Weight: 107
Accessories:
1 TGL6 , Equipment Ground Kit, (3) #2-250MCM CU/AL
1 THAUX66DA , Aux Contact Kit-DPDT

34 1 Switches and Disconnects, Elevator Disconnect, ES6T48R1KGN1A
Marks: ELEVATOR CONTROL SW

- 1 Mersen Elevator Switch 30-100A N1
NEMA 1 Enclosure

Bill of Material(s)

60 A, 480 V ac Primary, 120 V ac Secondary Control Transformer
120 V ac Fire Safety Interface Relay
1 NO/NC Mechanical Interlock Auxiliary Contact
UL98, cULus 508 Listed
Dimensions and Weight (Estimated)
Height: 8.7 in, Width: 16.3 in, Length: 24.39 in
Gross Weight: 58 lb, Net Weight: 51 lb

Options

60 A (2/0-#14) Isolated Neutral Lug
Key to Test Switch
Green Pilot Light

Accessories

3 60 A, 600 V ac, Class J Time Delay, AJT60 Fuse

35 1 Busway, ReliaGear Series Busway
Marks: BUS MTM1-T1

Build America, Buy America (2 CFR Part 184) Compliant
176 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

1 ANSI - 61 Gray, Standard
1 Standard Warranty
176 Ft of Feeder Indoor (IP40)
12 Each 90 Degree Elbow Forming Charge
1 Each Expansion Section Forming Charge
1 Each Unfused Reducer / Phase Transposition Forming Charge
1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
1 Each Non ABB Switchboard Stub Forming Charge
10 Spring Hanger (Pair)

36 1 Busway, ReliaGear Series Busway
Marks: BUS MTM1-T2

Build America, Buy America (2 CFR Part 184) Compliant
181 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

1 ANSI - 61 Gray, Standard
1 Standard Warranty
181 Ft of Feeder Indoor (IP40)
12 Each 90 Degree Elbow Forming Charge
1 Each Expansion Section Forming Charge
1 Each Unfused Reducer / Phase Transposition Forming Charge
1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
1 Each Non ABB Switchboard Stub Forming Charge
10 Spring Hanger (Pair)

37 1 Busway, ReliaGear Series Busway

Bill of Material(s)

Marks: BUS MTM1-MDS1

Build America, Buy America (2 CFR Part 184) Compliant
151 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

- 1 ANSI - 61 Gray, Standard
- 1 Standard Warranty
- 151 Ft of Feeder Indoor (IP40)
- 11 Each 90 Degree Elbow Forming Charge
- 1 Each Expansion Section Forming Charge
- 1 Each Unfused Reducer / Phase Transposition Forming Charge
- 1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
- 1 Each Non ABB Switchboard Stub Forming Charge
- 10 Spring Hanger (Pair)

38 1 Busway, ReliaGear Series Busway**Marks: BUS MTM1-MDS2**

Build America, Buy America (2 CFR Part 184) Compliant
131 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

- 1 ANSI - 61 Gray, Standard
- 1 Standard Warranty
- 131 Ft of Feeder Indoor (IP40)
- 12 Each 90 Degree Elbow Forming Charge
- 1 Each Expansion Section Forming Charge
- 1 Each Unfused Reducer / Phase Transposition Forming Charge
- 1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
- 1 Each Non ABB Switchboard Stub Forming Charge
- 10 Spring Hanger (Pair)

39 1 Busway, ReliaGear Series Busway**Marks: BUS MTM2-T5**

Build America, Buy America (2 CFR Part 184) Compliant
222 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
5000 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 200 kA for 3 Cycles, 200 kA for 1 s, and 200 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

- 1 ANSI - 61 Gray, Standard
- 1 Standard Warranty

Bill of Material(s)		
		222 Ft of Feeder Indoor (IP40) 14 Each 90 Degree Elbow Forming Charge 1 Each Expansion Section Forming Charge 1 Each Unfused Reducer / Phase Transposition Forming Charge 2 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge 10 Spring Hanger (Pair)
40	1	Busway, ReliaGear Series Busway Marks: BUS MTM2-T6 Build America, Buy America (2 CFR Part 184) Compliant 212 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s) 5000 A, 3 Phase 4 Wire, 600 V Maximum, ac Short Circuit Withstand Ratings of 200 kA for 3 Cycles, 200 kA for 1 s, and 200 kA for 3 s Tin Plated Copper Bus 100% Rated Neutral 50% Rated Internal Ground ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA IBC-2021, UBC Zone 4 List of Materials 1 ANSI - 61 Gray, Standard 1 Standard Warranty 212 Ft of Feeder Indoor (IP40) 14 Each 90 Degree Elbow Forming Charge 1 Each Expansion Section Forming Charge 1 Each Unfused Reducer / Phase Transposition Forming Charge 2 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge 10 Spring Hanger (Pair)
41	1	SEPS Bus Duct Marks: 4160V 2000A NSB RUN1 Non-Segregated/5KV/2000Amps
42	1	SEPS Bus Duct Marks: 4160V 2000A NSB RUN2 Non-Segregated/5KV/2000Amps
43	1	Power Study - Base Study
44	1	Power Study - Load Flow Study Adder
45	1	Power Study - Harmonic Study Adder
46	1	Startup Assistance - SWGR and SWBD's
47	1	Temporary Equipment
48	1	Temporary 4160V-480V 1500kva XFMR
49	1	Switchboard, ReliaGear Configured, RG-GM-CBSB-CTO Marks: TEMP SWBD 3 Section(s) Service Entrance Estimated Shipping Weight:2794 lbs

Bill of Material(s)	
1	Service Entrance Labeling 3P4W/480/277V/60Hz 2000A 65 kAIC Fully Rated Incoming Feed: Bottom Incoming Left Feeding Right Type 3R (non-walk-in) Enclosure Front/Rear Lineup Front Only Access Full Height Panel Bus Option
2	Hinged Wire Gutter Cover Configured Switchboard
1	ReliaGear Switchboard Lineup Estimated total factory connected wiring points for the lineup 28
1	Certified Test Reports requested (Per Lineup Item)
1	Evolution Main Section 30W 35D 90H (Est.) lbs 642
1	Group Mounted Feeder ReliaGear Panel Section 40W 35D 90H (Est.) lbs 1082
1	Group Mounted Feeder ReliaGear Panel Section 40W 35D 90H (Est.) lbs 1070
3	Bus Bracing 65000 AIC
3	Evolution - Fully Rated Aluminum Bus 750 A/Sq. in.
3	Ground: Equipment U/L With Lugs
1	Full Height Side Barriers
	Main Breaker
1	2000A 3 Pole E2.2SF 100% Rated (2000A Frame) Indiv. Mtd. Main Manually Operated MAIN Programmer(EKIP Touch) LSIG
1	RELT
1	RELT-EKIP SIGNALLING 2K3
1	(4Q) AUXILIARY CONTACTS - 400V
1	(S51/2) Bell Alarm - 250V
1	PADLOCK IN OPEN POSITION
1	DC SUPPLY - 24V - 48V
16	Mechanical (2 Hole) AL Line Lugs
	Feeders
3	700A 3 Pole XT6H800 (0A Frame)
3	Manually Operated Programmer (EKIP DIP) LSI
9	Mechanical AL Load Lugs
7	500A 3 Pole XT5H600 (600A Frame)
7	Manually Operated Programmer (EKIP DIP) LSI
14	Mechanical AL Load Lugs
3	450A 3 Pole XT5H600 (600A Frame)
3	Manually Operated Programmer (EKIP DIP) LSI
6	Mechanical AL Load Lugs
	Monitoring/Control Devices
1	Power Supply Plate
	Others
14	Engraved Nameplates
14	Screw-On Nameplates
	Others
1	Lifting Brackets
2	Reliagear (C/B feeders only) 40X Bus Stack
29	Neutral Lugs
1	Bonding Jumper
37	Equipment Ground Lugs
1	Ground Lug

50 3 Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR
Marks: 450A FUSIBLE DISC

1 Suitable for use as Service Equipment

Bill of Material(s)		
		Heavy Duty 600 Amps Fusible 3 Poles 600VAC/250VDC NEMA 3R (Outdoor) For Use Size With (2) 4-600* Copper or Size (2) 4-600* Aluminum wire *600MCM restricted to side entry only Height1: 54.49, Height2: 54.49, Width1: 23.65, Width2: 24.5, Depth1: 9.35, Depth2: 13.26, Weight: 117 Switch is NEC 2020 Article 230.62 compliant for service equipment barriers. Accessories: 1 TGL6 , Equipment Ground Kit, (3) #2-250MCM CU/AL 1 TRK66A , Class R Fuse Kit 3 A6D450R, 450 Amps, RK1 - Time Delay
51	5	Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR Marks: 500A FUSIBLE DISC 1 Suitable for use as Service Equipment Heavy Duty 600 Amps Fusible 3 Poles 600VAC/250VDC NEMA 3R (Outdoor) For Use Size With (2) 4-600* Copper or Size (2) 4-600* Aluminum wire *600MCM restricted to side entry only Height1: 54.49, Height2: 54.49, Width1: 23.65, Width2: 24.5, Depth1: 9.35, Depth2: 13.26, Weight: 117 Switch is NEC 2020 Article 230.62 compliant for service equipment barriers. Accessories: 1 TGL6 , Equipment Ground Kit, (3) #2-250MCM CU/AL 1 TRK66A , Class R Fuse Kit 3 A6D500R, 500 Amps, RK1 - Time Delay
52	3	Switches and Disconnects, Heavy Duty Safety Switch, TC72367R Marks: 650A FUSIBLE DISC 1 Suitable for use as Service Equipment Heavy Duty 800 Amps Fusible 3 Poles 600VAC NEMA 3R (Outdoor) For Use Size With (6) 1/0-250 or (3) 2-600 Copper or Size (6) 1/0-250 or (3) 2-600 Aluminum wire Height1: 61.64, Height2: 65.35, Width1: 41.99, Width2: 44.19, Depth1: 11.92, Depth2: 17.71, Weight: 480 Switch is NEC 2017 compliant for service equipment. To make this switch compliant with NEC 2020 Article 230.62 for service equipment barriers, install kit THSHLD8 Accessories: Standard Fuse Clips Supplied 3 A4BY650, 650 Amps, L - Current Limiting Time Delay
53	1	Load Interrupter Switch, VersaRupter Marks: TEMP CHILLER DISC 1 Single Configuration, 1 Section(s), Indoor Enclosure 1200 A Bus, 3 Phase 3 Wire, 5 kV, 60 kV BIL, 50/60 Hz with solidly grounding system 61 kA Momentary, 61 kA Fault Closing, Silver Plated Contacts, Copper-Silver Bus Front and Rear Access Required IEEE C37.20.3 , ANSI C37.57 , IEEE C37.20.4, ANSI C37.58 , CSA C22.2 No. 31, CSA C22.2 No. 193 1 Certified Test Reports Enclosure Paint: ANSI-61 (Light Gray) tested to minimum withstand of 600 hour humidity and salt spray test Dimensions And Weight (Estimated) Section 1 - Single Switch: Width = 35 in; Height = 90 in; Depth = 60 in, Weight = 1200 lb

Bill of Material(s)

Options

- 1 UL Label
- 1 60 in Depth
- 1 Bus Boots
- 1 Fully Insulated Bus
- 1 Horizontal Barrier
- 2 Metal Screen Barriers
- 1 Front and Rear Door Pad Locks
- 1 Rear Door
- 1 Non-Removable Handle
- 1 Full Vertical Barrier

Single Switch

- 1 1200 A Switch Stand Alone, No Transition
- 1 Distribution Class Arrester, 9L20FXX006XHS
- 1 Top Entry, (1) 300 kcmil per Phase, NEMA Drill Only, Without Loop
- 1 Bottom Exit, (1) 300 kcmil per Phase, NEMA Drill Only

Fuses

- 1 Current Limiting Fuse Model, 9F62FCB300
 - 1 Set of 3 Spare Fuses
- Note: Fuses/Spare Fuses could be split from the order for shipment and invoice by separate.
- 1 Double Barrel Fuse Clips
 - 1 Ground Studs, Line Side
 - 1 Run Back Bus

TERMS AND CONDITIONS OF SALE

General Policies and Conditions

1. This Proposal is offered subject to the following: 1) attached TERMS AND CONDITIONS OF SALE, 2) an executed Master Supply Agreement ("MSA"), and 3) ABB Inc.'s current general Terms and Condition of Sale. Any conflict among the documents comprising the terms of this Proposal shall be resolved in accordance with the following order of precedence: (i) an executed MSA incorporating the following Terms and Conditions of Sale (ii) attached TERMS AND CONDITIONS OF SALE incorporating ABB Inc. General Terms and Conditions of Sale (iii) or ABB Inc. General Terms and Conditions of Sale. Non-ABB preprinted PO terms have no force and/or effect and are hereby rejected by ABB.
2. All quoted or agreed prices are subject to revision at any time in the event of: (i) a material increase in component, raw material, or energy costs; or (ii) governmental action such as new or increased tariffs.
3. Buyer represents and warrants that there are no federal, state, or local (collectively "Governmental") contracting provisions, regulations, flow-downs, or requirements that apply to this transaction, including without limitation any Governmental domestic preference or prevailing wage, other than such terms that have been disclosed and agreed to by Seller in writing. Buyer assumes sole responsibility for any costs associated with non-compliance of terms not agreed by Seller in writing. Unless expressly provided in writing, Seller makes no representation that the quoted product(s) or service(s) comply with any Governmental contracting provisions and regulations.
4. This proposal expires in 30 calendar days, unless terminated sooner by notice. This proposal is not inclusive of taxes of any kind, unless explicitly stated.
5. Orders not requiring engineered drawings for approval must be released by Buyer for manufacture within 90 days of PO receipt. If engineered drawings are required, they must be returned and approved by Buyer for release within 60 days of mailing. If not, and/or shipment is delayed for any reason the price will increase by 1.5% for each partial/full month that shipment release is delayed after the 90-day period. If project is delayed 6 months or more after PO receipt, project will be repriced based off current market values.
6. For MV Transformers (including Padmount, Substation, & Power transformers), refer to the factory proposal for applicable terms and conditions including, but not limited to quote validity, price validity, escalation, warranty, cancellation, estimated delivery, and freight terms.

Payment Terms

1. Net 30 days from the date of invoice
2. For projects up to \$1,000,000 net, terms of payment are 100% upon invoicing.
3. If project value exceeds \$1,000,000 net, progress payments are required payable at the following milestones. These milestones will be applied at a line-item level and will be tailored to the project schedule.
 - 20% upon delivery of drawings
 - 30% upon release of equipment
 - 50% upon shipment

Warranty

1. The warranty for Products shall expire one (1) year from date of installation or eighteen (18) months after date of shipment, whichever occurs first, except that software is warranted for ninety (90) days from delivery. The warranty for Services shall expire one (1) year after performance of the Service, except that software related Services are warranted for ninety (90) days.
2. Additional 12 months available for 2% adder, 24 months for 4% adder. Engage ABB representative if longer durations are needed.
3. All warranty claim remedies are provided under the General Terms and Conditions of Sale, or any applicable MSA, whichever is applicable between the parties.

Order Cancellation – Schedule of Charges

1. 10% - Order received.
2. 30% - Drawings for approval submitted, if required.
3. 50% - Revisions to approval drawings submitted, if required.
4. 80% - Order released for manufacturing and shipment.
5. 100% - Production started.

Delivery and Transportation

1. CPT/FCA ABB's facility, place of manufacture or warehouse (Incoterms 2020). Title and risk of loss passes upon shipment.
2. ABB will assume the risk of loss or damage to the destination for a 2% adder (but not less than \$500 net) applied to the total price of the equipment. "Destination" is defined as ABB's common carrier's delivery point nearest first destination or point of export within the continental U.S.
3. Transportation and handling are prepaid and billed, unless otherwise noted in this quotation or MSA.
4. Shipment via Air or Open Top/Flatbed/Lift gate truck not included unless specifically listed herein.
5. Special Instruction - The Receiving Associate is required to sign, date, and note specific visible or concealed damage on Bill of Lading at time of delivery. Freight Company Associate is required to witness Receiver's signature, date, and damage claim annotations. ABB's Post Sales Service Department must be provided with copy of annotated BOL within five (5) days of delivery or Shipper's responsibility ends.

Other Notes

1. Standard factory test procedures will be performed. Customer inspections, customer witness tests, and any other non-standard test procedures are not included unless specifically noted herein.
2. The accompanying Bill of Material is our interpretation of what is required to meet the intent of the listed Drawings and Specifications. Please review thoroughly for accuracy and completeness and advise immediately if any revisions are required. This proposal is limited to the attached Bill of Material only. Selective coordination of the system should be verified by a qualified engineer and may require changes to the design, Bill of Material, and price.
3. The Parties are aware of the shortage of raw materials, electronic components worldwide which is likely to last for the foreseeable future, as well as, of market fluctuations in the availability and cost of other raw materials, commodities, other critical components, and transportation capacities. Notwithstanding anything to the contrary in the contract terms and conditions / purchase order, if after the date of ABB's proposal / offer or during the term of the performance of the contract / purchase order there are any changes to availability and / or market conditions for electronic components, raw materials, commodities, and transportation capabilities directly or indirectly affecting ABB's performance, ABB shall be entitled to relief in the schedule of the performance or delivery of the directly or indirectly affected scope of work under the contract / purchase order. In such circumstances, the Parties shall meet without delay and discuss in good faith to find a mutually agreeable solution, with equitable adjustment to the contract / purchase order date of delivery or completion. Customer hereby acknowledges and agrees that in said circumstances ABB may not be able to comply with the originally agreed delivery or completion schedule and that ABB shall not be liable for any liquidated or actual damages in connection thereto.

ABB INC. GENERAL TERMS AND CONDITIONS OF SALE

(2025-02 U.S.)

1. General.

The terms and conditions contained herein, together with any additional or different terms contained or referenced in ABB's proposal or, quotation and ("Proposal"), any addenda to the Proposal, the purchase order (excluding any pre-printed terms and conditions and any terms that conflict with the Proposal or ABB's acknowledgment), and ABB's acknowledgement, submitted to Purchaser constitute the entire agreement (the "Agreement") between the parties with respect to the purchase order and supersede all other prior communications and agreements regarding the purchase order and ABB objects to any additional terms proposed by Purchaser. Acceptance by ABB of the purchase order, or Purchaser's acceptance of ABB's Proposal, is expressly limited to and conditioned upon Purchaser's acceptance of these terms and conditions, payment for or acceptance of any performance by ABB being acceptance. "Equipment" as used herein means all the equipment, parts, accessories sold, and all software and software documentation, if any, licensed to Purchaser by ABB ("Software") under the purchase order. "Services" as used herein means all labor, supervisory, technical and engineering, installation, repair, consulting or other services provided by ABB under the purchase order. "Purchaser" shall include the initial end user of the Equipment and/or services; provided, however, that Article 14(a) shall apply exclusively to the initial end user. "Hazardous Materials" means any toxic or hazardous substance, hazardous material, dangerous or hazardous waste, dangerous good, radioactive material, petroleum or petroleum-derived products or by-products, or any other chemical, substance, material or emission, that is regulated, listed or controlled pursuant to any national, state, provincial, or local law, statute, ordinance, directive, regulation or other legal requirement of the United States ("U.S.") or the country of the Site.

2. Prices.

(a) Unless otherwise specified in writing, all Proposals expire thirty (30) days from the date thereof and may be modified or withdrawn by ABB before receipt of Purchaser's conforming acceptance. All prices set forth in a purchase order may be revised by ABB at any time prior to delivery or performance based on ABB's sole but reasonable estimate of its cost increases (after the Proposal date) resulting directly or indirectly from factors such as: (i) a significant increase in raw material, component, labor, or energy costs or (ii) governmental actions, such as increased tariffs on the Equipment, raw material, or components.

(b) Unless otherwise stated herein, Services prices are based on normal business hours (8 a.m. to 5 p.m. Monday through Friday). Overtime and Saturday hours will be billed at one and one-half (1 1/2) times the hourly rate; and Sunday hours will be billed at two (2) times the hourly rate; holiday hours will be billed at three (3) times the hourly rate. If a Services rate sheet is attached hereto, the applicable Services rates shall be those set forth in the rate sheet. Rates are subject to change without notice.

(c) Except as otherwise agreed by ABB, the price does not include any federal, state or local property, license, privilege, sales, use, excise, gross receipts, tariffs or other like taxes ("Taxes") which may now or hereafter be applicable. Purchaser agrees to pay or reimburse any such Taxes, or ABB's reasonable estimated cost impact thereof, which ABB or its suppliers are required to pay or collect. If Purchaser is exempt from the payment of any Tax or holds a direct payment permit, Purchaser shall, upon purchase order placement, provide ABB a copy, acceptable to the relevant governmental authorities of any such certificate or permit.

3. Payment.

(a) Unless specified to the contrary in writing by ABB, payment terms are net cash, payable without offset, in United States Dollars, 30 days from date of invoice by wire transfer to the account designated by ABB in the Proposal. ABB is not required to commence or continue its performance unless and until invoiced payments have been received in a timely fashion. For each day of delay in receiving required payments, ABB shall be entitled to a matching extension of the schedule.

(b) If in the judgment of ABB, the financial condition of Purchaser at any time prior to delivery does not justify the terms of payment specified, ABB may require payment in advance, payment security satisfactory to ABB and suspend its performance until said advance payment or payment security is received or may terminate the purchase order, whereupon ABB shall be entitled to receive reasonable cancellation charges. If delivery is delayed by Purchaser, payment shall be due on the date ABB is prepared to make delivery. Delays in delivery or nonconformities in any installments delivered shall not relieve Purchaser of its obligation to accept and pay for remaining installments.

(c) Purchaser shall pay, in addition to the overdue payment, a late charge equal to the lesser of 1 1/2% per month or any part thereof or the highest applicable rate allowed by law on all such overdue amounts plus ABB's attorneys' fees and court costs incurred in connection with collection. If Purchaser fails to make payment of any amounts due under any purchase order and fails to cure such default within ten (10) days after receiving written notice specifying such default, then ABB may by written notice, at its option, suspend its performance under the purchase order until such time as the full balance is paid or terminate the purchase order, as of a date specified in such notice. In the event of suspension, cancellation or termination hereunder, ABB will be entitled to recover all costs for work performed to date, costs associated with suspension, cancellation or termination of the work and all other costs recoverable at law.

4. Changes.

(a) Any changes requested by Purchaser affecting the ordered scope of work must first be reviewed by ABB and any resulting adjustments to affected provisions, including price, schedule, and guarantees mutually agreed in writing prior to implementation of the change.

(b) ABB may, at its expense, make any changes in the Equipment or Services as it deems necessary, in its sole discretion, to conform the Equipment or Services to the applicable specifications (including but not limited to technical, standards, codes, performance, schedule, location or performance, plus applicable laws and regulations). If Purchaser objects to any such changes, ABB shall be relieved of its obligation to conform to the applicable specifications to the extent that conformance may be affected by such objection. ABB will not be obligated to meet specifications if not provided by Purchaser in the scope of work.

5. Delivery.

(a) All Equipment manufactured, assembled or warehoused in the continental United States is delivered FCA ABB point of shipment, Incoterms® 2020 unless otherwise mutually agreed in writing. Equipment shipped outside the continental United States is delivered FCA Incoterms® 2020 United States port of export unless otherwise mutually agreed in writing. Purchaser shall be responsible for any and all demurrage or detention charges.

(b) If the scheduled delivery of Equipment is delayed by Purchaser or by Force Majeure, ABB may move the Equipment to storage for the account of and at the risk of Purchaser whereupon it shall be deemed to be delivered.

(c) Shipping and delivery dates are contingent upon Purchaser's timely approvals and delivery by Purchaser of any documentation required for ABB's performance hereunder.

(d) Claims for shortages or other errors in delivery must be made in writing to ABB within ten (10) days of delivery. Equipment may not be returned except with the prior written consent of and subject to terms specified by ABB. Claims for damage after delivery shall be made directly by Purchaser with the common carrier.

6. Title & Risk of Loss.

Except with respect to Software (for which title shall not pass, use being licensed) title to Equipment shall transfer to Purchaser upon delivery according to the applicable freight term. Notwithstanding any agreement with respect to delivery terms or payment of transportation charges, risk of loss or damage with respect to the sale of Equipment shall pass from ABB to Purchaser at delivery as defined in this Agreement.

7. Inspection, Testing and Acceptance.

(a) Any inspection by Purchaser of Equipment on ABB's premises shall be scheduled in advance to be performed during normal working hours and subject to rules and regulations in place at the ABB premises.

(b) If the purchase order provides for factory acceptance testing, ABB shall notify Purchaser when ABB will conduct such testing prior to shipment. Unless Purchaser states specific objections in writing within ten (10) days after completion of factory acceptance testing, completion of the acceptance test constitutes Purchaser's factory acceptance of the Equipment and its authorization for shipment.

(c) If the purchase order provides for site acceptance testing, testing will be performed by ABB personnel to verify that the Equipment has arrived at site complete, without physical damage, and in good operating condition. Completion of site acceptance testing constitutes full and final acceptance of the Equipment. If, through no fault of ABB, acceptance testing is not completed within thirty (30) days after arrival of the Equipment at the site, the site acceptance test shall be deemed completed and the Equipment shall be deemed accepted.

8. Warranties and Remedies.

(a) Equipment and Services Warranty. ABB warrants that Equipment (excluding Software, which is warranted as specified in paragraph (d) below) shall be delivered free of defects in material and workmanship and that

Services shall be free of defects in workmanship. The Warranty Remedy Period for Equipment (excluding Software and spare parts) shall end twelve (12) months after installation or eighteen (18) months after date of shipment, whichever first occurs. The Warranty Remedy Period for new spare parts shall end twelve (12) months after date of shipment. If the purchase order includes the sale of refurbished or repaired parts, the Warranty Remedy Period for such parts shall end ninety (90) days after date of shipment. The Warranty Remedy Period for Services shall end ninety (90) days after the date of completion of Services.

(b) Equipment and Services Remedy. If a nonconformity to the foregoing warranty is discovered in the Equipment or Services during the applicable Warranty Remedy Period, as specified above, under normal and proper use and provided the Equipment has been properly stored, installed, operated and maintained and written notice of such nonconformity is provided to ABB promptly after such discovery and within the applicable Warranty Remedy Period, ABB shall, at its option, either (i) repair or replace the nonconforming portion of the Equipment or re-perform the nonconforming Services or (ii) refund the portion of the price applicable to the nonconforming portion of Equipment or Services. If any portion of the Equipment or Services so repaired, replaced or re-performed fails to conform to the foregoing warranty, and written notice of such nonconformity is provided to ABB promptly after discovery and within the original Warranty Remedy Period applicable to such Equipment or Services or thirty (30) days from completion of such repair, replacement or re-performance, whichever is later, ABB will repair or replace such nonconforming Equipment or re-perform the nonconforming Services. The original Warranty Remedy Period shall not otherwise be extended.

(c) Exceptions. ABB shall not be responsible for providing temporary power, removal, installation, reimbursement for labor costs or working access to the nonconforming Equipment, including disassembly and re-assembly of non-ABB supplied equipment, or for providing transportation to or from any repair facility, or for any other expenses incurred in connection with the repair or replacement, all of which shall be at Purchaser's risk and expense. ABB shall have no obligation hereunder with respect to any Equipment which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to ABB's instructions; (iv) is comprised of materials provided by or a design specified by Purchaser; or (v) has failed as a result of ordinary wear and tear. Equipment supplied by ABB but manufactured by others is warranted only to the extent of the manufacturer's warranty, and only the remedies, if any, provided by the manufacturer will be allowed.

(d) Software Warranty and Remedies. ABB warrants that, except as specified below, the Software will, when properly installed, execute in accordance with ABB's published specification. If a nonconformity to the foregoing warranty is discovered during the period ending one (1) year after the date of shipment and written notice of such nonconformity is provided to ABB promptly after such discovery and within that period, including a description of the nonconformity and complete information about the manner of its discovery, ABB shall correct the nonconformity by, at its option, either (i) modifying or making available to the Purchaser instructions for modifying the Software; or (ii) making available at ABB's facility necessary corrected or replacement programs. ABB shall have no obligation with respect to any nonconformities resulting from (i) unauthorized modification of the Software or (ii) Purchaser-supplied software or interfacing. ABB does not warrant that the functions contained in the software will operate in combinations which may be selected for use by the Purchaser, or that the software products are free from errors in the nature of what is commonly categorized by the computer industry as "bugs".

(e) THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE, WHETHER WRITTEN, ORAL OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USAGE OF TRADE ARE HEREBY DISCLAIMED. THE REMEDIES STATED HEREIN CONSTITUTE PURCHASER'S EXCLUSIVE REMEDIES AND ABB'S ENTIRE LIABILITY FOR ANY BREACH OF WARRANTY.

9. Intellectual Property Infringement.

(a) ABB shall defend at its own expense any action brought against Purchaser alleging that the Equipment or the use of the Equipment to practice any process for which such Equipment is specified by ABB ("a Process") directly infringes a patent in effect in the United States, an European Union member state or the country of the Site (provided there is a corresponding patent issued by the U.S., UK or an EU member state), or any

copyright or trademark registered in the country of the Site and to pay all damages and costs finally awarded in any such action, provided that Purchaser has given ABB prompt written notice of such action, all necessary assistance in the defense thereof and the right to control all aspects of the defense thereof including the right to settle or otherwise terminate such action in behalf of Purchaser.

(b) ABB shall have no obligation hereunder and this provision shall not apply to: (i) any other equipment or processes, including Equipment or Processes which have been modified or combined with other equipment or process not supplied by ABB; (ii) any Equipment or Process supplied according to a design, other than an ABB design, required by Purchaser; (iii) any products manufactured by the Equipment or Process; (iv) any use of the Equipment or Process contrary to ABB instructions; (v) any patent issued after the date hereof; or (vi) any action settled or otherwise terminated without the prior written consent of ABB.

(c) If, in any such action, the Equipment is held to constitute an infringement, or the practice of any Process using the Equipment is finally enjoined, ABB shall, at its option and its own expense, procure for Purchaser the right to continue using said Equipment; or modify or replace it with non-infringing equipment or, with Purchaser's assistance, modify the Process so that it becomes non-infringing; or remove it and refund the portion of the price allocable to the infringing Equipment. THE FOREGOING PARAGRAPHS STATE THE EXCLUSIVE LIABILITY OF ABB AND EQUIPMENT MANUFACTURER FOR ANY INTELLECTUAL PROPERTY INFRINGEMENT.

(d) To the extent that said Equipment or any part thereof is modified by Purchaser, or combined by Purchaser with equipment or processes not furnished hereunder (except to the extent that ABB is a contributory infringer) or said Equipment or any part thereof is used by Purchaser to perform a process not furnished hereunder by ABB or to produce an article, and by reason of said modification, combination, performance or production, an action is brought against ABB, Purchaser shall defend and indemnify ABB in the same manner and to the same extent that ABB would be obligated to indemnify Purchaser under this "Intellectual Property Indemnification" provision.

10. Waiver of Consequential Damages.

In no event shall ABB, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, whether in contract, warranty, tort, negligence, strict liability or otherwise, including, but not limited to, loss of profits or revenue, loss of data, loss of use, loss of use of any of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, delays, and claims of customers of the Purchaser or other third parties for any damages.

11. Limitation of Liability.

(a) ABB's aggregate liability for all claims whether in contract, warranty, tort, negligence, strict liability, or otherwise for any loss or damage arising out of, connected with, or resulting from this Agreement or the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, repair, replacement, installation, technical direction of installation, inspection, operation or use of any equipment covered by or furnished under this Agreement, or from any services rendered in connection therewith, shall in no case (except as provided in the section entitled "Intellectual Property Indemnification") exceed the purchase order price.

(b) All causes of action against ABB arising out of or relating to this Agreement or the performance or breach hereof shall expire unless brought within one (1) year of the time of accrual thereof.

(c) In no event, regardless of cause, shall ABB be liable for penalties or penalty clauses of any description or for indemnification of Purchaser or others for costs, damages, or expenses arising out of or related to the Equipment and/Services.

(d) The rights and remedies of the parties contained under these terms and conditions shall be sole and exclusive.

12. Laws and Regulations.

ABB does not assume any responsibility for compliance with federal, state or local laws and regulations, except as expressly set forth in this Agreement, and compliance with any laws and regulations related to Purchaser's duties, obligations, and business practices including the application, operation, or use and disposal of the Equipment Services or Software is the sole responsibility of the Purchaser. All laws and regulations referenced in this Agreement shall be those in effect as of the original Proposal date. In the event of any subsequent revisions or changes thereto, ABB assumes no responsibility for compliance therewith. If Purchaser desires a modification as a result of any such change or revision, it shall be treated as a change per Article 4. Nothing contained herein shall be construed as imposing responsibility or liability upon ABB for obtaining any permits, licenses or approvals from any agency required in connection with the supply, erection or operation of the Equipment. This Agreement shall in all respects be governed by, and construed, interpreted and enforced in accordance with the laws of the State of New York, USA, excluding its conflicts of laws rules and the provisions of the United Nations Convention on Contracts for the International Sale of Goods, and both parties hereby agree that any litigation concerning, arising out of, or related to this Agreement, whether claims are based on contract, tort, equity or otherwise, shall be conducted only in the state or federal courts functioning in the State of New York, New York County and waive the defense of an inconvenient forum in respect to any such litigation. If any provision hereof, partly or completely, shall be held invalid or unenforceable, such invalidity or unenforceability shall not affect any other provision or portion hereof and these terms shall be construed as if such invalid or unenforceable provision or portion thereof had never existed.

13. OSHA.

ABB warrants that the Equipment will comply with the relevant standards of the Occupational Safety and Health Act of 1970 ("OSHA") and the regulations promulgated thereunder as of the date of the Proposal. Upon prompt written notice from the Purchaser of a breach of this warranty, ABB will replace the affected part or modify it so that it conforms to such standard or regulation. ABB's obligation shall be limited to such replacement or modification. In no event shall ABB be responsible for liability arising out of the violation of any OSHA standards relating to or caused by Purchaser's design, location, operation, or maintenance of the Equipment, its use in association with other equipment of Purchaser, or the alteration of the Equipment by any party other than ABB.

14. Software License. (a) ABB owns all rights in or has the right to sublicense all of the Software, if any, to be delivered to Purchaser under this Agreement. As part of the sale made hereunder Purchaser hereby obtains a limited license to use the Software, subject to the following: (i) the Software may be used only in conjunction with equipment specified by ABB; (ii) the Software shall be kept strictly confidential; (iii) the Software shall not be copied, reverse engineered, or modified; (iv) the Purchaser's right to use the Software shall terminate immediately when the specified equipment is no longer used by the Purchaser or when otherwise terminated, e.g. for breach, hereunder; and (v) the rights to use the Software are non-exclusive and non-transferable, except with ABB's prior written consent.

(b) Nothing in this Agreement shall be deemed to convey to Purchaser any title to or ownership in the Software or the intellectual property contained therein in whole or in part, nor to designate the Software a "work made for hire" under the Copyright Act, nor to confer upon any person who is not a named party to this Agreement any right or remedy under or by reason of this Agreement. In the event of termination of this License, Purchaser shall

immediately cease using the Software and, without retaining any copies, notes or excerpts thereof, return to ABB the Software and all copies thereof and shall remove all machine-readable Software from all of Purchaser's storage media.

15. Intellectual Property, Inventions and Information.

(a) "Intellectual Property Rights" means all current and future rights in copyrights, trade secrets, trademarks, mask works, patents, design rights, trade dress, and any other intellectual property rights that may exist anywhere in the world, including, in each case whether unregistered, registered or comprising an application for registration, and all rights and forms of protection of a similar nature or having equivalent or similar effect to any of the foregoing. "Technology" means all inventions, discoveries, ideas, concepts, methods, code, executables, manufacturing processes, unique compositions, mask works, designs, marks, and works of authorship fixed in the medium of expression, and materials pertaining to any of the preceding; whether or not patentable, copyrightable or subject to other forms of protection.

(b) ABB shall maintain all right, title and interest in any Technology and Intellectual Property Rights that ABB owned, created, conceived or discovered prior to entering into this Agreement, or owns, creates or discovers separately from the activities contemplated by this Agreement. Unless otherwise agreed in writing by ABB and Purchaser, ABB shall have all right, title and interest in any Technology and Intellectual Property Rights that ABB creates, conceives or discovers in furtherance of this Agreement, and ABB shall have all right, title and interest in any Technology and Intellectual Property Rights embodied in the Equipment and Services. Any design, manufacturing drawings or other information submitted to the Purchaser remains the exclusive property of ABB. Purchaser shall not, without ABB's prior written consent, copy or disclose such information to a third party, unless required by a public information request from a governmental body. Such information shall be used solely for the operation or maintenance of the Equipment and not for any other purpose, including the duplication thereof in whole or in part.

16. Force Majeure.

ABB shall neither be liable for loss, damage, detention or delay nor be deemed to be in default for failure to perform when prevented from doing so by causes beyond its reasonable control including but not limited to acts of war (declared or undeclared), delays attributable to outbreaks, epidemics and pandemics (including any variations),

Acts of God, fire, strike, labor difficulties, acts or omissions of any governmental authority or of Purchaser, compliance with government regulations, insurrection or riot, embargo, delays or shortages in transportation or inability to obtain necessary labor, materials, or manufacturing facilities from usual sources or from defects or delays in the performance of its suppliers or subcontractors due to any of the foregoing enumerated causes. In the event of delay due to any such cause, the date of delivery will be extended by period equal to the delay plus a reasonable time to resume production, and the price will be adjusted to compensate ABB for such delay.

17. Cancellation.

Special order, custom designed, and made-to-order Equipment are non-cancelable and non-returnable. Any other purchase order may be cancelled by Purchaser only upon prior written notice and payment of termination charges as set forth in the cancellation schedule included in the Proposal or payment of, including but not limited to, the purchase price of the work performed prior to the effective date of notice of termination, the costs identified to the purchase order incurred by ABB for work not completed, and all expenses incurred by ABB attributable to the termination, plus a fixed sum of ten (10) percent of the final total price to compensate for disruption in scheduling, planned production and other indirect costs.

18. Termination.

(a) No termination by Purchaser for material default shall be effective unless, within fifteen (15) days after receipt by ABB of Purchaser's written notice specifying such default, ABB shall have failed to initiate and pursue with due diligence correction of such specified default.

(b) If the event of termination for a material default, ABB shall reimburse Purchaser the difference between that portion of the Agreement price allocable to the terminated scope and the actual amounts reasonably incurred by Purchaser to complete that scope, and Purchaser shall pay to ABB the portion of the Agreement price allocable to Equipment completed and any amounts due for Services performed before the effective date of termination.

(c) ABB may terminate the Agreement (or any affected portion thereof) immediately for cause if Purchaser becomes insolvent/bankrupt, or materially breaches the Agreement, including, but not limited to, failure or delay in Purchaser making any payment when due, or fulfilling any payment conditions.

19. Export Control.

(a) The following definitions apply to this Article 19:

"Trade Control Laws" means all applicable trade and economic sanctions laws and regulations, specifically including but not limited to the U.S. International Traffic in Arms Regulations ("ITAR"), 22 C.F.R. 120 et seq.; the Export Administration Regulations ("EAR"), 15 C.F.R. 730-774; the Foreign Assets Control Regulations ("FACR"), 31 C.F.R. 500-598; the Foreign Trade Regulations ("FTR"), 15 C.F.R. 30-199; and, any administrative or regulatory decisions or guidelines adopted pursuant to Trade Control Laws.

"Purchaser Entities" means Purchaser's officers, directors, employees, parent company, subsidiaries and other affiliates, and if the Equipment, Software and/or Services are subject to resale or other distribution, Purchaser's customers and end-users of the same.

(b) Purchaser shall comply in all respects with Trade Control laws and shall not export, re-export, transfer, disclose or otherwise provide or make accessible the Equipment, Software, data or other information provided to Purchaser by ABB hereunder, to any non-U.S. person or entity (including Purchaser's dual and/or third-country national employees or third party contractors) without first complying with all requirements of the applicable Trade Control Laws. If Purchaser is a U.S. entity and is engaged in the business of either exporting or manufacturing (whether exporting or not) Defense Articles or furnishing Defense Services as defined in the ITAR, Purchaser represents that it shall maintain an active registration with the U.S. Department of State's Directorate of Defense Trade Controls ("DDTC"), as required by the ITAR, throughout the performance of this Contract, and that it maintains an effective export and import compliance program in accordance with the ITAR. If Purchaser is a U.S. entity and will export ABB's Equipment, Software, and/or data, Purchaser will be considered an exporter within the meaning of the U.S. export regulations. Therefore, ABB should not be listed as the exporter or U.S. Principal Party in Interest ("USPPI") on any documentation or filings relating to any export. Purchaser acknowledges it's acting on its own behalf and not as ABB's agent for export or any other purposes.

(c) Purchaser represents and warrants that the Equipment, Software and Services provided hereunder, and the "direct product" thereof are intended for civil use only and will not be used, directly or indirectly, for the production of chemical or biological weapons or of precursor chemicals for such weapons, or for any direct or indirect nuclear end use or any other end use prohibited by Trade Control Laws.

(d) Purchaser represents and warrants that: (1) neither Purchaser nor any Purchaser

Entity is included on any of the restricted party lists maintained by the U.S. Government, including the Specially Designated Nationals List administered by the U.S. Treasury Department's Office of Foreign Assets Control ("OFAC"), Denied Parties List, Unverified List or Entity List maintained by the U.S. Commerce Department's Bureau of Industry and Security ("BIS"), or the List of Statutorily Debarred Parties maintained by the U.S. State Department's Directorate of Defense Trade Controls, listed, the ITAR §126.1 Restricted Parties List, or the consolidated list of asset freeze targets designated by the United Nations, European Union, and United States or any similar list maintained by the European Union or European member state (collectively "Restricted Parties List"); and (2) no entity or person listed on the Restricted Parties List (or owned directly or indirectly, in whole or in part, by an entity or person on the Restricted Parties List) has any property, financial or other interest in the Equipment, Software or Services, and that the same shall not be transferred, reexported, disclosed to or otherwise provided to an entity or person on the Restricted Parties List. Purchaser shall notify ABB immediately if Purchaser or a Purchaser Entity becomes listed on the Restricted Party List.

(e) Purchaser shall notify ABB immediately upon awareness of any breach or suspected breach of this Article 19. Any violation of Purchaser's obligations under this Article 19 is a material breach of this Agreement and ABB reserves the right to terminate the Agreement immediately upon written notice for Purchaser's default. Purchaser shall indemnify, defend and hold harmless ABB, its officers, directors, employees, agents, affiliates, successors, and permitted assigns from and against all claims, causes of action, damages, liabilities, and expenses, including attorney's fees arising from Purchaser's breach of this Article 19 and any resulting termination of this Agreement.

(f) If agreed to by the Parties pursuant to a written statement of work or elsewhere in this Agreement, ABB shall file for a U.S. export license, but only after appropriate documentation for the license application has been provided by Purchaser. Purchaser shall furnish such documentation within a reasonable time after purchase order acceptance. Any delay in obtaining such license shall suspend performance of this Agreement by ABB. If an export license is not granted or, if once granted, is thereafter revoked or modified by the appropriate authorities, this Agreement may be canceled by ABB without liability for damages of any kind resulting from such cancellation. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

(g) When applicable, the party considered the exporter of the Equipment, Software, Services and/or data, will apply for the export license in compliance with all applicable Trade Control Laws. If ABB is the applicant of the export license, the Purchaser agrees to immediately provide all the necessary information and documentation (i.e. End-User/End-Use Certificate and Letter of Assurance) required to apply for the license. If an export license is denied or revoked, the applicant must notify the other party immediately and this Agreement may be terminated by ABB without liability for damages of any kind resulting from such termination.

20. Trade Controls

a) The Parties agree to comply with all applicable sanctions and export control laws in connection with this Agreement. Sanctions and export control laws and regulations include any applicable laws, regulations, or administrative or regulatory decisions or guidelines that sanction, prohibit or restrict certain activities including, but not limited to, (i) import, export, re-export, transfer, or transshipment of goods, services, technology, or software; (ii) financing of, in-vestment in, or direct or indirect transactions or dealings with certain countries, territories, regions, governments, projects, or specifically designated persons or entities, including any future amendments to these provisions; or (iii) any other laws, regulations, administrative or regulatory decisions, or guidelines adopted, maintained, or enforced by any Sanctions Agency on or after the date of the [purchase order] (collectively, "Trade Control Laws"). "Sanctions Agency" means any governmental or regulatory body, instrumentality, authority, institution, agency or court that promulgates or administers Trade Control Laws including, but not limited to, the aforementioned governmental and regulatory bodies of (i) the United Nations, (ii) the United States of America (including the U.S. Department of Treasury Office of Foreign Assets Control, U.S. Department of State and U.S. Department of Commerce), (iii) the European Union or (iv) Switzerland.

(b) The Parties confirm that they have not violated, shall not violate, and shall not cause the other Party to violate, any applicable Trade Control Laws. Each Party represents and warrants that, to the best of its knowledge, at the date of the [purchase Order] neither it, nor any of their respective directors or officers are a Restricted Person. Each Party agrees that it shall promptly notify the other Party if it becomes a Restricted Person. "Restricted Person" means any entity or person included on a list (including U.S. and EU lists) of targeted parties, blocked parties, or persons subject to asset-freezing or other restrictions introduced under any applicable Trade Control Laws (and includes any entity that is directly or indirectly owned fifty (50) percent or more, in the aggregate or individually, or otherwise controlled by any Restricted Person).

(c) If, as a result of Trade Control Laws issued or amended after the date of the [purchase order], including, but not limited to, (i) the Purchaser or the end-user is/becomes a Restricted Person, or (ii) any necessary export license or authorization from a Sanctions Agency is not granted, the performance by ABB or any of its affiliates becomes illegal or impracticable, ABB shall be entitled to either immediately suspend the performance of the affected obligation under the [purchase Order] until such time as ABB may lawfully discharge such obligation or unilaterally terminate the [purchase order] in whole or in part. ABB will not be liable to the Purchaser for any costs, expenses or damages associated with such suspension or termination of the [purchase order].

(d) The Parties undertake to obtain all the necessary licenses and/or permits from the competent authorities for the import or export, re-export, or in-country transfer of Equipment and Services, Equipment and Software, and the "direct product" thereof, that originate from the United States are subject to the U.S. Export Administration Regulations ("EAR") and must not be exported, re-exported, or transferred (in-country) without obtaining the necessary valid li-censes/authorizations of the competent US authorities. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

(e) The Purchaser represents and warrants that the Equipment and Services are for civil use only. The Purchaser further represents that it will not directly or indirectly sell, export, re-export, release, transmit or otherwise transfer any items received from ABB to any Restricted Parties, or parties that operate, or whose end use will be, in a jurisdiction/region prohibited by ABB including Belarus, Crimea, Cuba, Iran, North Korea, Russia, Syria, as well as the Donetsk, Luhansk, Kherson, and Zaporizhzhia regions of Ukraine (such list may be amended by ABB at any time).

(f) If the Purchaser infringes any obligations in this Trade Controls clause in connection with the [purchase order], the Purchaser must immediately notify ABB. Failure to comply with these Trade Compliance obligations shall be con-sidered a material breach, and ABB shall have the right to unilaterally terminate the Agreement with immediate effect. Such termination would be without prejudice to all rights of recourse which could be exercised by ABB, and ABB shall not be liable to Purchaser for any claim, losses or damages whatsoever related to its decision to terminate performance under this provision. Further, Purchaser shall indemnify ABB for all liabilities, damages, costs, or expenses incurred as a result of any such violation, breach and/or termination of the Agreement. ABB may report such violations to relevant authorities as required by applicable Trade Control Laws.

(g) For the avoidance of doubt, no provision in this Agreement shall be interpreted or applied in a way that would require any Party to do, or refrain from doing, any act which would constitute a violation of, or result in a loss of economic benefit under, applicable Trade Control Laws.

21. Bribery and Corruption.

(a) Purchaser hereby warrants that it will not, directly or indirectly, and it has no knowledge that other persons will, directly or indirectly, make any payment, gift or other commitment to its customers, to government officials or to agents, directors and employees of ABB or any other party in a manner contrary to applicable laws (including but not limited to the Corruption of Foreign Public Officials Act (Canada), the Foreign Corrupt Practices Act (United States) and, where applicable, legislation enacted by member States and signatories implementing the OECD Convention Combating Bribery of Foreign Officials) and shall comply with all relevant laws, regulations, ordinances and rules regarding bribery and corruption.

(b) Nothing hereunder shall render ABB liable to reimburse Purchaser for any such consideration given or promised.

(c) Purchaser's material violation of any of the obligations contained in Article 20(a) above may be considered by Seller to be a material breach hereunder and shall entitle Seller to terminate this agreement with immediate effect and without prejudice to any further right or remedies on the part of Seller hereunder or applicable law. Purchaser shall indemnify Seller for all liabilities, damages, costs or expenses incurred as a result of any such violation of the above-mentioned obligations and termination of this agreement.

(d) Purchaser understands that Seller's Code of Conduct is available for consultation online at <http://www.abb.com/integrity>. Purchaser agrees to perform its contractual obligations hereunder with substantially similar standards of ethical behavior as those found in Supplier's Code of Conduct.

(e) Seller has established the following reporting channels where Purchaser and its employees may report suspected violations of applicable laws, policies or standards of conduct:

Web portal: www.abb.com/integrity

Telephone: number specified on the above Web portal

Mail: address specified on the above Web portal

22. Assignment.

Any assignment of this Agreement or of any rights or obligations under the Agreement without prior written consent of ABB shall be void.

23. Nuclear.

Equipment and Services sold hereunder are not intended for use in connection with any nuclear facility or activity, and Purchaser warrants that it shall not use or permit others to use Equipment or Services for such purposes, without the advance written consent of ABB. If, in breach of this, any such use occurs, ABB (and its parent, affiliates, suppliers and subcontractors) disclaims all liability for any nuclear or other damage, injury or contamination, including without limitation any physical damage to a nuclear facility itself, resulting from a nuclear incident and, in addition to any other rights of ABB, Purchaser shall indemnify and hold ABB (and its parent, affiliates, suppliers and subcontractors) harmless against all such liability including, but not limited to, any physical damage to the nuclear facility or surrounding properties, if any. Consent of ABB to any such use, if any, will be conditioned upon additional terms and conditions that ABB determines to be acceptable for protection against nuclear liability including but not limited to the requirement that the Purchaser and/or its end user customer shall have complete insurance protection against liability and property damage including without limitation physical damage to a nuclear facility itself or any surrounding properties, if any, resulting from a nuclear incident and shall indemnify ABB, its subcontractors, suppliers and vendors against all claims resulting from a nuclear incident including, but not limited to, any physical damage to the nuclear facility.

24. Resale.

If Purchaser resells any of the Equipment or Services, the sale terms shall limit ABB's liability to the buyer to the same extent that ABB's liability to Purchaser is limited hereunder. Additionally, if the end-user intends to use the Equipment or Services in connection with any nuclear facility or activity, the Purchaser shall require the end-user comply with the financial requirements under Price-Anderson Act (PAA) and secure a written release of liability which flows from the end-user to the benefit of ABB.

25. Environmental, Health and Safety Matters.

(a) Purchaser shall be obligated to maintain safe working conditions at its facility or location (the "Site"), including the implementing of appropriate procedures regarding Hazardous Materials, confined space entry, and energization and de-energization of power systems (electrical, mechanical and hydraulic) using safe and effective lock- out/tag-out ("LOTO") procedures including physical LOTO or a mutually agreed upon alternative method.

(b) Purchaser shall immediately advise ABB in writing of all applicable Site-specific health, safety, security and environmental requirements and procedures. Without limiting Purchaser's responsibilities hereunder, ABB has the right but not the obligation to, from time to time, review, audit and inspect applicable health, safety, security and environmental documentation, procedures and conditions at the Site.

(c) If, in ABB's reasonable opinion, the health, safety, or security of personnel or the Site is, or is likely to be, imperiled by security risks, the presence of or threat of exposure to Hazardous Materials, or unsafe working conditions, ABB may, in addition to other rights or remedies available to it, remove some or all of its personnel from Site, suspend performance of all or any part of the purchase order, and/or remotely perform or supervise work. Any such occurrence shall be considered a Force Majeure event. Purchaser shall reasonably assist in ensuring the safe departure of personnel from the Site.

(d) Purchaser shall not require or permit ABB's personnel to operate Purchaser's equipment at Site.

(e) Purchaser will make its Site medical facilities and resources reasonably available to ABB personnel who need medical attention.

(f) ABB has no responsibility or liability for the pre-existing condition of Purchaser's equipment or the Site, which is the sole responsibility of Purchaser. Prior to ABB starting any work at Site, Purchaser will provide documentation that identifies the presence and condition of any Hazardous Materials existing in or about Purchaser's equipment or the Site that ABB may encounter while performing under this Agreement. The provision of such documentation shall in no way release Purchaser from its responsibility for said conditions. Purchaser shall disclose to ABB industrial hygiene and environmental monitoring data regarding conditions that may affect ABB's work or personnel at the Site. Purchaser shall keep ABB informed of changes in any such conditions.

(g) ABB shall promptly notify Purchaser if ABB becomes aware of: (i) conditions at the Site differing materially from those disclosed by Purchaser, or (ii) previously unknown physical conditions at Site differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Agreement. If any such conditions cause an increase in ABB's cost of, or the time required for, performance of any part of the work under the Agreement, an equitable adjustment in price and schedule shall be made.

(h) If ABB encounters Hazardous Materials in Purchaser's equipment or at the Site that require special handling or disposal, ABB is not obligated to continue work affected by the hazardous conditions. In such an event, Purchaser shall at its sole cost and expense eliminate the hazardous conditions in accordance with applicable laws and regulations so that ABB's work under the Agreement may safely proceed, and ABB shall be entitled to an equitable adjustment of the price and schedule to compensate for any increase in ABB's cost of, or time required for, performance of any part of the work. Purchaser shall properly store, transport and dispose of all Hazardous Materials introduced, produced or generated in the course of ABB's work at the Site. (i) Purchaser shall indemnify ABB for any and all claims, damages, losses, and expenses arising out of or relating to any Hazardous Materials which are or were (i) present in or about Purchaser's equipment or the Site prior to the commencement of ABB's work, (ii) improperly handled or disposed of by Purchaser or Purchaser's employees, agents, contractors or subcontractors, or (iii) brought, generated, produced or released on Site by parties other than ABB.

26. Confidentiality.

a) ABB and Purchaser (as to information disclosed, the "Disclosing Party") may each provide the other party (as to information received, the "Receiving Party") with Confidential Information in connection with this Agreement. "Confidential Information" means (a) information that is designated in writing as "confidential" or "proprietary" by Disclosing Party at the time of written disclosure, and (b) information that is orally designated as "confidential" or "proprietary" by Disclosing Party at the time of oral or visual disclosure and is confirmed to be "confidential" or "proprietary" in writing within fifteen (15) days after the oral or visual disclosure. In addition, prices for Products and Services shall be considered ABB's Confidential Information.

(b) Receiving Party agrees: (i) to use the Confidential Information only in connection with the Agreement and use of Products and Services, (ii) to take reasonable measures to prevent disclosure of the Confidential Information to third parties, and (iii) not to disclose the Confidential Information to a competitor of Disclosing Party. Notwithstanding these restrictions, each party shall permit access to the other's Confidential Information only to its employees who: (i) reasonably require access to Confidential Information for purposes approved by this Agreement, and (ii) have undertaken a binding obligation of confidentiality with respect to the confidential information of others entrusted to him or her, and (iii) have been apprised of the confidentiality obligations hereunder. ABB may disclose Confidential Information to its affiliates and subcontractors in connection with performance of the purchase order. A Receiving Party may only disclose Confidential Information to any other third party with the prior written permission of Disclosing Party, and in each case, only so long as the Receiving Party obtains a non-disclosure commitment from any such third party that prohibits disclosure of the Confidential Information and provided further that the Receiving Party remains responsible for any unauthorized use or disclosure of the Confidential Information. Receiving Party shall upon request return to Disclosing Party or destroy all copies of Confidential Information except to the extent that a specific provision of the Agreement entitles Receiving Party to retain an item of Confidential Information. ABB may also retain one archive copy of Purchaser's Confidential Information.

(c) The obligations under this Article 25 shall not apply to any portion of the Confidential Information that: (i) is or becomes generally available to the public other than as a result of disclosure by Receiving Party, its representatives or its affiliates; (ii) is or becomes available to Receiving Party on a non-confidential basis from a source other than Disclosing Party when the source is not, to the best of Receiving Party's knowledge, subject to a confidentiality obligation to Disclosing Party; (iii) is independently developed by Receiving Party, its representatives or affiliates, without reference to the Confidential Information; (iv) is required to be disclosed by law or valid legal process provided that the Receiving Party intending to make disclosure in response to such requirements or process shall promptly notify the Disclosing Party in advance of such disclosure and reasonably cooperate in attempts to maintain the confidentiality of the Confidential Information.

(d) As to any individual item of Confidential Information, the restrictions under this Article 25 shall expire five (5) years after the date of disclosure. This Article 25 does not supersede any separate confidentiality or nondisclosure agreement signed by the parties.

27. Non-Survival.

The following Articles shall not survive termination or cancellation of this Agreement: 5, 7, 8, 17 and 18. All other Articles shall survive the termination or cancellation of the Agreement.

28. Entire Agreement.

This Agreement constitutes the entire agreement between ABB and Purchaser. There are no agreements, understandings, restrictions, warranties, or representations between ABB and Purchaser other than those set forth herein or herein provided. As stated in Article 1 of this Agreement, ABB's Proposal, policies, addendum(s), if any, submitted to Purchaser, shall control over any conflicting terms. ABB specifically rejects any exceptions to this Agreement, Proposals, policies, and/or addendum(s) on the face of any purchase order. Purchaser shall advise ABB in writing of all conflicts, errors, omissions, or discrepancies among the Proposal, Policies, Addendum(s) and this Agreement immediately upon discovery. This Agreement shall supersede any standard, preprinted terms and conditions that are automatically attached to purchase orders issued by Purchaser.

29. US Government Contracts.

This Article 28 applies only if the Agreement is for the direct or indirect sale, or is funded in whole or in part by, an agency of the U.S. federal government, or a state government, or any other U.S. government instrumentality or political subdivision (collectively "U.S. government entity"). Unless otherwise expressly stated and specifically agreed in ABB's Proposal:

(a) Purchaser agrees that:

(i) all Equipment, Software, and Services provided by ABB meet the definition of "commercial-off-the-shelf" ("COTS") or "commercial product" or "commercial service" or "commercial computer software" as those terms are defined in Federal Acquisition Regulation ("FAR") 2.101.

(ii) ABB technical data and computer software are developed at ABB's private expense and not in performance of the Agreement. ABB retains ownership and proprietary rights in all technical data and computer software provided to Purchaser under the Agreement and under a U.S. Government contract or subcontract. Neither the Purchaser, the U.S. Government nor any higher-tier contractor under a U.S. Government contract will obtain any rights in ABB technical data or computer software beyond the rights provided under ABB's standard commercial licenses consistent with FAR 12.211 and 12.212.

(iii) to the extent the Buy American Act (41 U.S.C. §§ 8301 – 8305, as amended), Trade Agreements Act (19 U.S.C. §§ 2501 – 2581, as amended), Build America, Buy America (Pub. L. 117-58, December 29, 2022, as amended) or other domestic preference requirements are applicable to this Agreement, the country of origin of Equipment or Software is unknown.

(iv) the version of any applicable FAR clause listed in this Article 28 shall be the one in effect on the effective date of this Agreement.

(b) If Purchaser is an agency of the U.S. Government, then as permitted by FAR 12.302, Purchaser agrees that:

(i) all paragraphs of FAR 52.212-4 (except those listed in 12.302(b)) are replaced with these Terms and Conditions.

(ii) only the clauses identified in FAR 52.212-5 apply and only to the extent applicable for sale of COTS and/or commercial products and/or commercial services and as appropriate for the purchase order price.

(iii) any Services offered by ABB are exempt from the Service Contract Act of 1965 (41 U.S.C. §§ 6701 - 6707, as amended).

(iv) all other U.S. Government agency contract provisions are rejected.

(c) If Purchaser is procuring as a contractor, or subcontractor at any tier, on behalf of an agency of a U.S. government entity, then Purchaser agrees that:

(i) only the clauses identified in FAR 52.212-5(e)(1) or 52.244-6(c)(1) (whichever is applicable) apply and only to the extent applicable for sale of COTS and/or commercial products and/or services and as appropriate for the purchase order price.

(ii) Purchaser shall notify ABB prior to transmitting any Controlled Unclassified Information ("CUI") to ABB, and only upon written authorization by ABB may Purchaser transmit CUI to ABB. Purchaser shall transmit CUI to ABB in accordance with applicable CUI safeguarding and/or dissemination authority requirements.

(iii) prevailing wage and related public works labor and employment laws or regulations are not applicable to ABB's services offered in the Proposal.

(iv) Purchaser is solely responsible for its obligations to its customer(s), including validating that ABB's Proposal fulfills Purchaser's U.S. Government contracting obligations, if any. To the extent the terms and conditions of Purchaser's customer contract(s) are different from the terms and conditions of this Agreement, Purchaser shall defend, indemnify and hold ABB harmless from and against all losses, liabilities, cost, expense (including attorney's fees and expenses of litigation and/or settlement), damages, allegations, claims, causes of action and judgments resulting from such difference. In no event will Purchaser withhold payment due to ABB for any dispute or liability incurred between Purchaser and its customer(s).

30. Data Protection.

(a) The parties agree that the protection of Personal Data is very important. If Purchaser discloses Personal Data to ABB, ABB shall comply with all applicable data protection laws and regulations. Purchaser shall comply with all applicable data protection laws and regulations in respect of any Personal Data it receives from ABB in the course of receiving the Equipment or Services.

(b) The parties agree that neither will withhold or delay its consent to any changes to this clause which are required to be made in order to comply with applicable data protection laws and regulations and/or with guidelines and order from any competent supervisory authority, and their application to the Equipment or Services from time to time, and agrees to implement any such changes at no additional cost to the other party.

(c) The parties acknowledge that the processing of Personal Data in accordance with this purchase order may require the conclusion of additional data processing agreements or additional data protection agreements. If and to the extent such additional data processing agreements or additional data protection agreements are not initially concluded as part of the purchase order, the parties shall, and shall ensure that their relevant affiliates or subcontractors shall, upon the other's request promptly enter into any such agreement with an affiliate, as designated by the other party and as required by mandatory law or a competent data protection or other competent authority.

VBE-2
VBE PARTICIPATION SUBMITTAL

Bidder/Offerer: I.B. Abel, Inc. **Solicitation # :** DGS C-0948-0090 P3.4

Solicitation Title: Capitol Complex Central Plant - Building Reno. Chiller System Rep

Discipline: .4 Electrical (.1 GC, .2 HVAC, .3 Plumbing, or .4 Electrical)

Base Bid: 1.00 (identify the corresponding Base Bid for this VBE Participation Submittal)

CHECK ONE, AND ONLY ONE, BOX. FAILURE TO COMPLY WILL RESULT IN REJECTION OF YOUR BID/PROPOSAL.

Click on bold titles to navigate to that specific page.

☐ **I agree to meet the VBE participation goal in full.**
I have completed and am submitting with my bid or proposal a **VBE Utilization Schedule (VBE-3)**, which is required in order to be considered for award.

☐ **I am requesting a partial waiver of the VBE participation goal.**
After making good faith outreach efforts as more fully described in the **Guidance for Documenting Good Faith Efforts to Meet the VBE Participation Goal**, I am unable to achieve the total VBE participation goal for this solicitation and am requesting a partial waiver of the VBE 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. a **VBE Utilization Schedule (VBE-3)** for that portion of the VBE participation goal that I will meet; AND
2. a **Good Faith Efforts Waiver Request** for the portion of the VBE participation goals that I am unable to meet.

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

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

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

VBE-3 VBE UTILIZATION SCHEDULE

Bidder/Offeror: I.B. Abel, Inc.

Solicitation # : DGS C-0948-0090 P3.4 **Solicitation Title:** Capitol Complex Central Plant - Building Reno. Chiller

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

VBE Name SAP Vendor Number (6-digit number provided by VBE) VBE Verification Number (located on DGS VBE verification)	Type of VBE (check all that apply)	Description of Work to be Performed (Statement of Work/Specification reference)	% Commitment (or % of work to be self-performed by VBE bidder/offeror)	Dollar Value of Commitment (after applying any calculation per VBE-1, Section IV, Calculating VBE participation)
Name: <u>Veterans R Us</u> SAP Vendor Number: <u>123456</u> VBE Verification Number: <u>123456-2023-VBE</u>	VBE	staffing resources	%	\$
Name: Schneider SAP Vendor Number: VBE Verification Number:	☒ VBE ☐ SDVBE		%	
Name: Perry County SAP Vendor Number: VBE Verification Number:	☐ VBE ☐ SDVBE		%	
Name: Manna Supply SAP Vendor Number: VBE Verification Number:	☐ VBE ☐ SDVBE		%	
Name: SAP Vendor Number: VBE Verification Number:	☐ VBE ☐ SDVBE		%	
Attach additional sheets if necessary			Total % VBE commitment: <u>0</u>	Total \$ amount: <u>0</u>

VBE-3.1
LETTER OF COMMITMENT

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

Solicitation #: _____ Solicitation Title: _____

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

Services/Supplies and Time Frame. If Bidder/Offeror is the successful vendor, the VBE 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 VBE will provide:	
Specific Time Frame the VBE 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 VBE-3
	(c)	(d)	(c) x (d) = (e)
VBE Subcontractor - performs at least 50% of the value of the subcontract with its own forces		100%	
VBE Manufacturer - produces on premise material, supplies, articles, or equipment required for contract.		100%	
VBE Stocking Suppliers - maintains materials on premises that are bought and stored and required for the contract.		60%	
VBE Non-stocking Supplier - Service Fee Only - Does not carry inventory.		100%	

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

Sincerely,

Acknowledged

Printed name

Printed name

Bidder/Offeror Point of Contact Signature

VBE Point of Contact Signature

** The work performed by a firm that is dually verified as both an SDB and 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. See SDB-1 Instructions, Section II, Paragraph 4 for example of how work performed by a firm that is dually verified is credited.*

VBE-5

GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF VBE PARTICIPATION GOAL

Project Description:	Capitol Complex Central Plant - Building Reno. Chiller System Replacement and Electrical System Upgrades
Commonwealth Agency Name:	DGS
Solicitation #:	DGS C-0948-0090 P3.4
Solicitation Due Date and Time:	1/20/26 2:00 pm

Bidder/Offeror Company Name:	I.B. Abel, Inc.
Bidder/Offeror Contact Name:	Mat Robinson
Bidder/Offeror Contact Email:	mrobinson@ib-abel.com
Bidder/Offeror Contact Phone Number:	(717) 451-6179

Part 1 – Identified Items of Work Offeror Made Available to VBEs

Identify those items of contract work that the Offeror made available to VBEs. This includes, where appropriate, those items the Offeror identified and subdivided into economically feasible units to facilitate the VBE participation. For each item listed, show the anticipated percentage of the total contract cost. Offeror must demonstrate that enough work to meet the VBE participation goal was made available to VBEs, and the total percentage of the items of work identified for VBE participation met or exceeded the VBE 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 VBE Firms? If not, explain why.
Excavating, Rigging, Testing, Equipment	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no
	☐ yes ☐ no	☐ yes ☐ no	☐ yes ☐ no

Attach additional sheets if necessary.

VBE-5

GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF VBE PARTICIPATION GOAL

Part 2 – Identified VBEs and Record of Solicitations

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

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

Name of Identified VBE 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
VBE Name: NCE Testing ☐ VBE ☐ SDVBE	Electrical Testing	Date: 12/8/25 ☐ mail ☒ email ☐ fax	Date: 12/17/25 ☐ mail ☒ email ☐ fax	Date and Time of Call: 1/8/26 12:00 am Spoke with: Robert Maceenia Left Message:	☐ yes ☐ no	☐ yes ☐ no	☐ Used other VBE ☐ Used non-VBE ☐ Self performing
VBE Name: Keystone ☐ VBE ☐ SDVBE	Equipment	Date: 12/8/25 ☐ mail ☒ email ☐ fax	Date: 12/17/25 ☐ mail ☒ email ☐ fax	Date and Time of Call: 12/11/25 12:00 am Spoke with: Rob Stern Left Message:	☐ yes ☐ no	☐ yes ☐ no	☐ Used other VBE ☐ Used non-VBE ☐ Self performing

Attach additional sheets as necessary.

VBE-5
GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF
VBE PARTICIPATION GOAL

Part 3 – VBE Outreach Compliance Statement

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

- Stocking supplies for fire alarm parts and smarts
- Stocking suppliers for electrical materials
- Stocking suppliers for electrical equipment
- Excavation
- Rigging

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

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

Emails, phone calls

4. Bonding Requirements (Please Check One):

☐

This project does not involve bonding requirements.

☐

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

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

☐

Offeror did attend the pre-Bid/Proposal conference or Supplier Forum

☐

No pre-Bid/Proposal conference or Supplier Forum was held

☐

Offeror did not attend the pre-Bid/Proposal conference or Supplier Forum

VBE-5

GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF VBE PARTICIPATION GOAL

Part 4 – Additional Information Regarding Rejected VBE Quotes

This form must be completed if Part 2 indicates that a VBE quote was rejected because the Offeror is using a non-VBE or is self-performing the Identified Items of Work. List the Identified Items of Work, state whether the work will be self-performed or performed by a non-VBE, and if applicable, state the name of the non-VBE firm. Also include the names of all VBEs and non-VBE firms that provided a quote and the amount of each quote.

Describe Identified Items of Work not being performed by VBEs (include specific section from bid or proposal)	Self-performing or using non-VBE (provide name of non-VBE if applicable)	Amount of non-VBE quote \$	Name of other firms that provided quotes and whether they are VBE	Amount quoted \$	Reason why VBE quote was rejected along with brief explanation
Electrical Testing	☐ self-performing ☐ using Non-VBE Name: Qualas	\$ 86,625	☐ VBE ☐ Non-VBE Name: Tactical Testing	\$ 184,900	☐ price ☐ capabilities ☐ other Qualas was lower than Tactical Testing. No VBE quotes were received to compare pricing
Security	☐ self-performing ☐ using Non-VBE Name: Schneider	\$ 9,100	☐ VBE ☐ Non-VBE Name: n/a	\$ 0	☐ price ☐ capabilities ☐ other Proprietary as per RFP documents
Fire Alarm	☐ self-performing ☐ using Non-VBE Name: Siemens	\$ 9,850	☐ VBE ☐ Non-VBE Name: n/a	\$ 0	☐ price ☐ capabilities ☐ other Proprietary as per RFP documents
Excavating	☐ self-performing ☐ using Non-VBE Name: Perry County	\$ 79,250	☐ VBE ☐ Non-VBE Name: n/a	\$ 0	☐ price ☐ capabilities ☐ other Received no quotes from VBE excavating
Equipment	☐ self-performing ☐ using Non-VBE Name: Manna Supply	\$ 2,676,240	☐ VBE ☐ Non-VBE Name: Keystone	\$ 8,995,964	☐ price ☐ capabilities ☐ other Price was lower from a different supplier

Attach additional sheets as necessary.

VBE-5
GOOD FAITH EFFORTS DOCUMENTATION TO SUPPORT WAIVER REQUEST OF
VBE PARTICIPATION GOAL

Part 5 – VBE Subcontractor Unavailability Certificate

1. It is hereby certified that the firm of _____
(Name of VBE)

located at _____
(Number) (Street)

(City) (State) (Zip)

was offered an opportunity to bid on Solicitation No. _____

by _____
(Name of Bidder/Offeror's Firm)

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

(Signature of VBE's Representative) (Title) (Date)

(DGS VBE Certification #) (Telephone #)

***** 3.

If the VBE does not complete this form, the bidder.offeror must complete the following:

To the best of my knowledge and belief, the above-listed VBE is either unavailable for the work/service for this project, is unable to prepare a Proposal, or did not respond to a request for a price Proposal and has not completed the above portion of this submittal.

(Signature of Bidder/Offeror) (Title) (Date)

Arijana Cooper

From: Arijana Cooper
Sent: Monday, December 8, 2025 9:35 AM
Cc: Mathew Robinson; Jason Vansickle
Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

I.B. Abel, Inc. is currently seeking SBD/VBE participation for applicable UNSPSC codes related to the P3.4 scope of electrical work for the DGS C-0948-0090 P3.4 Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

This includes:

- Stocking supplies for fire alarm parts and smarts
- Stocking suppliers for electrical materials
- Stocking suppliers for electrical equipment
- Excavation
- Rigging
- Project Management

Please review the project information provided below, along with the link to the project documents:

<https://ib-abel.sharefile.com/public/share/web-sbd01e338ab6747b3b907b7e83f5b63bc>

Kindly confirm your intent to participate or decline this opportunity by **Friday, December 19, 2025**.

Should you have any questions or require additional information, please don't hesitate to reach out. Mat Robinson is the lead estimator and his contact information is:

MRobinson@ib-abel.com

717-451-6179

Thank you for your time and consideration.

Project: Project No. the **DGS C-0948-0090 P3.4** Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Harrisburg, PA 17110

Bid Opening Date and Time: 12/29/2025

Brief Description: The project consists of upgrades, relocations and replacement of various building, HVAC and electrical systems and components associated with the existing 8,600 ton Central Chiller Plant serving the PA State Capitol Complex. To support the electrical equipment replacement and reconfiguration an underground electrical vault will be constructed and connected to the existing chiller plant, via an underground tunnel.

Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

AC

Arijana Cooper

To

Cc

Bcc

Mathew Robinson; Jason Vansickle

'tmarenco@battagassoc.com'; 'jennifer.moses@zitomedia.com'; 'mljordan@zoominternet.net'; 'pcep@pa.net'; 'gundyexca@yahoo.com'; Brion Martin - Manna Supply, Inc. (brion.martin@mannasupply.com); Janell Butorac - J Sterling Solutions LLC (janell@sterlingdistr.com); 'amy@allaccessrigging.com'; Kenneth Dupree - Unique Harmony Consultants LLC (kdupree@uniqueharmonyconsultantsllc.com)

Reply

Reply All

Forward

Mon 12/8/2025 9:35 AM

Arijana Cooper

From: Arijana Cooper
Sent: Friday, December 12, 2025 7:31 AM
Cc: Mathew Robinson; Jason Vansickle
Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Good morning,

Please note the bid due date has been extended. Addendum 3 and 4 have been added to the project share folder.

I.B. Abel, Inc. is currently seeking SBD/VBE participation for applicable UNSPSC codes related to the P3.4 scope of electrical work for the DGS C-0948-0090 P3.4 Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

This includes:

- Stocking supplies for fire alarm parts and smarts
- Stocking suppliers for electrical materials
- Stocking suppliers for electrical equipment
- Excavation
- Rigging
- Project Management

Please review the project information provided below, along with the link to the project documents:

<https://ib-abel.sharefile.com/public/share/web-sbd01e338ab6747b3b907b7e83f5b63bc>

Kindly confirm your intent to participate or decline this opportunity by **Friday, December 19, 2025**.

Should you have any questions or require additional information, please don't hesitate to reach out. Mat Robinson is the lead estimator and his contact information is:

MRobinson@ib-abel.com

717-451-6179

Thank you for your time and consideration.

Project: Project No. the **DGS C-0948-0090 P3.4** Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Harrisburg, PA 17110

Bid Opening Date and Time: 01/12/2026

Brief Description: The project consists of upgrades, relocations and replacement of various building, HVAC and electrical systems and components associated with the existing 8,600 ton Central Chiller Plant serving the PA State Capitol Complex. To support the electrical equipment replacement and reconfiguration an underground electrical vault will be constructed and connected to the existing chiller plant, via an underground tunnel.

Arijana Cooper

From: Microsoft Outlook
To: robstern7@aol.com; jennifer.moses@zitomedia.com; mljordan@zoominternet.net; pcep@pa.net; gundyexca@yahoo.com; brion.martin@mannasupply.com; janell@sterlingdistr.com; amy@allaccessrigging.com; kdupree@uniqueharmonyconsultantsllc.com; jgormley@ncetest.com; bjmessina@ncetest.com
Sent: Friday, December 12, 2025 7:32 AM
Subject: Relayed: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

robstern7@aol.com

jennifer.moses@zitomedia.com

mljordan@zoominternet.net

pcep@pa.net

gundyexca@yahoo.com

brion.martin@mannasupply.com

janell@sterlingdistr.com

amy@allaccessrigging.com

kdupree@uniqueharmonyconsultantsllc.com

jgormley@ncetest.com

bjmessina@ncetest.com

Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Arijana Cooper

From: Microsoft Outlook
To: tmarenco@battagassoc.com
Sent: Friday, December 12, 2025 7:31 AM
Subject: Relayed: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Delivery to these recipients or groups is complete, but no delivery notification was sent by the destination server:

tmarenco@battagassoc.com

Subject: Solicitation for Project: DGS Capitol Complex Central Plant - Building Renovations, Chiller System Replacement and Electrical System Upgrades

Arijana Cooper

From: Mathew Robinson
Sent: Friday, January 9, 2026 1:04 PM
To: pcep@pa.net
Cc: Arijana Cooper
Subject: Re: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
Addendum 11 has been uploaded. Our bid is now due on the 20th. Please verify but I see no changes to the project other than due date pertaining to addendums 9-11. Please send your pricing by EOB the 14th.

<https://ib-abel.sharefile.com/public/share/web-s39c36c308ba94e1492b09558f0848215>

Thank you,
Mat

Mathew Robinson
Senior Estimator
Mobile: 717-451-6179
www.ib-abel.com

 **24/7 Service & Support 717-845-1639**

From: Mathew Robinson <mrobinson@ib-abel.com>
Sent: Thursday, January 08, 2026 11:39 AM
To: pcep@pa.net <pcep@pa.net>
Cc: Arijana Cooper <arijana.cooper@ib-abel.com>
Subject: Re: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
Addendum 8 has been uploaded. Our bid is still due on the 13th. Please send your pricing to us as soon as you can.

<https://ib-abel.sharefile.com/public/share/web-s59e439513e364d9982fdbec9f38d6e52>

Thank you,
Mat

Mathew Robinson
Senior Estimator
Mobile: 717-451-6179
www.ib-abel.com

24/7 Service & Support 717-845-1639

From: Mathew Robinson <mrobinson@ib-abel.com>
Sent: Tuesday, December 30, 2025 6:32 AM
To: pcep@pa.net <pcep@pa.net>
Cc: Arijana Cooper <arijana.cooper@ib-abel.com>
Subject: Re: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
Addendum 6 and 7 have been uploaded to the sharefile. Let me know if you plan to attend the additional walk through.

<https://ib-abel.sharefile.com/public/share/web-sb015c2e830bb4b8aa778671c76f83b15>

Thank you,
Mat

Mathew Robinson
Senior Estimator
Mobile: 717-451-6179
www.ib-abel.com

24/7 Service & Support 717-845-1639

From: Mathew Robinson <mrobinson@ib-abel.com>
Sent: Thursday, December 18, 2025 2:15 PM
To: pcep@pa.net <pcep@pa.net>
Cc: Arijana Cooper <arijana.cooper@ib-abel.com>
Subject: Fw: 25-2216 - DGS Central Plant Upgrades - Excavation

Hello,
We are currently bidding the above referenced project in Harrisburg, PA. We would like to get a quote for the Excavation from you. The attached drawings are for your use. The link below contains the spec's and all bidding information pertaining to the project. This information is for your use. Our pricing is due 1/13/26. We would like your quote by EOB 1/09/26. With the Holidays and company schedules please confirm timing of this quote.

Notes:

Prevailing wage determination is located in the project manual of the link provided.
We will probably build the duct bank as an assembly and lower into the excavation. Including the rebar.
Please provide concrete for the duct bank and reinstalled exterior light poles.
~~Plan to form and pour the light pole bases.~~
Test bores, soil composition, and other information are contained in the project manual and specs through the link below.
Highlighted routing and footages are approx.
The grounding triads scale out to be about 4'6" per side however please plan on 10' per side of excavation.

<https://ib-abel.sharefile.com/public/share/web-sfc805706b3604cf9878bf5c74cb93974>

If you have any questions please contact me directly.

Thank you,

Mat

Mathew Robinson

Senior Estimator

Mobile:717-451-6179

www.ib-abel.com



☎ 24/7 Service & Support 717-845-1639



January 5, 2026

I B Abel Inc.
2745 Black Ridge Road
York, PA 17406-7920

Attention: Mathew Robinson

Subject: 2508324 I.B. Abel - DGS Central Plant Proposal

Reference:

Dear Mathew,

Qualus Services, LLC appreciates this opportunity to be of service to I B Abel Inc. After careful review, it is our pleasure to submit this proposal for your consideration. The execution strategy described in this proposal has been prepared to define the scope of work and overall approach that Qualus intends to follow throughout the execution of this project.

Staffed with experienced engineers, field service technicians, operational professionals, and outfitted with the most up-to-date software and equipment, Qualus prides itself on being at the forefront in terms of industry standards, testing and design capabilities, and quality assurance processes. Our proven business philosophy is to invest in building long-term relationships with our clients based on our strong client-centric culture emphasizing safety, quality, and project execution track record.

We appreciate the opportunity to work with you on this project. If you have any questions or concerns, please contact me at 410-344-0300 or by email at JP.Shoop@QualusCorp.com

Sincerely,

JP Shoop
Account Manager

TABLE OF CONTENTS

PROJECT SUMMARY.....3

HSSE & HUMAN PERFORMANCE.....3

ABOUT QUALUS.....3

EQUIPMENT SCOPE.....4

WORK SCOPE.....6

CLARIFICATIONS 13

CUSTOMER RESPONSIBILITIES 14

PROJECT SCHEDULE 14

PROJECT PRICING 14

PROPOSAL ACCEPTANCE.....15

TERMS & CONDITIONS.....15

PROJECT SUMMARY

NETA Acceptance Testing at Capitol Complex - Central Chiller Plant. 7th Street / Soldier's Grove. Dauphin County. City of Harrisburg.

HSSE & HUMAN PERFORMANCE

Safety First, We All Own It is a core value and a top priority for all projects. Qualus operates with a strict zero-tolerance policy when it comes to non-compliance of safety protocols. In addition to our Corporate Safety Manual and our Life Saving Rules, a site-specific safety plan will be created, tailored, and distributed to meet the specific needs and challenges of the project. Our teams also utilize Job Task Hazard Analyses and HP utilization checklists to ensure that we maintain our heightened state of awareness when it comes to your infrastructure. Any elements of your programs not covered in our standards will be included as a requirement in the working conditions.

ABOUT QUALUS

Qualus is a leading pure-play power services firm and innovator at the forefront of the energy transition and transformation, with differentiated capabilities across grid modernization, resiliency, security, and sustainability. The firm partners with utilities, commercial, industrial, data center, and government clients, and renewable and energy storage developers, offering comprehensive solutions through boutique and integrated advisory, planning, engineering, digital solutions, program management, and specialized field services. Qualus also provides software and technology enabled services and develops breakthrough solutions for critical power industry challenges such as distributed and variable resource integration, emergency management, and secure data exchange. The firm has nearly 1,600 professionals, with offices throughout the U.S. and Canada.

EQUIPMENT SCOPE

Relocated Existing 10MVA Unit Substations (x2)

Relays:

51,51G 2

51 2

81,47,27,59 2

Instrument Transformers

CT 6

PT 2

Meters (Schneider Electric PM8000) 2

MDS15' - 1200A 15KV Switchgear 1

Vacuum Circuit Breakers 7

CT 22

PT 4

Lightning Arresters 2

Relays:

50/51,50G 4

51 2

51,50G 2

87B 2

25 1

81,47,27,59 2

Meters (Schneider Electric ION 9000T) 2

Meters (Schneider Electric PM8000) 4

MDS5' - 2000A 5KV Switchgear 1

5KV Main Disconnects 2

5KV Fused Disconnects 5

Lightning Arresters 2

CT 5

Meters (Schneider Electric PM8000) 5

12.47KV:480/277V Unit Substation XFMR	2
3500kVA 12.47KV-480Y/277V XFMR	2
480V Draw-Out Circuit Breakers	3
Meters (Schneider Electric PM8000)	3
MTM2' 5000A 480V Switchgear	1
480V Draw-Out Circuit Breakers	9
Meters (Schneider Electric PM8000)	8
MTM1' 3200A 480V Switchgear	1
480V Draw-Out Circuit Breakers	5
Meters (Schneider Electric PM8000)	4
CT	2
Cables / Busway	
15KV Cable Set	8
5KV Cable Set	4
2000A 4.16KV Busway	2
LV Cable Sets #3 AWG & Larger	24
LV Busway	4
LV Panels	14
Small Transformers	1
600A Circuit Breaker in 'MDS2'	1
LV Disconnects	4
LV CB > 225 Amp (MDP-NE, PP, LR)	3
Grounding System	1

NOTE: UPS, VFD, Existing and Relocated equipment is not included in this proposal.

WORK SCOPE

Qualus Services (Qualus) will provide the required technical labor, supervision, basic equipment, consumable materials, and engineering services to perform the following scope of work:

CABLES, MEDIUM AND HIGH VOLTAGE CABLE

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage, where visible and safely accessible.
2. Verify tightness of bolted electrical connections with a calibrated torque wrench, where possible.
3. Inspect compression applied connectors for correct cable match and indentation, where visible.
4. Inspect shield grounding, cable supports and terminations. (See note below)
5. Where applicable, verify that visible cable bends meet or exceed ICEA and manufacturer's bending radius, where visible (See note below)
6. If cables are terminated through window type current transformers, inspect to verify that neutral and ground conductors are correctly placed and that shields are correctly terminated for operation of protective devices, where visible.
7. Inspect for correct identification and arrangements, where visible. (See note below)
8. Inspect cable jacket insulation and condition, where visible. (See note below)

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Insulation resistance test on each conductor with all other conductors and shield grounded.
3. Shield continuity test on each cable.
4. Perform very low frequency (VLF) dielectric withstand voltage test.
 - All cables must be outside of manholes for testing. Qualus Services will not enter manholes with energized conductors. Electrical contractors are responsible for disconnecting and re-connection of cables.

CABLES, LOW VOLTAGE, 600-VOLT MAXIMUM (#3AWG and larger)

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Verify tightness of bolted electrical connections with a calibrated torque wrench (where possible).
3. Inspect compression applied connectors for correct cable match and indentation, where visible.
4. Inspect for correct identification and arrangements, where visible.
5. Inspect cable jacket insulation and condition, where visible.

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Insulation resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable for 1 minute.
3. Continuity tests to ensure correct cable connection.
 - Electrical contractor is responsible for disconnecting and re-connection of cables.

DRY TYPE TRANSFORMERS (500KVA and greater)

A. Perform the following mechanical inspections

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment and grounding.
3. Verify that resilient mounts are free and that any shipping brackets have been removed.
4. Verify tightness of bolted electrical connections with a calibrated torque wrench.
5. Verify that as-left tap connections are as specified.
6. Verify that cooling fans operate and that fan motors have correct overcurrent protection.
7. Verify the presence of surge protection.

B. Perform the following electrical testing

1. Resistance measurements through bolted electrical connections.
2. Insulation resistance tests winding to winding and each winding to ground (where possible).
3. Calculate the polarization index.
4. Turns ratio and winding resistance test on all tap positions.
5. Test surge arresters.

MEDIUM VOLTAGE, METAL ENCLOSED AIR SWITCHES

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Inspect anchorage, alignment, grounding, and required clearances.
3. Verify correct blade alignment, blade penetration, travel stops and mechanical operation.
4. Verify that fuses sizes and types are in accordance with drawings, and all engineered studies.
5. Verify that expulsion limiting devices are in place on all holders having expulsion type elements.
6. Verify that each fuse has adequate mechanical support and contact integrity.
7. Verify tightness of bolted electrical connections with a calibrated torque wrench.
8. Verify operation and sequencing of interlocking systems.
9. Verify correct barrier installation.
10. Verify correct operation of all indicating and control devices.
11. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.
12. Verify operation of heaters when safely possible.

B. Perform the following electrical testing

1. Resistance measurements through bolted connections.
2. Measure contact resistance across each switchblade and fuse holders.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. Dielectric withstand voltage test.
5. Measure fuse resistance.

MEDIUM VOLTAGE VACUUM CIRCUIT BREAKERS

A. Perform the following mechanical inspections

1. Visually inspect for signs of physical damage.
2. Inspect anchorage, alignment and grounding.
3. Mechanical operator test in accordance with manufacturer's published data, if applicable.
4. Measure critical distances such as contact gap on the operating mechanism in accordance with
5. manufacturer's published data.
6. Verify tightness of bolted electrical connections with a calibrated torque wrench.
7. Verify cell fit and element alignment.
8. Verify racking mechanism operation.
9. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.
10. Verify operation of heaters.
11. Record as-left operation counter readings.

B. Perform the following electrical testing

1. Resistance measurements through bolted connections.
2. Contact/pole resistance test.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. Minimum pickup voltage tests on trip and close coils.
5. Verify operation of electrical close and trip operations, trip-free and antipump function.
6. Trip breaker via protective relays.
7. Vacuum bottle integrity (dielectric withstand voltage) test across each vacuum bottle with the contacts in the open position.
8. Dielectric withstand voltage test.

PANELBOARDS

A. Visual and Mechanical Inspection

1. Inspect and note general condition of each section and document equipment nameplate information.
2. Inspect physical and mechanical condition.
3. Inspect anchorage, alignment, grounding, and required area clearances.

B. Electrical Tests

1. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground.

MICROPROCESSOR BASED RELAYS

A. Perform the following mechanical inspections.

1. Verify operation of light-emitting diodes, display and targets.
2. Record passwords for all access levels.
3. Clean the front panel and remove foreign material from the case.
4. Check tightness of connections.
5. Verify that the frame is grounded in accordance with manufacturer's instructions.
6. Set the relay in accordance with the coordination study.
7. Download settings from the relay. Print a copy of the settings for the report and compare the settings to those of the coordination study.

B. Perform the following electrical testing.

1. Insulation resistance test on each circuit to frame. Procedures for performing this test on solid state relays shall be determined from the manufacturer's published data.
2. Apply voltage or current to all analog inputs and verify correct registration of the relay meter function.
3. Check functional operation of each element used in the protection scheme.
4. Control verification:
 - Check operation of all active digital inputs.
 - Check all output contacts or SCRs, preferably by operating the controlled device such as circuit breaker, auxiliary relay or alarm.
 - Check all internal logic functional used in protection scheme.
 - For pilot schemes, perform a loop-back test to check the receive and transmit communications circuits.
 - For pilot schemes, perform satellite synchronized end to end tests.
 - For pilot schemes with direct transfer trip (DTT), perform communications statistics, fault counters, sequence of events recorder and all event records.
 - Upon completion of testing, reset all min/max recorders, communications statistics, fault counters, sequence of events recorders and all event records.

METERING DEVICE

Visual and Mechanical Inspection

1. Document equipment nameplate data.
2. Inspect physical and mechanical condition.
3. Verify freedom of movement, end play, and alignment of rotating disks.

Electrical Tests

1. Verify accuracy of meters at all cardinal points.
2. Calibrate meters according to manufacturer's recommendations.
3. Verify all instrument multipliers.
4. Verify that current transformer and voltage transformer secondary circuits are intact.

SWITCHGEAR AND SWITCHBOARDS ASSEMBLIES

A. Perform the following mechanical inspections.

1. Inspect switchboard for damage and overall condition.
2. Inspect anchorage, alignment, grounding, and required area clearances.
3. Verify that the unit is clean and that all shipping bracing, loose parts, and documentation shipped inside cubicle have been removed.
4. Verify that fuse and circuit breaker sizes and types correspond to drawings and coordination study (**customer provided**).
5. Verify that current and voltage transformers ratios correspond to drawings.
6. Verify tightness of bolted electrical connections with a calibrated torque wrench.
7. Confirm correct operation and sequencing of electrical and mechanical interlocks.
8. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.
9. Inspect insulators for evidence of damage or contaminated surfaces.
10. Verify barrier and shutter installation and operation.
11. Exercise all active components.
12. Inspect mechanical indicating devices for correct operations.
13. Verify that filters are in place and vents are clear, if applicable.
14. Verify cubicle heater operation, when safely possible.
15. Perform visual and mechanical inspection of instrument transformers.
16. Inspect control power transformers.
17. Inspect for physical damage, cracked insulation, broken leads, tightness of connections and defective wiring.
18. Verify that primary and secondary fuse and circuit breaker ratings match drawings.

B. Perform the following electrical testing.

1. Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.1.A.8.1.
2. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 100.1.
3. Perform a dielectric withstand voltage test on each bus section, each phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If the manufacturer has no recommendation for this test, it shall be in accordance with Table 100.2. The test voltage shall be applied for one minute.
4. Perform current-injection tests on the entire current circuit in each section of switchgear per manufacturers specifications.
5. Control power transformers:
 - a) Insulation resistance test.
 - b) Turns ratio test on all taps.
6. Voltage transformers:
 - a) Verify correct secondary voltage.
 - b) Turns Ratio Test
 - c) Insulation Resistance Test
7. Current transformers:
 - a) Turns Ratio Test
 - b) Insulation Resistance Test

CIRCUIT BREAKERS, AIR, INSULATED-CASE/MOLDED-CASE (LOW VOLTAGE)

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Inspect anchorage and alignment.
3. Operate breaker.
4. Verify tightness of bolted electrical connections with a calibrated torque wrench.
5. Inspect operating mechanism, contacts and arc chutes in unsealed units.
6. Verify operation of charging mechanism where applicable.
7. Perform adjustments for final protective device settings. We have included one (1) input of settings. Additional setting changes would result in additional costs.

B. Perform the following electrical testing

1. Resistance measurements through bolted connections.
2. Contact/pole resistance test.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. High current injection test. (Secondary Injection on temporarily equipment)
 - Electrical testing will be performed only on breakers rated over 225 Amp.
 - Customer must provide 480V, 1P, 100A for our primary injection test set.
 - Customer will remove and reinstall any fixed mounted breakers that require primary injection testing.

TRANSFORMERS, DRY TYPE, AIR COOLED, LOW VOLTAGE, SMALL (<500KVA).

A. Perform the following mechanical inspections.

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment, and grounding.
3. Verify that resilient mounts are free and that any shipping brackets have been removed.
4. Verify tightness of bolted electrical connections with a calibrated torque wrench.
5. Verify that as-left tap connections are as specified.

B. Perform the following electrical testing.

1. Resistance measurements through bolted electrical connections.
2. Insulation resistance tests winding to winding and each winding to ground (where possible). Calculate the polarization index.
3. Perform Turns Ratio on the as found tap.

GROUNDING SYSTEMS

A. Perform the following mechanical inspections.

1. Inspect physical and mechanical condition.
2. Verify tightness of bolted electrical connections with a calibrated torque wrench.
3. Inspect anchorage.

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Fall of potential or alternative test in accordance with ANSI/IEEE 81 on the main grounding electrode or system (if applicable).
3. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and derived neutral points.

LOW VOLTAGE AIR SWITCHES

A. Perform the following mechanical inspections.

1. Visually inspect for signs of physical damage.
2. Inspect anchorage, alignment, grounding, and required clearances.
3. Verify correct blade alignment, blade penetration, travel stops and mechanical operation.
4. Verify that fuses sizes and types are in accordance with drawings, and all engineered studies.
5. Verify that each fuse has adequate mechanical support and contact integrity.
6. Verify tightness of bolted electrical connections with a calibrated torque wrench.
7. Verify operation and sequencing of interlocking systems.
8. Verify correct barrier installation.
9. Verify correct operation of all indicating and control devices.
10. Verify appropriate lubrication on moving current carrying parts and on moving and sliding surfaces.

B. Perform the following electrical testing.

1. Resistance measurements through bolted connections.
2. Measure contact resistance across each switchblade and fuseholders.
3. Insulation resistance test for one minute on each pole, phase to phase and phase to ground with switch closed and across each open pole.
4. Measure fuse resistance.
5. Perform ground fault test (if applicable).

INFRARED SCANNING (New equipment only)

In addition to the outlined services, we will perform an infrared survey of the equipment listed in accordance with NETA and project specifications and bid specifications.

Customer will provide a person to assist with removal and reinstallation of panel covers. This person is required to be:

- Qualified as defined under provisions statement in NFPA-70E.
- Must have the appropriate shock and arc flash PPE.

CLARIFICATIONS

1. Qualus is committed to a safe work environment for our personnel and in maintaining our industry leading safety record. In support of this effort, Qualus will “Move at the Speed of Safety”. If site conditions are less than ideal, requiring additional time and effort to meet typical safety standards, Qualus reserves the right to pass on any delay costs to the customer.
2. Testing and/or abatement of hazardous materials including but not limited to PCBs, asbestos, and lead paint, are not included in this proposal.
3. Utility switching fees and/or wiring permit fees, if any, are not included in this proposal and will be additional to the base contract price.
4. This proposal does not include any permitting or inspection fees.
5. Standby time is not included in this proposal. Any non-Qualus caused delays in accessing the required workspace and/or equipment once on site, such as inclement weather, de-energizing/energizing equipment for an outage, equipment malfunction, coordination between trade(s), etc. may be subject to additional charges.
6. Notice of delays or change orders will be brought to your attention before costs are incurred. The customer must provide written authorization to proceed with any additional work.
7. A charge will apply if work is cancelled within 48 hours of the scheduled date.
8. Qualus pricing does not include any work outside the substation yard.
9. Qualus to mobilize to site once all apparatus is set. Any requirement to mobilize early without all equipment in the final position will incur additional costs via Change Order.
10. Qualus pricing does not include any purchasing or transporting of SF6 gas.
11. A written purchase order or signed copy of the Work Authorization/Proposal is required before materials can be ordered and/or before site work can be performed.
12. Certain NETA testing may not be feasible and will not be performed.
13. Pricing is based on performing the scope of work listed in this quotation only. Any equipment or test procedures not explicitly listed will require a change order. Testing will be performed once on all equipment unless otherwise specified. Re-testing failed equipment will be addressed as a change order.
14. Excludes time and cost for badging, safety training, drug testing, or COVID testing.
15. Excludes load testing of any kind unless otherwise specified.
16. No retainage is agreed to or accepted for this project.
17. Ground rods must be made accessible prior to final concealment and or connection.

CUSTOMER RESPONSIBILITIES

- 1. Provide any available existing drawings of the existing switchgear.
- 2. Provide the existing Short Circuit, Coordination, and Arc Flash Study model for incorporation of the new circuit breakers and relays. If an existing study and model is not available, additional charges will apply.
- 3. Perform Isolation and LO/TO activities, witnessed and verified by Qualus personnel.
- 4. Clear and free access to the work location and parking for required vehicles.
- 5. Provide adequate site conditions clear from mud, snow, and ice, as required. This includes removal of debris, snow, or other obstructions for clear and safe access.
- 6. Provide offloading, storage, and site handling of all material delivered from Qualus.
- 7. Provide a safe, secure laydown area for Qualus supplied equipment, and materials.
- 8. Equipment must be deenergized and ready for testing prior to Qualus arriving onsite. Any deviation may require a change order.
- 9. Provide 480V, 100A, 1PH for our test set.

PROJECT SCHEDULE

- 1. The pricing is based on work being performed during normal working hours, Monday through Friday, 7:00AM-3:30PM. Work after normal working hours, Saturdays, Sundays, and Holidays is not included.
- 2. Any specific schedule or time frame offered for accomplishing the scope of work in this proposal is subject to prior sale and the availability of Qualus resources. The schedule for performance of this work scope must be confirmed with Qualus at the time of order placement.

PROJECT PRICING

Qualus proposes completing the Work Scope listed above for the following amounts:

BASE WORK SCOPE:

▪ NETA ATS (New Equipment)	\$65,750.00 Fixed
▪ NETA ATS (Temp. Equipment):	\$11,275.00 Fixed
▪ Infrared Scan (1 Tech X 1 Day X 2 Times):	\$4,900.00 Fixed
▪ Commissioning Support (1 Tech X 2 Days):	\$4,700.00 Fixed

Note:

- 1. Prices quoted are exclusive of any present or future federal or state taxes or local sales, use or excise taxes, or tariffs. If any such present or future sales, use or excise taxes, or tariffs apply, then they shall be added to the invoice as a separate item unless Purchaser has furnished an acceptable tax exemption certificate from such tax prior to shipment.

PROPOSAL ACCEPTANCE

Upon acceptance of this proposal, please send a contract/purchase order to:

Qualus Services LLC

Attn: JP Shoop

11620 Crossroads Circle

Middle River MD 21220

Fax: 410-335-4389

Email: JP.Shoop@QualusCorp.com

This proposal is considered proprietary in nature, intended for the sole use of the entity addressed above, and as such is not intended for general public distribution.

TERMS & CONDITIONS

Qualus Terms & Conditions Apply

AIA Monthly Progress Billing, Net 30 Day Terms

Freight: Prepay and Add

FOB: Factory

This proposal is valid for 45 days.

QUALUS Standard Terms & Conditions

Unless a separate agreement on terms and conditions exist between the Company and the Purchaser, the following terms and conditions shall apply to all sales by Qualus Corp. and its affiliates, including Qualus, LLC, Qualus Services, LLC, Qualus Consulting, LLC, Qualus Solutions, LLC, and Qualus Solutions of FL, LLC (collectively, hereinafter the "Company").

1. Terms of Payment – Payment terms are due thirty (30) days from the date of invoice. Company shall invoice Purchaser monthly. If payment is not made within thirty (30) days of the invoice date, a late payment charge of one and one half percent (1 1/2%) per month shall be imposed on the unpaid balance. With respect to goods purchased, pro rata payments shall become due as partial shipments are made. When shipments are delayed by the Purchaser, payment shall become due from the date the Company is prepared to make shipment. Goods which at Purchaser's request (i) are held for delayed shipment or (ii) are placed in off-site storage, will be invoiced as if shipped when originally scheduled and will be held and stored at the risk and expense of the Purchaser.

2. Payment - If, in the sole opinion of the Company, the financial condition of the Purchaser at the time the equipment is ready for shipment does not justify the terms of payment specified, then as a condition of shipment, Company may require (i) that the Purchaser provide adequate assurances of payment or (ii) payment terms satisfactory to the Company, in its sole discretion.

3. Quotations -

3.1 Quotations are void unless accepted within thirty (30) days from the date thereof, unless otherwise stated and, in the meantime, are subject to change or withdrawal upon notice. Orders made thereon are not binding until and unless accepted by the Company. Shipping dates are approximate and based upon prompt receipt of all necessary information and approved drawings whenever required. Stenographic and clerical errors are subject to correction.

3.2 Unless otherwise specified in writing, all quotes are on a straight time basis, excluding work on Saturdays, Sundays and Holidays.

4. Changes, Deletions and Extra Work – Purchaser, without invalidating the Contract, may order extra work scope and make changes in addition to or deducting from the work, and the Contract sum shall be adjusted accordingly. All such work shall be executed under the conditions of this Contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.

The value of any such extra work or change shall be determined in one or more of the following ways:

- (a) by estimate and acceptance of lump sum.
- (b) by unit prices named in the Contract or subsequently agreed upon.
- (c) by cost and percentage of cost or by cost and a fixed fee.

5. Minimum Billing Charge - The minimum billing charge shall be \$100.00.

6. Delivery - Unless otherwise specified, all products are delivered f.o.b. point of shipment regardless of transportation costs being "allowed", "pre-paid", or "collect".

7. Shipment Delays - The Company shall not be liable for delays in starting work or in shipment or non-shipment due to causes beyond its reasonable control or due to acts of God, acts of the

Purchaser, fires, strikes, labor disturbances, floods, pandemics, epidemics, quarantine restrictions, war, insurrections or riot, civil or military authority, compliance with priority orders or preference ratings issued by the Government, freight embargo's, car shortages, wrecks or delays in transportation, unusually severe weather, or inability to obtain necessary labor, materials or manufacturing facilities due to such causes or any of them. In the event of any such delay, the date of shipment will be extended, at the minimum, for a period equal to the period of the delay. The contract of sale will in no event be subject to cancellation by the Purchaser, whether due to delay in delivery or to any other cause, except by mutual agreement of the parties, nor shall the Company be liable under any circumstances for special or consequential damages on any account of delay.

8. Suspension/Cancellation – In the event Purchaser requests a suspension of work under this Contract, Purchaser shall, in writing, notify Company reasonably in advance of the suspension date; this notification will indicate the anticipated suspension period. Company shall advise Purchaser of the price adjustment resulting from the planned suspension of the work. The price adjustment will be based on Company's ability to reasonably relocate manpower, and any materials, and equipment during the suspension period. Remobilization costs will be priced on the same basis.

Purchaser may cancel this contract upon thirty (30) days written notice to the Company, and upon payment to Company of reasonable and proper cancellation charges; including but not limited to charges for engineering, testing, repair, upgrade and installation work completed, and for materials on order / in manufacture / in storage and lost profits ("Cancellation Charges").

If the financial condition of Purchaser at any time does not, in the judgment of Company, justify continuance of the work to be performed hereunder on the terms of payment agreed upon, Company may require full or partial payment in advance or shall be entitled to cancel the Contract and shall receive reimbursement for its reasonable and proper Cancellation Charges. In the event of bankruptcy or insolvency of Purchaser or in the event any proceeding is brought against the Purchaser, voluntarily or involuntarily, under the bankruptcy or any insolvency laws, Company shall be entitled to cancel the Contract at any time during the period allowed for filing claims against the estate and shall receive reimbursement for its reasonable and proper cancellation charges. Company's rights under this paragraph are in addition to all rights available to it at law or in equity.

9. Limitation of Liability - The Company shall not accept any penalty or liquidated damage clauses of any kind, or any liability arising from such clauses, unless specifically approved in writing by a duly authorized representative of the Company. The Company shall not be liable for any indirect, special, consequential, or punitive damages (including lost profits, loss of use, business interruption, lost productivity, loss of communications) arising out of or relating to this purchase (whether for breach of contract, breach of warranty, tort, negligence, or other form of action) and irrespective of whether Company has been advised of the possibility of any such damage. In no event shall the Company's liability exceed the price the Purchaser paid to the Company for the specific Goods or Services provided by the Company giving rise to the claim or cause of action.

10. Damage and Loss Claims – The Company shall not be responsible for loss, shortage, or damage after receipt of "in good order" receipts from the transportation company. The Company's

responsibility for loss, shortage, or damage ceases with the delivery to a common carrier, at which time title and risk of loss pass to the purchaser, and all claims for loss, shortage, damage, or delay must be made to the carrier by the Purchaser. Concealed damage claims must be reported to the carrier within fifteen (15) days from the date of delivery. The Company will reasonably assist the Purchaser in securing satisfactory adjustment of any claims.

11. Warranty –

11.1 The Company warrants that the (i) goods shall be as provided by the specifications provided by Purchaser and new (unless otherwise directed or permitted), and if new, without apparent damage or defect, (ii) services will be performed in accordance with the specifications provided by Purchaser and performed in a workmanlike manner. In the event Purchaser notifies Company of defective materials or workmanship within the lesser of eighteen (18) calendar months from shipment of materials or completion of the work, or twelve (12) calendar months from installation of the goods, the Company will, (i) at its option either repair or replace defective new materials, and correct the defective workmanship free of charge. Repairs or warranty work shall be performed f.o.b. factory or at a Purchaser's site, at the Company's option.

11.2 Whenever work is performed at Purchaser's site, it will be performed during a normal eight-hour straight-time day. If the Purchaser requests that product warranty work be performed during any other time period, Purchaser will be invoiced for the premium portion of the work; i.e. the difference between the applicable rate and the overtime rate for the services performed.

11.3 This warranty does not apply to, nor is any expense or other damages or liability assumed for, any goods which are used, which have been improperly stored, or installed, or from any accidental or intentional attempts to operate the goods in excess of their rating, or in any abnormal atmosphere or environments, or to which unauthorized repairs have been made whether or not such goods are defective or in accord with the specifications. Any such repairs or modifications must be authorized by the Company in writing.

11.4 This warranty does not apply to, nor is any expense or other damages or liability assumed for work performed on serviced equipment that has been subsequently serviced by another firm without authorization by the Company in writing.

12. Equipment and Materials of Others - The Company's responsibility does not extend to equipment not manufactured by the Company. The Company will reasonably assist Purchaser in making claims under any warranty provided by the supplier or manufacturer of such equipment.

12.1 The Company's responsibility does not extend to used equipment supplied in any other than "fully reconditioned" state.

12.2 THE FORGOING WARRANTY IS EXCLUSIVE AND EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES (EXCEPT TITLE), WHETHER EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE FORGOING REMEDIES OF REPAIR OR REPLACEMENT SHALL CONSTITUTE THE SOLE REMEDY OF THE PURCHASER AND SOLE LIABILITY OF THE COMPANY FOR ANY BREACH OF WARRANTY.

13. Nuclear Insurance – Indemnity - For applications in nuclear projects, the Purchaser/Owner shall have a complete and proper insurance protection against liability and

property damage resulting from a nuclear incident and shall indemnify the Company, its suppliers and subcontractors against all claims resulting from a nuclear incident.

14. Returned Goods – No goods shall be returned without the Purchaser having secured approval and terms of return from the Company. The return of all goods including, but not limited to, returnable shipping materials such as cable reels, end plates or covers, oil drums, gas bottles, etc. will not be permitted under any condition without the Company's properly executed Returned Goods Authorization Form. Goods returned without complete identification in accordance with the Company's instructions or without charges prepaid shall not be accepted. The Company reserves the right to refuse any goods returned for credit.

15. Termination - After acceptance by the Company, an order shall not be terminated, in whole or part by the Purchaser except by agreement in writing from the Company and such agreement shall be contingent upon payment of reasonable Cancellation Charges based upon expenses already incurred and commitments made by the Company plus a charge of 10% of the contract price to compensate the Company for indirect costs resulting from the termination.

16. Rescheduling - Rescheduling of an order by the Purchaser shall require agreement in writing executed by the Company and renegotiation of the price and escalation terms to reasonably cover additional costs and commitments occasioned by the change. Delivery commitments made by the Company are based upon complete specifications and/or information supplied by the Purchaser with the order and upon prompt return of approval drawings (if required by the Purchaser) by the date requested by the Company. Rescheduling of any order by the Company as a result of the Purchaser's delay in returning approval drawings shall require renegotiation of price and escalation terms to reasonably cover additional costs and commitments occasioned by the delay.

17. Drawing Approval and Changes - If at drawing approval, the Company has failed to design the product in accordance with the Purchaser's specifications, the Company shall, at its expense, make appropriate changes. Where Purchaser's specifications are not definitive, the Company reserves the right to design the product in line with, in the Company's judgment, good engineering practice. If at drawing approval, the Purchaser makes changes outside the scope of the design as covered in Purchaser's specifications, the price and delivery terms shall be renegotiated to reasonably cover any additional cost and commitments occasioned by the change. Such change must be in writing executed by the Purchaser and Company. Changes made to an order by the Purchaser after engineering is completed or entry of the order into manufacturing shall result in substantially greater costs and delivery delays.

18. Taxes - Prices quoted are exclusive of any present or future federal or state taxes or local sales, use or excise taxes, or tariffs. If any such present or future sales, use or excise taxes, or tariffs apply, then they shall be added to the invoice as a separate item unless Purchaser has furnished an acceptable tax exemption certificate from such tax prior to shipment.

19. Indemnification – Purchaser shall fully indemnify, defend and hold harmless Company, its affiliates and all of its and their respective co-owners, partners, joint venturers, officers, directors, employees and agents (collectively the "Company Indemnified Parties") from and against all claims directly or indirectly arising out of or resulting from or relating to any of the following:

- (a) Personal injury or death of any person, or damage to the extent in any way directly or indirectly arising out of or related to the negligence (of any type) or willful misconduct of Purchaser or anyone directly or indirectly employed by them or anyone for whose acts they may be liable (other than any Contractor Indemnified Parties")
- (b) Personal injury to or death of any employees of Purchaser, regardless of the cause of such damages, losses, costs, and expenses, including the sole or joint negligence, breach of contract or other basis of liability of any Contractor Indemnified Parties.

20. Dispute Resolution – Any controversy or claim arising out of or relating to this Contract, or the breach thereof, shall be settled by arbitration by the American Arbitration Association under its Commercial Arbitration Rules, and judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof. The arbitration shall be conducted in accordance with the Federal Arbitration Act, 9 U.S.C. 1 *et seq*, and the venue for the arbitration shall be the Circuit Court of Seminole County, Florida.

20.1 Both Company and Purchaser hereby knowingly, voluntarily, and intentionally waive and forever relinquish any and all claims or rights that such party may have to any trial by jury on any issue arising out of any litigation or disputes or claims under this Contract or any order or in any way associated therewith. Both parties intend to waive and forever relinquish any right under the Seventh Amendment of the United States Constitution to trial by jury and any claims or rights to a trial by jury under the constitution of any state or any other constitutional, statutory, or otherwise applicable law providing for a right to trial by jury.

21. General –

21.1 Company shall not be responsible for the acts and workmanship of the employees, contractors, subcontractors or agents of the Purchaser. The Company reserves the right to subcontractor any of the work to one or more subcontractors.

21.2 The delegation or assignment by Purchaser of any or all of its duties or rights hereunder without Company's prior written consent shall be void.

21.3 The rights and obligations of the parties under this Contract shall be interpreted and governed in all respects by the laws of the state of Florida. If either party brings against the other party any proceeding arising out of this agreement, that party may bring that proceeding only in the United States District Court for the Middle District of Florida or, only if there is no federal subject matter jurisdiction, in Circuit Court of Seminole County, Florida.

21.4 Any information, suggestions or ideas transmitted by Purchaser to Company in connection with performance hereunder are not to be regarded as secret or submitted in confidence except as may be otherwise provided in a writing signed by a duly authorized representative of Purchaser.

21.5 Company shall comply with all state and federal safety and health laws, including but not limited to the Occupational Safety and Health Act of 1970 (OSHA) and all standards, rules, regulations and orders issued pursuant to such state and federal safety and health laws and laws related to non-segregated facilities and equal employment opportunity.

21.6 This Contract contains the complete agreement between the parties and no modification, amendment, revision, waiver or other change will be binding on Company unless assented to in writing by Company's authorized representative. Any oral or written

representation, warranty, course of dealing or trade usage not contained or referenced herein will not be binding on Company.

21.7 Purchaser shall obtain and pay for all necessary permits for the work to be done and shall hold company harmless from any liability for work done without said permits.

21.8 Should any term or provisions of this Contract be held invalid, illegal, or unenforceable, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby and such provision shall be ineffective only to the extent of such invalidity, illegality, or unenforceability.

INITIALS: COMPANY _____
PURCHASER _____

CL2:459754_v6
Revised February 2, 2025



A Member of the Professional Electrical Services and Management, L.L.C. (PESM) Team

Mathew Robinson

Senior Estimator

Mobile: 717-451-6179

www.ib-abel.com

Date: 12/3/25

Due Date-12/15/25

Proposal #: tjpesmprot dgs hb cap complex cup 12 3 25

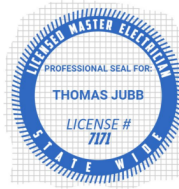
Project: 25-2216 - DGS Central Plant Upgrades

Thank you for allowing us the opportunity to service you and your team. Our team has over 65 years of providing quality electrical related services to commercial, educational, institutional, mission critical data centers, and industrial buildings, in both the private and government sectors.

We will strive to insure that your electrical systems installation and maintenance, will meet the required specifications, electrical industry recommended and or required codes and standards, (such as NETA, NFPA70A, NFPA70B, NFPA70E, NFPA110, IEEE, NEMA, OSHA, ANSI, ASTM, BOCA, JACHO- as well as local jurisdictional and general insurance requirements). Our solutions are tailored to each specific client/facility. This will assist in minimizing the hazards to **life, property, and equipment for the final owners.**

Based on industry insurance reports, hundreds of millions of dollars are lost, as well as many lives lost and injuries reported, as a direct result of property owners, first-not having a properly tested new electrical system installation and second- owners not implementing a form of a recommended or required code/standard compliant Electrical Risk Management Program (ERMP) program in their facilities.

Please see below your supplied specifications and equipment drawings that reflect the 3rd party independent testing/engineering services that are required for this project. PESM has assembled a plan with multiple options for your review. Please contact us to discuss or if changes are needed. Areas **highlighted in yellow** are either comments from PESM or emphasized information. Items ~~crossed out~~ are to be completed by others.



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Were general testing or NETA type testing is noted in the specs, (unless otherwise noted) it was utilized as the bases for this testing plan. As the spec listed testing of devices that are not shown on the supplied drawings- they are excluded.

I) SPECIFICATIONS and information supplied by client: (as applicable)

SECTION 260513

MEDIUM-VOLTAGE CABLES

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.

b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.

2. Test results that comply with requirements.

3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

3.8 FIELD QUALITY CONTROL

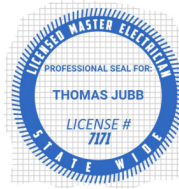
A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal.

a. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of



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reducing natural ground resistance.

b. Perform tests by the fall-of-potential method according to IEEE 81.

4. Provide drawings locating each ground rod/plate and ground rod/plate assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods/plates driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

a. Equipment Rated 500 kVA and Less: 10 ohms.

b. Equipment Rated 500 to 1000 kVA: 5 ohms.

c. Equipment Rated More Than 1000 kVA: 3 ohms.

d. Equipment Rated More Than 600V/GND: 3 ohms.

SECTION 260543

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL AND TELECOMMUNICATION SYSTEMS

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

SECTION 261116

SECONDARY UNIT SUBSTATIONS WITH SWITCHGEAR SECONDARY

3.6 FIELD QUALITY CONTROL

A. General Field Testing Requirements:

1. Comply with provisions of NFPA 70B, "Testing and Test Methods" Chapter.

2. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

3. After installing secondary unit substation but before primary is energized, verify that grounding system at substation is tested at specified value or less.

4. After installing secondary unit substation and after electrical circuitry has been energized, test for compliance with requirements.

5. Visual and Mechanical Inspection:

a. Verify equipment nameplate data complies with Contract Documents.

b. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

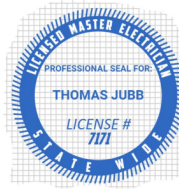
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

7. Prepare test and inspection reports. Record as-left set points of all adjustable devices.

B. Switchgear Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.



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- b. Inspect anchorage, alignment, grounding, and required area clearances.
- c. Verify unit is clean and shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.
- d. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study as well as to address of circuit breaker that is used to identify it in microprocessor-communication software.
- e. Verify that current and voltage-transformer ratios correspond to Drawings.
- f. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
 - 1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
 - 2) Make key exchange with devices operated in off-normal positions.
- g. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- h. Inspect insulators for evidence of physical damage or contaminated surfaces.
- i. Verify correct barrier and shutter installation and operation.
- j. Exercise all active components.
- k. Inspect mechanical indicating devices for correct operation.
- l. Verify that filters are in place and vents are clear.
- m. Inspect control power transformers as follows:
 - 1) Inspect for physical damage, cracked insulation, broken leads, connection tightness, defective wiring, and overall general condition.
 - 2) Verify that primary- and secondary-fuse or circuit-breaker ratings match Drawings and comply with manufacturer's recommendations.
 - 3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.
- 2. Electrical Tests:
 - a. Perform dc voltage insulation-resistance tests on each bus section, phase-to phase and phase-to-ground, for one minute. If temperature of bus is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.
 - 1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.
 - 2) Do not proceed to dielectric-withstand-voltage tests until insulation resistance levels are raised above minimum values.
 - b. Perform a dielectric-withstand-voltage test on each bus section, each phase-to ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.
 - 1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric-withstand-voltage test, test specimen is considered to have passed test.
 - c. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for



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600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's recommendation.

1) Minimum insulation-resistance values of control wiring must not be less than 2 megohms.

d. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at all devices.

2) Verify secondary voltages by energizing primary winding with system voltage.

e. Perform current-injection tests on entire current circuit in each section of switchgear.

1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 A flows in secondary circuit. Verify correct magnitude of current at each device in circuit.

2) Perform current tests by primary injection with magnitudes such that a minimum of 1.0 A flows in secondary circuit. Verify correct magnitude of current at each device in circuit.

f. Verify operation of space heaters.

g. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from each source.

C. Medium-Voltage Surge Arrester Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, grounding, and clearances.

c. Verify arresters are clean.

d. Verify that ground lead on each device is individually attached to a ground bus or ground electrode.

e. Verify that stroke counter is correctly mounted and electrically connected if applicable. Record stroke counter reading.

2. Electrical Test:

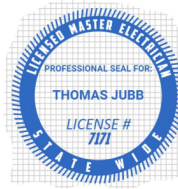
a. Perform an insulation-resistance test on each arrester, phase terminal-to-ground. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to meet recommended minimum insulation resistance listed in table.

b. Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.

3. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than this table or manufacturer's recommendations. Dielectric-withstand-voltage tests must not proceed until insulation-resistance levels are raised above minimum values.

b. Perform a contact/pole-resistance test. Compare bolted connection resistance



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values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of lowest value. Microhm or dc millivolt drop values must not exceed high levels of normal range as indicated in manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

c. Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.

d. Verify correct operation of any auxiliary features, such as electrical close and trip operation, trip-free operation, and anti-pump function. Auxiliary features must operate in accordance with manufacturer's published data.

e. Trip circuit breaker by operation of each protective device. Reset all trip logs and indicators.

f. Perform power-factor or dissipation-factor tests on each pole with breaker open and each phase with breaker closed. Power-factor or dissipation-factor values must meet manufacturer's published data.

g. Perform vacuum bottle integrity (dielectric-withstand-voltage) test across each vacuum bottle, with contacts in "open" position in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by end of total time of voltage application during vacuum bottle integrity test, test specimen is considered to have passed test.

h. Perform a dielectric-withstand-voltage test in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric-withstand-voltage test, test specimen is considered to have passed test.

i. Verify operation of heaters.

D. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Verify correct connection of transformers with system requirements.

c. Verify that adequate clearances exist between primary and secondary circuit wiring.

d. Verify unit is clean.

e. Verify that required grounding and shorting connections provide contact.

f. Verify correct operation of transformer withdrawal mechanism and grounding operation.

g. Verify correct primary- and secondary-fuse sizes for voltage transformers.

h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:

a. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, comply with manufacturer's recommendations. Insulation-resistance values of instrument transformers must not be less than values shown in NETA ATS, Table 100.5.

b. Perform a polarity test of each current transformer in accordance with



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IEEE C57.13.1. Polarity results must agree with transformer markings.

c. Perform a ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must comply with IEEE C57.13.

d. Perform an excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or must comply with IEEE C57.13.1.

e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. The measured burdens must match instrument transformer Accuracy Class rating.

f. Perform dielectric-withstand-voltage tests on primary winding with secondary grounded. Test voltages must comply with NETA ATS, Table 100.9. If no evidence of distress or insulation failure is observed by end of total time of voltage application, primary winding is considered to have passed test.

g. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with test equipment manufacturer's published data.

h. Verify that current-transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3.

3. Electrical Tests of Voltage and Potential Transformers:

a. Perform insulation-resistance tests winding-to-winding and each winding-toground. Apply test voltage for one minute in accordance with NETA ATS, Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's recommendations. Insulation-resistance values of instrument transformers must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.5.

b. Perform insulation-resistance tests winding-to-winding and each winding-toground. Test voltages must be applied for one minute in accordance with NETA ATS, Table 100.5. Insulation-resistance values of transformers must not be less than values shown in NETA ATS, Table 100.5.

c. Perform a polarity test on each transformer to verify polarity marks or H(1)-X(1) relationship. Polarity results must agree with transformer markings.

d. Perform a turns-ratio test on all tap positions. Ratio errors must not exceed tolerances specified in IEEE C57.13.

e. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to instrument transformer ratings. The measured burdens must match instrument transformer Accuracy Class rating.

f. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with test equipment manufacturer's published data.

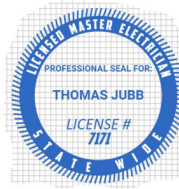
g. Verify that voltage-transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3.

E. Dry-Type Transformer Section Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, and grounding.



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- c. Verify that resilient mounts are free and that any shipping brackets have been removed.
- d. Verify unit is clean.
- e. Verify that alarm, control, and trip settings on temperature and level indicators are set and operate within manufacturer's recommended settings.
- f. Verify that cooling fans operate and that fan motors have correct overcurrent protection.
- g. Perform specific inspections and mechanical tests recommended by manufacturer.
- h. Verify that as-left tap connections are as specified.
- i. Verify presence of surge arresters and that their ratings are as specified.
- 2. Electrical Tests:
 - a. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index; value of index must not be less than 1.0.
 - b. Perform power-factor or dissipation-factor tests on windings in accordance with test equipment manufacturer's published data. Investigate and correct power-factor values that exceed:
 - 1) 2.0 percent for power transformers.
 - 2) 5.0 percent for distribution transformers.
 - c. Measure core insulation resistance at 500 V(dc) if core is insulated and core ground strap is removable. Core insulation-resistance values must not be less than 1 megohm at 500 V(dc).
 - d. Perform a power-factor or dissipation-factor tip-up test on windings greater than 2.5 kV. Tip-up test result exceeding 1.0 percent must be investigated.
 - e. Perform turns-ratio tests at all tap positions. The test results must not deviate by more than one-half percent from either adjacent coils or calculated ratio. If test fails, replace transformer.
 - f. Perform an excitation-current test on each phase. The typical excitation-current test data pattern for a three-legged core transformer is two similar current readings and one lower current reading. Investigate and correct if test shows a different pattern.
 - g. Measure resistance of each winding at each tap connection.
 - h. Perform an applied-voltage test on all primary and secondary windings-to-ground. See IEEE C57.12.91, Sections 10.2 and 10.9. The ac dielectric-withstand-voltage test result must not exceed 75 percent of factory test voltage for one-minute duration. The dc dielectric-withstand-voltage test result must not exceed 100 percent of ac RMS test voltage specified in IEEE C57.12.91, Section 10.2, for one minute duration. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric-withstand-voltage test, test specimen is considered to have passed test.
 - i. Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.
- F. Low-Voltage Power Circuit-Breaker Field Tests:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, and grounding.
 - c. Verify that all maintenance devices are available for servicing and operating



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breaker.

d. Verify unit is clean.

e. Verify that arc chutes are intact.

f. Inspect moving and stationary contacts for condition and alignment.

g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.

h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.

i. Verify cell fit and element alignment.

j. Verify racking mechanism operation.

k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

l. Perform adjustments for final protective-device settings in accordance with coordination study provided by end user.

m. Record as-found and as-left operation counter readings.

2. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations must be investigated.

b. Measure contact resistance across each power contact of circuit breaker. Microhm or dc millivolt drop values must not exceed high levels of normal range as indicated in manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic must not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are not available, trip times must not exceed value shown in NETA ATS, Table 100.7.

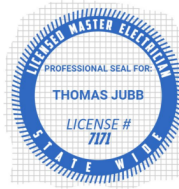
d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic must not exceed manufacturer's published time-current tolerance band.

e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic must not exceed manufacturer's published time-current tolerance band.

f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.

g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.

h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and



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close coils must conform to manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.

i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.

j. Verify correct operation of any auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, anti-pump function, and trip unit battery condition. Reset trip logs and indicators.

Auxiliary features must operate in accordance with manufacturer's published data.

k. Verify operation of charging mechanism. The charging mechanism must operate in accordance with manufacturer's published data.

G. Metering Device Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

c. Verify unit is clean.

d. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.

b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.

c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specification

d. Verify that current-transformer and voltage-transformer secondary circuits are intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

H. Nonconforming Work:

1. Equipment will be considered defective if it does not pass tests and inspections.

2. Remove and replace defective units and retest.

I. Prepare test and inspection reports.

4. Report:

a. Prepare a written report covering monitoring performed and corrective action taken.

b. For each relay and adjustable circuit breaker, tag device with adjusting technician's initials and date of adjustment. Record settings and file with test records specified in "Field Quality Control" Article.

B. Infrared Inspection and Adjusting: Perform survey during periods of maximum possible loading. Remove all necessary covers prior to inspection.

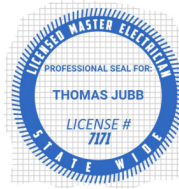
1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of electrical power connections of unit substation.

2. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchgear 11 months after date of Substantial Completion.

3. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1.8 deg F (1 deg C) at 104 deg F (30 deg C).

4. Record of Infrared Inspection: Prepare a certified report that identifies testing technician and equipment used, and lists the following results:

a. Description of equipment to be tested.



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- b. Discrepancies.
- c. Temperature difference between area of concern and reference area.
- d. Probable cause of temperature difference.
- e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
- f. Identify load conditions at time of inspection.
- g. Provide photographs and thermograms of deficient area.
- 5. Act on inspection results in accordance with recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Client Agency's operations permit.

SECTION 261323

MEDIUM-VOLTAGE SWITCHGEAR

3.5 FIELD QUALITY CONTROL

A. General Field Testing Requirements:

- 1. Comply with the provisions of NFPA 70B, "Testing and Test Methods."
- 2. After installing switchgear and after electrical circuitry has been energized, test for compliance with requirements.
- 3. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

B. Medium-Voltage Switchgear Assembly Field Tests:

1. Visual and Mechanical Inspection:

- a. Verify that fuse and switch sizes and types correspond to Drawings and coordination study, as well as to the switch's address in the control network.
- b. Verify that current and voltage transformer ratios correspond to Drawings.
- c. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
- d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
 - 1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
 - 2) Make key exchange with devices operated in off-normal positions.
- e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- f. Inspect insulators for evidence of physical damage or contaminated surfaces.
- g. Verify correct barrier and shutter installation and operation.
- h. Exercise active components.
- i. Inspect mechanical indicating devices for correct operation.
- j. Verify that filters are in place and vents are clear.
- k. Perform visual and mechanical inspection of instrument transformers in accordance with Article "Instrument Transformer Field Tests."
- l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or switch ratings match drawings.



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3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.

2. Electrical Tests:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Perform dc voltage insulation-resistance tests on each bus section, phase to phase and phase to ground, for one minute. If the temperature of the bus is other than plus or minus 20 deg C, adjust the resulting resistance as provided in NETA ATS, Table 100.11.

1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.

2) Do not proceed to the dielectric withstand voltage tests until insulation resistance levels are raised above minimum values.

c. Perform a dielectric withstand voltage test on each bus section, each phase to ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply the test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.

d. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate the applied voltage, follow the manufacturer's recommendation.

1) Minimum insulation-resistance values of control wiring must not be less than two megohms.

e. Control Power Transformers:

1) Perform insulation-resistance tests. Perform measurements from winding to winding and each winding to ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.

2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to a rated secondary voltage source. Verify correct potential at all devices.

3) Verify correct secondary voltage by energizing the primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected.

4) Verify correct function of control transfer relays located in the switchgear with multiple control power sources.



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f. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at all devices.

2) Verify secondary voltages by energizing the primary winding with system voltage.

g. Perform current-injection tests on the entire current circuit in each section of switchgear.

1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.

2) Perform current tests by primary injection with magnitudes such that a minimum of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.

h. Perform system function tests in accordance with "System Function Tests" Article.

i. Verify operation of space heaters.

j. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from each source.

3. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Insulation resistance values must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than this

table or manufacturer's recommendations. Dielectric-withstand-voltage tests must not proceed until insulation-resistance levels are raised above minimum values.

b. Perform a contact/pole-resistance test. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value. Microhm or dc millivolt drop values must not exceed the high levels of the normal range in accordance with manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

c. Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the trip and close coils must comply with manufacturer's published data. In the absence of the manufacturer's published data, comply with NETA ATS, Table 100.20.

d. Verify correct operation of any auxiliary features, such as electrical close and trip operation, trip-free operation, and anti-pump function. Auxiliary features must operate in accordance with manufacturer's published data.

e. Trip switch by operation of each protective device. Reset trip logs and indicators.

f. Perform power-factor or dissipation-factor tests on each pole with the switch open and each phase with the switch closed. Power-factor or dissipation-factor values must comply with manufacturer's published data.

g. Perform vacuum bottle integrity (dielectric-withstand-voltage) test across each vacuum bottle, with the contacts in the "open" position in accordance with manufacturer's published data. If no evidence of distress or insulation failure is



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observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.

h. Perform a dielectric-withstand-voltage test in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric-withstand-voltage test, the test specimen is considered to have passed the test.

i. Verify operation of heaters.

C. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.

b. Inspect physical and mechanical condition.

c. Verify correct connection of transformers with system requirements.

d. Verify that adequate clearances exist between primary and secondary circuit wiring.

e. Verify the unit is clean.

f. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.

Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

g. Verify that required grounding and shorting connections provide contact.

h. Verify correct operation of transformer withdrawal mechanism and grounding operation.

i. Verify correct primary and secondary fuse sizes for voltage transformers.

j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000 V(dc) for one minute. For units with solid state components that cannot tolerate the applied voltage, follow manufacturer's written recommendations. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.5.

c. Perform a polarity test of each current transformer in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.

d. Perform a ratio-verification test using the voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.

e. Perform an excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match the curve supplied by the manufacturer or be in accordance with IEEE C57.13.1.

f. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared with and must match instrument transformer ratings.

g. Perform insulation-resistance tests on the primary winding with the secondary



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grounded. Test voltages must be in accordance with Table 100.5.

h. Perform dielectric withstand tests on the primary winding with the secondary grounded. Test voltages must be in accordance with Table 100.9.

i. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.

j. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by the engineer in the project drawings.

3. Electrical Tests of Voltage Transformers:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Perform insulation-resistance tests winding-to-winding and each winding to ground. Test voltages must be applied for one minute in accordance with Table 100.5. For units with solid-state components that cannot tolerate the applied voltage, follow manufacturer's recommendations. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.5.

c. Perform a polarity test on each transformer to verify the polarity marks or H1- X1 relationship as applicable. Polarity results must agree with transformer markings.

d. Perform a turns-ratio test on all tap positions. Ratio errors must be in accordance with IEEE C57.13.

e. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared with and must match instrument transformer ratings.

f. Perform a dielectric withstand test on the primary windings with the secondary windings connected to ground. The dielectric voltage must be in accordance with Table 100.9. The test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the primary windings are considered to have passed the test.

g. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use test equipment manufacturer's published data.

h. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that the circuits are grounded at only one point.

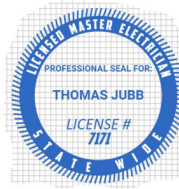
D. Ground Resistance Test:

1. Visual and Mechanical Inspection:

a. Verify ground system complies with the Contract Documents and NFPA 70 Article 250, "Grounding and Bonding."

b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.

c. Inspect bolted electrical connections using a calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.



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Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

d. Inspect anchorage.

2. Electrical Tests:

a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on the main grounding electrode or system. The resistance between the main grounding electrode and ground must be no more than 5 ohms.

b. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 ohms. Compare equipment nameplate data with Contract Documents.

c. Inspect physical and mechanical condition.

d. Inspect bolted electrical connections for high resistance using a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

E. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

d. Verify the unit is clean.

e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

b. Verify accuracy of meters at all cardinal points. Meter accuracy must be in accordance with manufacturer's published data.

c. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.

d. Verify all instrument multipliers. Instrument multipliers must be in accordance with system design specifications.

e. Verify that current transformer and voltage transformer secondary circuits are intact. Test results must confirm the integrity of the secondary circuits of current and voltage transformers.

F. Medium-Voltage Surge Arrester Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.

b. Inspect physical and mechanical condition.

c. Inspect anchorage, alignment, grounding, and clearances.

d. Verify the arresters are clean.

e. Verify that the ground lead on each device is individually attached to a ground bus



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or ground electrode.

f. Verify that the stroke counter is correctly mounted and electrically connected if applicable. Record the stroke counter reading.

2. Electrical Test:

a. Perform an insulation-resistance test on each arrester, phase terminal to ground. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to meet recommended minimum insulation resistance listed in the table.

b. Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.

c. Test grounding connections. Resistance between the arrester ground terminal and the ground system must be less than 0.5 ohm.

G. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.

b. Verify operation of light-emitting diodes, display, and targets.

c. Record passwords for each access level.

d. Clean the front panel and remove foreign material from the case.

e. Check tightness of connections.

f. Verify that the frame is grounded in accordance with manufacturer's instructions.

g. Set the relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."

h. Download settings from the relay. Print a copy of the settings for the report and compare the settings to those specified in the coordination study.

2. Electrical Tests:

a. Perform insulation-resistance tests from each circuit to the grounded frame in accordance with manufacturer's published data.

b. Apply voltage or current to analog inputs, and verify correct registration of the relay meter functions.

c. Functional Operation: Check functional operation of each element used in the protection scheme as follows:

1) Timing Relay:

a) Determine time delay.

b) Verify operation of instantaneous contacts.

2) Volts/Hertz Relay:

a) Determine pickup frequency at rated voltage.

b) Determine pickup frequency at a second voltage level.

c) Determine time delay.

3) Sync Check Relay:

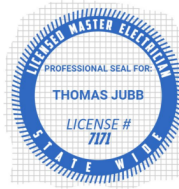
a) Determine closing zone at rated voltage.

b) Determine maximum voltage differential that permits closing at zero degrees.

c) Determine live line, live bus, dead line, and dead bus set points.

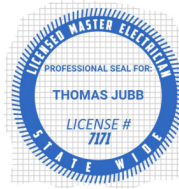
d) Determine time delay.

e) Verify dead bus/live line, dead line/live bus, and dead bus/dead line control functions.



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- 4) Undervoltage Relay:
 - a) Determine dropout voltage.
 - b) Determine time delay.
 - c) Determine time delay at a second point on the timing curve for inverse time relays.
- 5) Directional Power Relay:
 - a) Determine minimum pickup at maximum torque angle.
 - b) Determine closing zone.
 - c) Determine maximum torque angle.
 - d) Determine time delay.
 - e) Verify time delay at a second point on the timing curve for inverse time relays.
 - f) Plot the operating characteristic.
- 6) Current Balance Relay:
 - a) Determine pickup of each unit.
 - b) Determine percent slope.
 - c) Determine time delay.
- 7) Negative Sequence Current Relay:
 - a) Determine negative sequence alarm level.
 - b) Determine negative sequence minimum trip level.
 - c) Determine maximum time delay.
 - d) Verify two points on the I-two-squared-t curve.
- 8) Phase Sequence or Phase Balance Voltage Relay:
 - a) Determine positive sequence voltage to close the NO contact.
 - b) Determine positive sequence voltage to open the NC contact (undervoltage trip).
 - c) Verify negative sequence trip.
 - d) Determine time delay to close the NO contact with sudden application of 120 percent of pickup.
 - e) Determine time delay to close the NC contact upon removal of voltage when previously set to rated system voltage.
- 9) Instantaneous Overcurrent Relay:
 - a) Determine pickup.
 - b) Determine dropout.
 - c) Determine time delay.
- 10) Time Overcurrent:
 - a) Determine minimum pickup.
 - b) Determine time delay at two points on the time current curve.
- 11) Ground Detector Relay:
 - a) Determine maximum impedance to ground causing relay pickup.
- 12) Directional Overcurrent Relay:
 - a) Determine directional unit minimum pickup at maximum torque angle.
 - b) Determine closing zone.
 - c) Determine maximum torque angle.
 - d) Plot operating characteristics.
 - e) Determine overcurrent unit pickup.
 - f) Determine overcurrent unit time delay at two points on the time current curve.



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d. Control Verification:

1) Functional Tests:

- a) Check operation of all active digital inputs.
- b) Check output contacts or silicone-controlled rectifiers (SCRs), preferably by operating the controlled device, such as switch, auxiliary relay, or alarm.
- c) Check internal logic functions used in protection scheme.
- d) Upon completion of testing, reset min/max recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.

2) In-Service Monitoring: After the equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.

H. DC System VRLA Batteries Field Test:

1. Visual and Mechanical Inspection:

- a. Verify that batteries are adequately located.
- b. Verify that battery area ventilation system is operable.
- c. Verify existence of suitable eyewash equipment.
- d. Verify equipment nameplate data complies with Contract Documents.
- e. Inspect physical and mechanical condition.
- f. Verify adequacy of battery support racks, mounting, anchorage, alignment, grounding, and clearances.
- g. Verify the units are clean.
- h. Inspect spill containment installation.
- i. Verify application of an oxide inhibitor on battery terminal connections.

2. Electrical Tests:

- a. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended levels.
- b. Verify charger functions and that alarms comply with system manufacturer's recommendations.
- c. Measure negative post temperature. Negative post temperature must comply with manufacturer's published data or IEEE 1188.
- d. Measure charger float and equalizing voltage levels. Charger float and equalizing voltage levels must be in accordance with the battery manufacturer's published data.
- e. Measure each monoblock/cell voltage and total battery voltage with charger energized and in float mode of operation. Monoblock/cell voltages must be in accordance with manufacturer's published data.
- f. Measure intercell connection resistances.
- g. Perform internal ohmic measurement tests. Cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical cells that are in a fully charged state. Monoblock/cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical monoblocks/cells in a fully charged state.
- h. Perform a load test in accordance with manufacturer's published data or IEEE 1188. Replace units that fail to pass the test.
- i. Measure the battery system voltage from positive to ground and negative to ground. Voltage measured from positive to ground must be equal in magnitude to



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the voltage measured from negative to ground.

I. Nonconforming Work:

1. Switchgear will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.
- J. Prepare test and inspection reports. Record as-left set points of adjustable devices.

1. The contractor shall provide three (3) copies of the manufacturer's representative certification.
2. The contractor shall provide three (3) copies of the manufacturer's field startup report.
3. The contractor shall provide three (3) copies of factory test reports.

3.6 SYSTEM FUNCTION TESTS

A. System function tests must prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and all components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
3. Verify the correct operation of sensing devices, alarms, and indicating devices.

3.7 FOLLOW-UP SERVICE

A. Voltage Monitoring and Adjusting: After acceptance by the Department, but not more than six months after acceptance, if requested by the Department or Client Agency, perform the following voltage monitoring:

1. During a period of normal load cycles as evaluated by Client Agency, perform seven days of three-phase voltage recording at the outgoing section of each switchgear. Use voltmeters with calibration traceable to NIST standards and with a chart speed of not less than 1 inch (25 mm) per hour. Voltage unbalance greater than 1 percent between phases, or deviation of phase voltage from the nominal value by more than plus or minus 5 percent during the test period is unacceptable.
2. Corrective Action: If test results are unacceptable, perform the following corrective action, as appropriate:
 - a. Adjust switchgear taps.
 - b. Prepare written request for voltage adjustment by electric utility.
3. Retests: Repeat monitoring, after corrective action has been performed, until specified results are obtained.
4. Report:
 - a. Prepare a written report covering monitoring performed and corrective action taken.

B. Infrared Inspection: Perform the survey during periods of maximum possible loading. Remove covers prior to the inspection.

1. After acceptance by the Department, but not more than 60 days after acceptance, perform infrared inspection of the electrical power connections of the switchgear.
2. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1deg C at 86 deg F (30 deg C).
3. Record of Infrared Inspection: Prepare a certified report that identifies the testing technician and equipment used and lists the results as follows:
 - a. Description of equipment to be tested.
 - b. Discrepancies.



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- c. Temperature difference between the area of concern and the reference area.
- d. Probable cause of temperature difference.
- e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
- f. Identify load conditions at time of inspection.
- g. Provide photographs and thermograms of the deficient area.
- 4. Act on inspection results in accordance with the recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Client Agency's operations permit

SECTION 262200

LOW VOLTAGE TRANSFORMERS

3.3 FIELD QUALITY CONTROL

- A. Engage a qualified electrical testing and inspecting agency to administer and perform tests and inspections specified within this section, with the assistance of a factory authorized service representative.
- B. Test Objectives: To ensure transformer is operational within industry and manufacturer's tolerances, is installed according to the Contract Documents, and is suitable for energizing.
- C. Test Labeling: On satisfactory completion of tests for each transformer, attach a dated and signed "Satisfactory Test" label to tested component.
- D. Schedule tests and provide notification at least 7 days in advance of test commencement.
- E. Report: Submit a written report of observations and tests. Report defective materials and installation.
- F. Tests: Include the following minimum inspections and tests according to manufacturer's written instructions. Comply with IEEE C57.12.91 for test methods and data correction factors.
 - 1. Inspect accessible components for cleanliness, mechanical and electrical integrity, and damage or deterioration. Verify that temporary shipping bracing has been removed. Include internal inspection through access panels and covers.
 - 2. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, if not available, those specified in UL 486A and UL 486B.
 - 3. Insulation Resistance: Perform megohmmeter tests of primary and secondary winding to winding and winding to ground.
 - a. Minimum Test Voltage: 1000 V, dc.
 - b. Minimum Insulation Resistance: 500 megohms.
 - c. Duration of Each Test: 10 minutes.
 - d. Temperature Correction: Correct results for test temperature deviation from 20 deg C standard.

SECTION 262300

LOW-VOLTAGE SWITCHGEAR

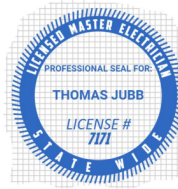
3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Comply with provisions of "Testing and Test Methods" Chapter in NFPA 70B and NETA ATS.
 - 2. After installing switchgear and after electrical circuitry has been energized, test for compliance with requirements.
 - 3. Perform visual and mechanical inspections and electrical tests stated in NETA ATS. Certify compliance with test parameters.
 - 4. Visual and Mechanical Inspection:



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- a. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study, as well as to circuit breakers address in control network.
- b. Verify that current and voltage transformer ratios correspond to Drawings.
- c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.
- d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
 - 1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
 - 2) Make key exchange with devices operated in off-normal positions.
- e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- f. Inspect insulators for evidence of physical damage or contaminated surfaces.
- g. Verify correct barrier and shutter installation and operation.
- h. Exercise active components.
- i. Inspect mechanical indicating devices for correct operation.
- j. Verify that filters are in place and that vents are clear.
- k. Perform visual and mechanical inspection of instrument transformers in accordance with "Instrument Transformer Field Tests" Paragraph.
- l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
 - 3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.
5. Electrical Tests:
 - a. Perform DC voltage insulation-resistance tests on bus sections, phase-to-phase and phase-to-ground, for one minute. If bus temperature is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.
 - 1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.
 - 2) Do not proceed to dielectric withstand voltage tests until insulation resistance levels are raised above minimum values.
 - b. Perform dielectric withstand voltage test on bus sections, phase-to-ground with phases not under test grounded, in accordance with manufacturer's published



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data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, test specimen is considered to have passed test.

c. Perform insulation-resistance tests on control wiring for ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's published instruction.

1) Minimum insulation-resistance values of control wiring may not be less than 2 MΩ.

d. Control Power Transformers:

1) Perform insulation-resistance tests. Perform measurements from winding-to winding and windings-to-ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.

2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to rated secondary voltage source. Verify correct potential at devices.

3) Verify correct secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with secondary wiring disconnected.

4) Verify correct function of control transfer relays located in switchgear with multiple control power sources.

e. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at devices.

2) Verify secondary voltages by energizing primary winding with system voltage.

f. Perform current-injection tests on entire current circuit in switchgear sections.

1) Perform current tests by secondary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.

2) Perform current tests by primary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.

g. Perform system function tests in accordance with "System Function Tests" Paragraph.

h. Verify operation of space heaters.

i. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from sources.

B. Circuit-Breaker Field Tests:

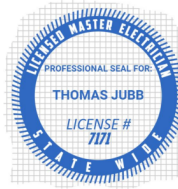
1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, and grounding.

c. Verify that maintenance devices are available for servicing and operating breaker.

d. Verify unit is clean.



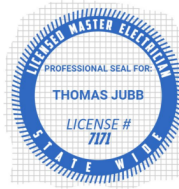
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- e. Verify that arc chutes are intact.
 - f. Inspect moving and stationary contacts for condition and alignment.
 - g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.
 - h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.
 - i. Verify cell fit and element alignment.
 - j. Verify racking mechanism operation.
 - k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - l. Perform adjustments for final protective-device settings in accordance with coordination study provided by Client Agency.
 - m. Record as-found and as-left operation counter readings.
2. Electrical Tests:
- a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across open poles. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than Table 100.1 or manufacturer's published instructions must be investigated.
 - b. Measure contact resistance across power contacts of circuit breakers. Drop values for $\mu\Omega$ or mV(dc) may not exceed high levels of normal range as indicated in manufacturer's published data. In absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
 - c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are unavailable, trip times may not exceed value shown in NETA ATS, Table 100.7.
 - d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
 - e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
 - f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.
 - g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.
 - h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.



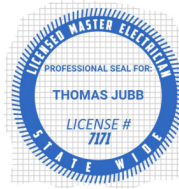
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- i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
 - j. Verify correct operation of auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, ant pump function, and trip-unit battery condition. Reset trip logs and indicators. Auxiliary features must operate in accordance with manufacturer's published data.
 - k. Verify operation of charging mechanism. Charging mechanism must operate in accordance with manufacturer's published data.
- C. Instrument Transformer Field Tests:
- 1. Visual and Mechanical Inspection:
 - a. Verify that equipment nameplate data complies with Contract Documents.
 - b. Inspect physical and mechanical condition.
 - c. Verify correct connection of transformers with system requirements.
 - d. Verify that adequate clearances exist between primary and secondary circuit wiring.
 - e. Verify that unit is clean.
 - f. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.
 - g. Verify that required grounding and shorting connections provide contact.
 - h. Verify correct operation of transformer withdrawal mechanism and grounding operation.
 - i. Verify correct primary and secondary fuse sizes for voltage transformers.
 - j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - 2. Electrical Tests of Current Transformers:
 - a. Perform insulation-resistance test of current transformers and secondary wiring for ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
 - b. Perform polarity test on current transformers in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.
 - c. Perform ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.
 - d. Perform excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or be in accordance with IEEE C57.13.1.
 - e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared to, and must match, instrument transformer ratings.



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- f. Perform insulation-resistance tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.5.
 - g. Perform dielectric withstand tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.9.
 - h. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
 - i. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by Engineer in Project Drawings.
3. Electrical Tests of Voltage Transformers:
- a. Perform insulation-resistance tests, winding-to-winding and windings-to-ground. Test voltages must be applied for one minute in accordance with NETA ATS Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
 - b. Perform polarity test on transformers to verify polarity marks or H1-X1 relationship as applicable. Polarity results must agree with transformer markings.
 - c. Perform turns-ratio test on tap positions. Ratio errors must be in accordance with IEEE C57.13.
 - d. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to, and must match, instrument transformer ratings.
 - e. Perform dielectric withstand test on primary windings with secondary windings connected to ground. Dielectric voltage must be in accordance with NETA ATS, Table 100.9. Test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, primary windings are considered to have passed test.
 - f. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use test equipment manufacturer's published data.
 - g. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that circuits are grounded at only one point.
- D. Ground-Resistance Test:
1. Visual and Mechanical Inspection:
- a. Verify that ground system complies with Contract Documents and with Article 250, "Grounding and Bonding," in NFPA 70.
 - b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.
 - c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or



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NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Inspect anchorage.

2. Electrical Tests:

a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on main grounding electrode or system. Resistance between main grounding electrode and ground must be no more than 5 Ω .

b. Perform point-to-point tests to determine resistance between main grounding system and major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 Ω . Compare equipment nameplate data with the Contract Documents.

c. Inspect physical and mechanical condition.

d. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

E. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

d. Verify that unit is clean.

e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.

b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.

c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specifications.

d. Verify that current transformer and voltage transformer secondary circuits are



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intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

F. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

- a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.
- b. Verify operation of LEDs, display, and targets.
- c. Record passwords for each access level.
- d. Clean front panel and remove foreign material from case.
- e. Check tightness of connections.
- f. Verify that frame is grounded in accordance with manufacturer's published instructions.
- g. Set relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."
- h. Download settings from relay. Print copy of settings for report and compare settings to those specified in coordination study.

2. Electrical Tests:

- a. Perform insulation-resistance tests from circuits to grounded frame in accordance with manufacturer's published data.
- b. Apply voltage or current to analog inputs, and verify correct registration of relay meter functions.
- c. Check functional operation of elements used in protection scheme as follows:
 - 1) ANSI No. 2/62, Timing Relay:
 - a) Determine time delay.
 - b) Verify operation of instantaneous contacts.
 - 2) ANSI No. 24, Volts/Hertz Relay:
 - a) Determine pickup frequency at rated voltage.
 - b) Determine pickup frequency at second voltage level.
 - c) Determine time delay.
 - 3) ANSI No. 25, Sync Check Relay:
 - a) Determine closing zone at rated voltage.
 - b) Determine maximum voltage differential that permits closing at zero degrees.
 - c) Determine set points of live line, live bus, dead line, and dead bus.
 - d) Determine time delay.
 - e) Verify control functions of dead bus/live line, dead line/live bus, and dead bus/dead line.
 - 4) ANSI No. 27, Undervoltage Relay:
 - a) Determine dropout voltage.
 - b) Determine time delay.
 - c) Determine time delay at second point on timing curve for inverse time relays.
 - 5) ANSI No. 32, Directional Power Relay:
 - a) Determine minimum pickup at maximum torque angle.
 - b) Determine closing zone.
 - c) Determine maximum torque angle.
 - d) Determine time delay.
 - e) Verify time delay at second point on timing curve for inverse time



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relays.

f) Plot operating characteristic.

6) ANSI No. 46, Current Balance Relay:

a) Determine pickup of unit.

b) Determine percent slope.

c) Determine time delay.

7) ANSI No. 46N, Negative Sequence Current Relay:

a) Determine negative sequence alarm level.

b) Determine negative sequence minimum trip level.

c) Determine maximum time delay.

d) Verify two points on I_2T curve.

8) ANSI No. 47, Phase Sequence or Phase Balance Voltage Relay:

a) Determine positive sequence voltage to close N.O. contact.

b) Determine positive sequence voltage to open N.C. contact (undervoltage trip).

c) Verify negative sequence trip.

d) Determine time delay to close N.O. contact with sudden application of 120 percent of pickup.

e) Determine time delay to close N.C. contact on removal of voltage when previously set to rated system voltage.

9) ANSI No. 50, Instantaneous Overcurrent Relay:

a) Determine pickup.

b) Determine dropout.

c) Determine time delay.

10) ANSI No. 51, Time Overcurrent:

a) Determine minimum pickup.

b) Determine time delay at two points on time current curve.

11) ANSI No. 64, Ground Detector Relay:

a) Determine maximum impedance to ground causing relay pickup.

12) ANSI No. 67, Directional Overcurrent Relay:

a) Determine directional unit minimum pickup at maximum torque angle.

b) Determine closing zone.

c) Determine maximum torque angle.

d) Plot operating characteristics.

e) Determine overcurrent unit pickup.

f) Determine overcurrent unit time delay at two points on time current curve.

13) ANSI No. 87, Differential Relay:

a) Determine operating unit pickup.

b) Determine operation of restraint unit.

c) Determine slope.

d) Determine harmonic restraint.

e) Determine instantaneous pickup.

d. Control Verification:

1) Functional Tests:

a) Check operation of active digital inputs.

b) Check output contacts or SCRs, preferably by operating controlled device, such as circuit breaker, auxiliary relay, or alarm.



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- c) Check internal logic functions used in protection scheme.
- d) On completion of testing, reset minimum/maximum recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.
- 2) In-Service Monitoring: After equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.
- G. Ground-Fault Protection Field Tests: Evaluate interconnected system in accordance with switchgear manufacturer's published instructions.
 - 1. Determine proper location of sensors around bus of circuit to be protected. This determination may be done visually, with knowledge of which bus is involved.
 - 2. Verify grounding points of system to determine that ground paths do not exist that would bypass sensors. Use high-voltage testers and resistance bridges.
 - 3. Test installed system for correct response by application of full-scale current into equipment to duplicate ground-fault condition, or by equivalent means such as by simulated fault current generated by the following:
 - a. A coil around sensors
 - b. A separate test winding in sensors.
 - 4. Record test results on test form provided with instructions provided by manufacturer.
- H. System Function Tests: Perform system function tests after other field quality-control tests have been completed and components have passed specified tests. Verify correct interaction of sensing, processing, and action devices.
 - 1. Develop test parameters and perform tests for purpose of evaluating performance of integral components and their functioning as complete unit within design requirements and manufacturer's published data.
 - 2. Verify correct operation of interlock safety devices for fail-safe functions in addition to design function.
 - 3. Verify correct operation of sensing devices, alarms, and indicating devices.

SECTION 262413

SWITCHBOARDS

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

- 1. Comply with provisions of "Testing and Test Methods" Chapter in NFPA 70B and NETA ATS.
- 2. After installing switchboard and after electrical circuitry has been energized, test for compliance with requirements.
- 3. Perform visual and mechanical inspections and electrical tests stated in NETA ATS. Certify compliance with test parameters.
- 4. Visual and Mechanical Inspection:
 - a. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study, as well as to circuit breaker's address in control network.
 - b. Verify that current and voltage transformer ratios correspond to Drawings.
 - c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated



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torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.

2) Make key exchange with devices operated in off-normal positions.

e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

f. Inspect insulators for evidence of physical damage or contaminated surfaces.

g. Verify correct barrier and shutter installation and operation.

h. Exercise active components.

i. Inspect mechanical indicating devices for correct operation.

j. Verify that filters are in place and that vents are clear.

k. Perform visual and mechanical inspection of instrument transformers in accordance with "Instrument Transformer Field Tests" Paragraph.

l. Inspect control power transformers.

1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.

2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.

3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.

5. Electrical Tests:

a. Perform DC voltage insulation-resistance tests on bus sections, phase-to-phase and phase-to-ground, for one minute. If bus temperature is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.

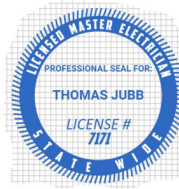
1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.

2) Do not proceed to dielectric withstand voltage tests until insulation-resistance levels are raised above minimum values.

b. Perform dielectric withstand voltage test on bus sections, phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, test specimen is considered to have passed test.

c. Perform insulation-resistance tests on control wiring for ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's published instruction.



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- 1) Minimum insulation-resistance values of control wiring may not be less than 2 MΩ.
- d. Control Power Transformers:
 - 1) Perform insulation-resistance tests. Perform measurements from winding-to winding and windings-to-ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.
 - 2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to rated secondary voltage source. Verify correct potential at devices.
 - 3) Verify correct secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with secondary wiring disconnected.
 - 4) Verify correct function of control transfer relays located in switchboard with multiple control power sources.
- e. Voltage Transformers:
 - 1) Perform secondary wiring integrity test. Verify correct potential at devices.
 - 2) Verify secondary voltages by energizing primary winding with system voltage.
- f. Perform current-injection tests on entire current circuit in switchboard sections.
 - 1) Perform current tests by secondary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.
 - 2) Perform current tests by primary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.
- g. Perform system function tests in accordance with "System Function Tests" Paragraph.
- h. Verify operation of space heaters.
- i. Perform phasing checks on double-ended or dual-source switchboard to ensure correct bus phasing from sources.
- B. Circuit-Breaker Field Tests:
 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, and grounding.
 - c. Verify that maintenance devices are available for servicing and operating breaker.
 - d. Verify unit is clean.
 - e. Verify that arc chutes are intact.
 - f. Inspect moving and stationary contacts for condition and alignment.
 - g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.
 - h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.
 - i. Verify cell fit and element alignment.
 - j. Verify racking mechanism operation.
 - k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - l. Perform adjustments for final protective-device settings in accordance with



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coordination study provided by Client Agency.

m. Record as-found and as-left operation counter readings.

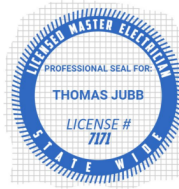
2. Electrical Tests:

- a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across open poles. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than Table 100.1 or manufacturer's published instructions must be investigated.
- b. Measure contact resistance across power contacts of circuit breakers. Drop values for $\mu\Omega$ or mV(dc) may not exceed high levels of normal range as indicated in manufacturer's published data. In absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are unavailable, trip times may not exceed value shown in NETA ATS, Table 100.7.
- d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
- e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
- f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.
- g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.
- h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.
- i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
- j. Verify correct operation of auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, ant pump function, and trip-unit battery condition. Reset trip logs and indicators. Auxiliary features must operate in accordance with manufacturer's published data.
- k. Verify operation of charging mechanism. Charging mechanism must operate in accordance with manufacturer's published data.

C. Instrument Transformer Field Tests:

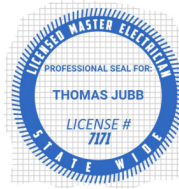
1. Visual and Mechanical Inspection:

- a. Verify that equipment nameplate data complies with Contract Documents.



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- b. Inspect physical and mechanical condition.
- c. Verify correct connection of transformers with system requirements.
- d. Verify that adequate clearances exist between primary and secondary circuit wiring.
- e. Verify that unit is clean.
- f. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.
- g. Verify that required grounding and shorting connections provide contact.
- h. Verify correct operation of transformer withdrawal mechanism and grounding operation.
- i. Verify correct primary and secondary fuse sizes for voltage transformers.
- j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
- 2. Electrical Tests of Current Transformers:
 - a. Perform insulation-resistance test of current transformers and secondary wiring for ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
 - b. Perform polarity test on current transformers in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.
 - c. Perform ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.
 - d. Perform excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or be in accordance with IEEE C57.13.1.
 - e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared to, and must match, instrument transformer ratings.
 - f. Perform insulation-resistance tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.5.
 - g. Perform dielectric withstand tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.9.
 - h. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
 - i. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by Engineer in Project Drawings.
- 3. Electrical Tests of Voltage Transformers:
 - a. Perform insulation-resistance tests, winding-to-winding and windings-to-ground. Test voltages must be applied for one minute in accordance with NETA ATS



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Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.

- b. Perform polarity test on transformers to verify polarity marks or H1-X1 relationship as applicable. Polarity results must agree with transformer markings.
- c. Perform turns-ratio test on tap positions. Ratio errors must be in accordance with IEEE C57.13.
- d. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to, and must match, instrument transformer ratings.
- e. Perform dielectric withstand test on primary windings with secondary windings connected to ground. Dielectric voltage must be in accordance with NETA ATS, Table 100.9. Test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, primary windings are considered to have passed test.
- f. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use test equipment manufacturer's published data.
- g. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that circuits are grounded at only one point.

D. Ground-Resistance Test:

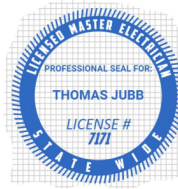
1. Visual and Mechanical Inspection:

- a. Verify that ground system complies with Contract Documents and with Article 250, "Grounding and Bonding," in NFPA 70.
- b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.
- c. Inspect bolted electrical connections for high resistance using one of the following two methods:
 - 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Inspect anchorage.

2. Electrical Tests:

- a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on main grounding electrode or system. Resistance between main grounding electrode and ground must be no more than 5 Ω .
- b. Perform point-to-point tests to determine resistance between main grounding system and major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 Ω . Compare equipment nameplate data with the Contract Documents.
- c. Inspect physical and mechanical condition.



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d. Inspect bolted electrical connections for high resistance using one of the following two methods:

- 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

E. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

- a. Inspect physical and mechanical condition.
- b. Inspect bolted electrical connections for high resistance using one of the following two methods:

- 1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.

d. Verify that unit is clean.

e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

- a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.
- b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.
- c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specifications.
- d. Verify that current transformer and voltage transformer secondary circuits are intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

F. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

- a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.
- c. Record passwords for each access level.
- d. Clean front panel and remove foreign material from case.
- e. Check tightness of connections.
- f. Verify that frame is grounded in accordance with manufacturer's published instructions.
- g. Set relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."



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h. Download settings from relay. Print copy of settings for report and compare settings to those specified in coordination study.

2. Electrical Tests:

a. Perform insulation-resistance tests from circuits to grounded frame in accordance with manufacturer's published data.

b. Apply voltage or current to analog inputs, and verify correct registration of relay meter functions.

c. Check functional operation of elements used in protection scheme as follows:

1) ANSI No. 2/62, Timing Relay:

a) Determine time delay.

b) Verify operation of instantaneous contacts.

2) ANSI No. 24, Volts/Hertz Relay:

a) Determine pickup frequency at rated voltage.

b) Determine pickup frequency at second voltage level.

c) Determine time delay.

3) ANSI No. 25, Sync Check Relay:

a) Determine closing zone at rated voltage.

b) Determine maximum voltage differential that permits closing at zero degrees.

c) Determine set points of live line, live bus, dead line, and dead bus.

d) Determine time delay.

e) Verify control functions of dead bus/live line, dead line/live bus, and dead bus/dead line.

4) ANSI No. 27, Undervoltage Relay:

a) Determine dropout voltage.

b) Determine time delay.

c) Determine time delay at second point on timing curve for inverse time relays.

5) ANSI No. 32, Directional Power Relay:

a) Determine minimum pickup at maximum torque angle.

b) Determine closing zone.

c) Determine maximum torque angle.

d) Determine time delay.

e) Verify time delay at second point on timing curve for inverse time relays.

Plot operating characteristic.

6) ANSI No. 46, Current Balance Relay:

a) Determine pickup of unit.

b) Determine percent slope.

c) Determine time delay.

7) ANSI No. 46N, Negative Sequence Current Relay:

a) Determine negative sequence alarm level.

b) Determine negative sequence minimum trip level.

c) Determine maximum time delay.

d) Verify two points on I_2T curve.

8) ANSI No. 47, Phase Sequence or Phase Balance Voltage Relay:

a) Determine positive sequence voltage to close N.O. contact.

b) Determine positive sequence voltage to open N.C. contact



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(undervoltage trip).

c) Verify negative sequence trip.

d) Determine time delay to close N.O. contact with sudden application of 120 percent of pickup.

e) Determine time delay to close N.C. contact on removal of voltage when previously set to rated system voltage.

9) ANSI No. 50, Instantaneous Overcurrent Relay:

a) Determine pickup.

b) Determine dropout.

c) Determine time delay.

10) ANSI No. 51, Time Overcurrent:

a) Determine minimum pickup.

b) Determine time delay at two points on time current curve.

11) ANSI No. 64, Ground Detector Relay:

a) Determine maximum impedance to ground causing relay pickup.

12) ANSI No. 67, Directional Overcurrent Relay:

a) Determine directional unit minimum pickup at maximum torque angle.

b) Determine closing zone.

c) Determine maximum torque angle.

d) Plot operating characteristics.

e) Determine overcurrent unit pickup.

f) Determine overcurrent unit time delay at two points on time current curve.

13) ANSI No. 87, Differential Relay:

a) Determine operating unit pickup.

b) Determine operation of restraint unit.

c) Determine slope.

d) Determine harmonic restraint.

e) Determine instantaneous pickup.

d. Control Verification:

1) Functional Tests:

a) Check operation of active digital inputs.

b) Check output contacts or SCRs, preferably by operating controlled device, such as circuit breaker, auxiliary relay, or alarm.

c) Check internal logic functions used in protection scheme.

d) On completion of testing, reset minimum/maximum recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.

2) In-Service Monitoring: After equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.

G. Ground-Fault Protection Field Tests: Evaluate interconnected system in accordance with switchboard manufacturer's published instructions.

1. Determine proper location of sensors around bus of circuit to be protected. This determination may be done visually, with knowledge of which bus is involved.

2. Verify grounding points of system to determine that ground paths do not exist that would bypass sensors. Use high-voltage testers and resistance bridges.

3. Test installed system for correct response by application of full-scale current into equipment to duplicate ground-fault condition, or by equivalent means such as by



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simulated fault current generated by the following:

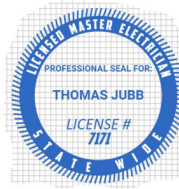
- a. A coil around sensors.
- b. A separate test winding in sensors.
4. Record test results on test form provided with instructions provided by manufacturer.
- H. System Function Tests: Perform system function tests after other field quality-control tests have been completed and components have passed specified tests. Verify correct interaction of sensing, processing, and action devices.
 1. Develop test parameters and perform tests for purpose of evaluating performance of integral components and their functioning as complete unit within design requirements and manufacturer's published data.
 2. Verify correct operation of interlock safety devices for fail-safe functions in addition to design function.
 3. Verify correct operation of sensing devices, alarms, and indicating devices.
- I. Nonconforming Work:
 1. Switchboard components will be considered defective if they do not pass tests and inspections.
 2. Remove and replace defective units and retest.
- J. Collect, assemble, and submit test and inspection reports. Record as-left set points of adjustable devices.
- B. Infrared Inspection: Perform survey during periods of maximum possible loading. Remove covers prior to inspection.
 1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of electrical power connections of switchboard.
 2. Instrument: Inspect distribution systems with imaging equipment capable of detecting minimum temperature difference of 1 deg C at 30 deg C.
 3. Record of Infrared Inspection: Prepare certified report that identifies testing technician and equipment used and that lists results as follows:
 - a. Description of equipment to be tested.
 - b. Discrepancies.
 - c. Temperature difference between area of concern and reference area.
 - d. Probable cause of temperature difference.
 - e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
 - f. Identify load conditions at time of inspection.
 - g. Provide photographs and thermograms of deficient area.
 4. Act on inspection results in accordance with recommendations in NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Client Agency's operations permit. Retest until deficiencies are corrected.
 5. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of switches 11 months after date of Substantial Completion.

SECTION 262416

PANELBOARDS

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.



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C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After acceptance by the Department, but not more than 60 days after acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of acceptance by the Department.
- c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

SECTION 262500

ENCLOSED BUS ASSEMBLIES

3.2 FIELD QUALITY CONTROL

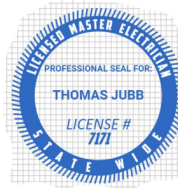
- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Remove and replace units that do not pass tests and inspections and retest as specified above.
- D. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of bus assembly including joints and plug-in units.
 1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
 2. Perform 2 follow-up infrared scans of bus assembly, one at 4 months and the other at 11 months after Substantial Completion.
 3. Prepare a certified report identifying bus assembly checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.
- E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
 2. Test continuity of each line- and load-side circuit.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated



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in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

SECTION 262913

ENCLOSED CONTROLLERS

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports: Retain first two paragraphs below to describe tests and inspections to be performed.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.

2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.

3. Test continuity of each circuit.

4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Using Agency before starting the motor(s).

5. Test each motor for proper phase rotation.

6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each multi-pole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.

b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multi-pole enclosed controller 11 months after date of Substantial Completion.

c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed controllers will be considered defective if they do not pass tests and inspections.

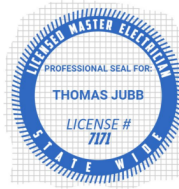
E. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

SECTION 262923

VARIABLE-FREQUENCY MOTOR CONTROLLERS

3.8 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:



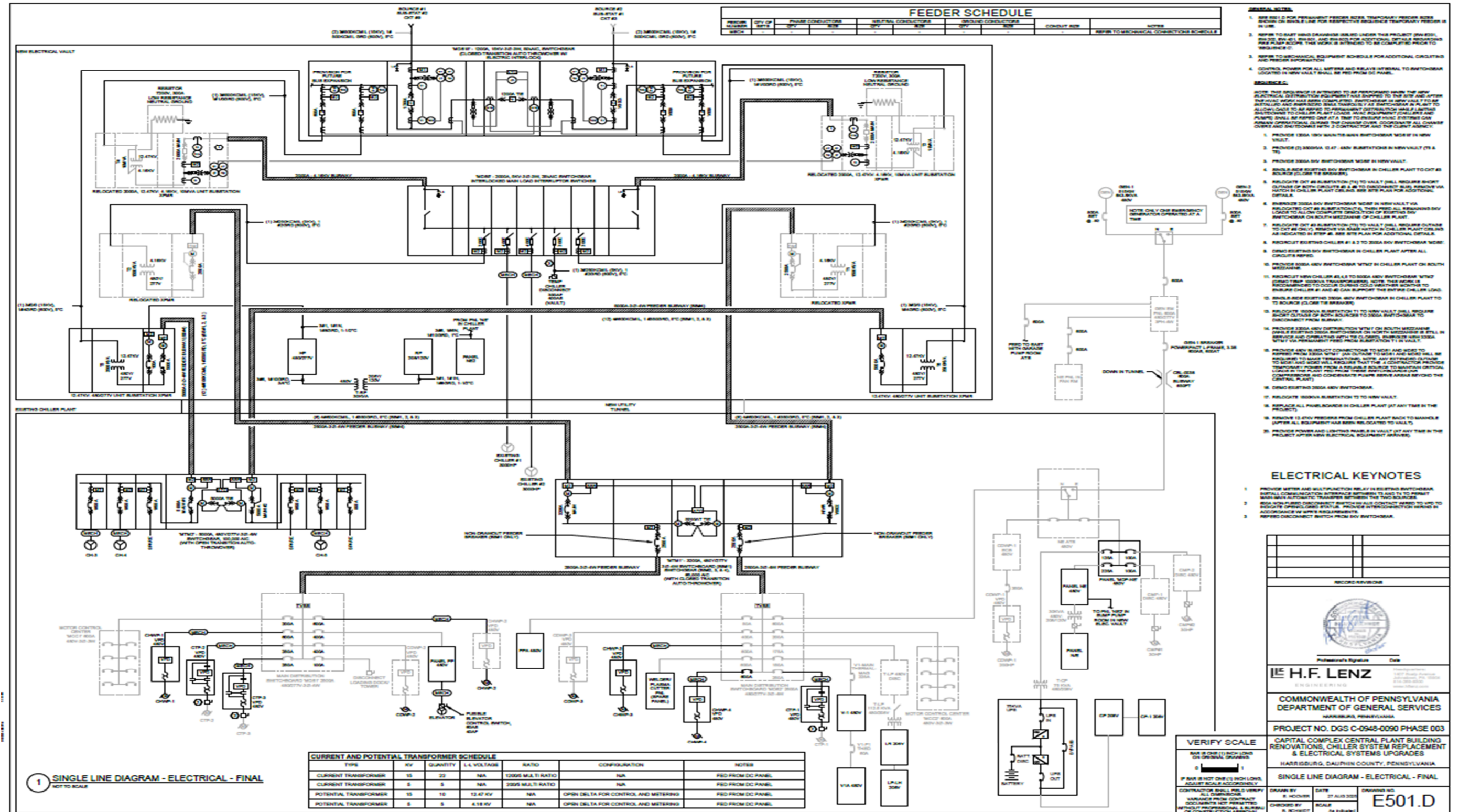
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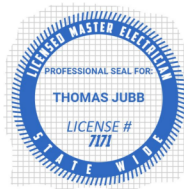
1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
 3. Report results in writing.
- C. Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS. Certify compliance with test parameters.



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DRAWING NEW EQUIPMENT:





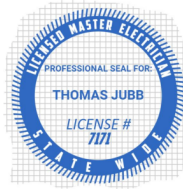
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EQUIPMENT SUPPLIED EQUIPMENT LIST WITH OUR ADDED NOTES HIGHLIGHTED IN YELLOW

es from client:
equipment list below does not include the existing MV transformers and Gear to be altered, relocated and reused.
on testing all transformers for re-installation before removal and after re-installation.
will be testing the Temp 5kV safety switch before and after usage and completion of that phase of work.
on testing the temporary trailer and transformer.
are required to offer two options for the 480V gear...conduit/wire and buss. Plan to test both options. If there is a difference please call that price
in your quote.
specs for further acceptance testing requirements.

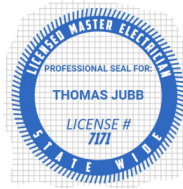
**Equipment List
Panels**

MDP-NE Panelboard Main Lugs Only Surface Mount 600A 480V
LP-LH Panelboard Main Lugs Only Surface Mount 250V 400A
CP Panelboard Main Breaker Surface Mount 250V 175A
V-1 RH Panelboard Main Lugs Only Surface Mount 480V
LR Panelboard Main Breaker Surface Mount 250V 400A
CP-1 Panelboard Main Breaker Surface Mount 250V 100A
V-1 Panelboard Main Breaker Surface Mount 250V 125A
PP Panelboard Main Breaker Only Surface Mount 300A 480V
Welder/Plasma Cutter Panel MLO Surface Mount 480V 250A
V1A Panel MLO Surface Mount 480V 250A
N/E Panelboard Main Lugs Only Surface Mount 250V 225A
NE2 Panelboard Main Breaker Surface Mount 250V 50A
NE Panelboard Main Breaker Surface Mount 250V 225A
RP Panelboard Main Breaker Surface Mount 250V 100A
HP Panel MLO Surface Mount 480V 100A
DC Panelboard Main Breaker Surface Mount 125V DC 50A
Switchgear & relays,ct/pt, cntrl wires



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MTM2 480V 5000A Service Switchgear*
MTM1 480V 3200A Service Switchgear*
MDS15 15KV 1200A Service Switchgear*
MDS5 5KV 2000A Service Switchgear*
Safety Switches
Temp Chiller 5kv Fused Safety Switch- test 2-times
Mechanical Equipment Safety Switches
AHU-6 30AMP 120V Single Phase
EF-1 480V 30Amp 3-phase
EF-2 480V 30Amp 3-phase
EF-3A 480V 30Amp 3-phase
EF-3B 480V 30Amp 3-phase
EF-3C 480V 30Amp 3-phase
EF-3D 480V 30Amp 3-phase
Elevator Power Unit 480V 60Amp 3-phase 40AMP Fuses
Foundation Pump 480V 30Amp 3-phase
TF-1 120V 30Amp 1-phase
TF-2 120V 30Amp 1-phase
Vault Pump 480V 30Amp 3-phase
Transformers
T-RP 30KVA Transformer Wall Mount 480V Primary
T-5 3500KVA New Transformer 15kv to 480v
T-6 3500KVA New Transformer 15kv to 480v
UPS System
75KVA UPS by OEM
1-Temp trailer-sw brd & transf
2-cable/bus sections:5kv
6-cable/bus sections:600v
4-existing transf/sw gear to be moved & relocated- test 2-times



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8-sets mv cable
20-sets lv cable
1-main grnd 3pt tst
10-equip grnd 2-pt tst
2-vfd's

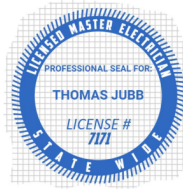
stments:

Acceptance testing-\$159,000

Infrared thermal scans of new equipment per spec- 2 in 11 month window-\$25,900 (client to supply qualified person tto remove/install covers during scans- approx. 14- 8hr days)

TES: (as applicable the specific project work scope)

1. Customer cancellations &/or rescheduling will be subject to an additional fee; 24 to 48 hours prior to scheduled outage - 10% of contract amount. 24 hours or less prior to scheduled outage – 25% of contract amount.
2. Equipment not shown on supplied drawings
3. Equipment excluded-motors, lv riser panels/br panels-or related breakers or branch cables, vfd's, ups, sw/pnl brds/brkrs
4. Retesting, parts, repairs, man hole entry,
5. Client to remove/install covers during IR scans



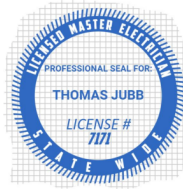
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6. Unless there is an emergency situation , we request a minimum of 48 hours' notice for the scheduling of non-emergency/normal services.
7. Site specific training, access, and/or security requirements, commissioning, as well as costs for testing for illnesses and/or disease are not included in this proposal.
8. Applicable taxes are not included in this proposal.
9. Credit card payments will be assessed a 3% processing fee (2/1/19 Implementation Date) accepted: Visa, Mastercard, American Express (4%).
10. If applicable: the cost of developing test plans is excluded from this proposal.
11. We require a minimum of 8 hours of ready work per day.
12. Provide reasonable parking and sanitary facilities for our technicians.
13. Provide test plans/procedures to us if applicable.
14. Client to supply all information for the Engineering studies
15. Excluded: voltage/current recordings, power quality meters, static ups, engineering studies/device settings, commissioning, retests, -IR may be used in lieu of torquing main connections,

All investments are based on trained TT technicians.

All investments are based upon all work performed during normal business hours, Monday through Friday, 7am-3:30pm

All investments include 1- service vehicle.



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Information is shared with the receiving party. The information contained therein, nor any proprietary information furnished pursuant thereto, shall be disclosed to others or used for any purpose other than set forth above without approval. We sincerely appreciate the opportunity of submitting this proposal and hope that we may have the pleasure of serving you.

Respectfully,

Thomas Jubb

Professional Electrical Services and Management, L.L.C. (PESM)

Victory Gallop Court

Frederick, MD 21078

Contact: Thomas Jubb, ME, SE, FM

tjubbpesm@outlook.com

Phone: 443-417-6265

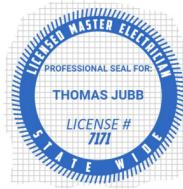
Please assign all purchase orders to Team Member:

Matthew McDermott

410-992-5980

Matthew McDermott <tacticaltestingllc@outlook.com>

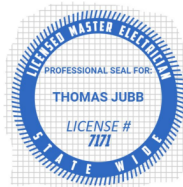
tactical-testing.com -619 Waterside Ct., Balto., MD 21220



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Terms and Conditions:

- **Terms of payment: 1:** Terms are net thirty (30) days. If invoice payment is not received within thirty (30) days, a service charge of 1.5% will be added to the outstanding balance. Based on project work scope, partial invoicing may be implemented.
- **Cancellations:** Cancellations of agreed services must be received twenty-four (24) hours prior to the agreed date and time. Professional Electrical Services and Management's costs plus ten percent (10%), and any rental fee charges will be incurred.
- **Delays:** Professional Electrical Services and Management shall be made aware of delays twenty-four (24) hours prior to site visit or charges will be incurred. Our employees are entitled to a minimum of four (4) hours for time missed to no fault of their own, acts of God, terrorism.
- **Standby time:** Service charges will be incurred if Professional Electrical Services and Management employees cannot perform the services requested due to no fault of their own. Overtime rates will be charged, if necessary, to complete services scheduled for that day.
- **Safety:** Professional Electrical Services and Management employees agree to follow all job specific, state, federal, rules and regulations. Professional Electrical Services and Management employees reserve the right not to perform work that in their trained opinion violates standard safety rules of the trade.
- **Disclaimer:** Professional Electrical Services and Management assumes no responsibility for any damage or injury to any property caused directly or indirectly as a result of Professional Electrical Services and Management performing its duties under this agreement except such damage or injury that may be held to result solely and directly from or out of: Any grossly negligent performance by Professional Electrical Services and Management its obligations under this Agreement or any willful misconduct on the part of Professional Electrical Services and Management, its agents or employees.
- **Responsibility:** All services are performed in accordance with industry standards, project specifications and/or NETA specifications. Where remediation is beyond the scope of normal reliability testing, and where corrective action is required, such services will be quoted separately.
- **Scheduling:** PESM requires a minimum of 48 hours of non-emergency/normal work scheduling notice.



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AUTHORIZATION TO PROCEED

Project: _____

Site Address: _____

Site Contact/Phone: _____ Office Contact/Phone: _____

We instruct TT to proceed with scheduling and performing the work described in the attached proposal.

Proposed date to be begin work: _____

Alternate date: _____

Investment reimbursement will be by: (check one)

Company Name: _____

A) Company check before project start date ☐

Number/\$Amount: _____

B) Purchase ☐ or Service ☐ order

Number/\$Amount: _____

C) Charge card: Visa ☐ Master ☐ Other ☐

Number/\$Amount: _____

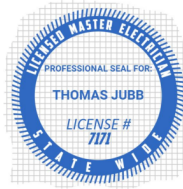
Billing/Company Address: _____

Authorization Signature: _____

Printed Name: _____

Title (Please Print): _____

Date: _____ Phone: _____ Email: _____



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Professional Electrical Services and Management, L.L.C.

(PESM)



(Master Licensed services for Private/Governmental, Industrial, Commercial, Contractor and Residential Client's)



I) PESM- "ELECTRICAL PROJECT SERVICES and MANAGEMENT": All project services will be reviewed and stamped by a "Licensed Master Electrical Manager"

- *Commissioning/Management – testing-new electrical systems, EV charging systems, solar/wind power projects, maintenance
- *Development/Interpretation of specifications — electrical related projects, maintenance, engineering, equipment evaluation
- *Project Management — all electrical related services and projects
- *Estimating/ Project Procurement Services— electrical services, maintenance, procurement development and reviews
- *Proposal Development — electrical services, maintenance, engineering, equipment verifications
- *Electrical System Inspections/ Assessments- Insurance requirements, real estate transactions, new construction, existing systems
- *Consulting- Codes/Standards compliance, training, specifications, RFP's, OSHA safety programs, new and existing system's

II) PESM- "ELECTRICAL SALES, MARKETING and CLIENT RETENTION SERVICES":

- *Sales assistance with perspective/existing clients— estimating, proposal development, client site visits, agreement negotiations, client retention services
- *Sales Training, Marketing Support-customer relationship management (CRM programs)- information input and management
- *Marketing Plan Development, Client Retention and Management— growing new client base, fostering relationships with client's, creating client retention and referral programs to assist in growing your business

III) PESM- "ELECTRICAL PRODUCTS" and "TEAM MEMBERS"

- *Power Quality Meters
- *Electrical Equipment Replacement, Retrofit, Retro Fills
- *Custom Code/Standards Compliant Field Labels
- *NRTL Labeling (UL)



MISSION STATEMENT:

To ensure our professional licensed electrical, technical, management, and marketing services, assist with the growth and continued success of your business, while protecting your assets.

Providing client assurance that their electrical systems will meet the current industry codes and standards while operating safely and efficiently, thus minimizing their liabilities.

Phone: 443-502-2380
Cell: 443-417-6265



SCHNEIDER ELECTRIC

Philadelphia Branch
125 Rock Rd.
Horsham, PA 19044
Phone: (215) 443-0442
Fax: (215) 443-0995

January 20, 2026

Attention: Mathew Robinson

C/O: IB Abel

Project: State Capitol Central Plant Upgrades – Security

General Scope of the Project:

Schneider Electric will provide material and labor to install the new access control equipment for the above-referenced project.

Scope of Work:

- Schneider Electric will provide and install one (1) access control dual reader module to support two (2) new door locations.
 - This proposal assumes that this reader module will connect to an existing intelligent controller and be installed within an existing enclosure.
- Schneider Electric will provide the card readers, door contacts, request-to-exit buttons and miscellaneous material.
- Schneider Electric will program and test the system to make sure it is in working condition.
- Schneider Electric will provide the appropriate Open Options subcontroller license.
- Schneider Electric will provide the appropriate Verint PSIM system licenses.

Exclusions:

- The electrical installation including cable pathway, cable and cable pulling, as well as any supporting devices are excluded from this proposal.
- Device installation will be executed by others and is excluded from this proposal.
- Electronic lock procurement and installation is excluded this proposal.
- 2026 Prevailing wage and certified payroll are excluded from this proposal.
- Taxes are excluded from this proposal.
- Overtime or premium labor is excluded.
- Patching, painting and all general construction will be done by others.

Investment Pricing:

Base Price.....\$9,100.00

Pricing is valid for thirty (30) days.

Please feel free to contact me at any time with questions or concerns regarding this proposal. I can be reached by phone at 215-469-0078

Respectfully,
Steven Palme
Service Account Manager
Schneider Electric – Philadelphia Branch



State Capitol Central Plant Upgrades - Security

Labor				
	Hours	listed \$/hr		
Installation Technician	16	\$	147.00	\$ 2,352.00
Project Management	8	\$	186.00	\$ 1,488.00
Solutions Engineer	4	\$	171.00	\$ 684.00
As-Built Documentation	4	\$	147.00	\$ 588.00
Software Programming	2	\$	171.00	\$ 342.00
Total:				\$ 5,454.00

Material				
	Quantity	Listed \$		
Open Options Two-Door Module (MR52-S3B)	1	\$	966.70	\$ 966.70
HID Signo20 Card Reader (20NKS-00-000000)	2	\$	366.97	\$ 733.94
Alarm Controls Pneumatic Exit Button (TS-14)	2	\$	368.52	\$ 737.04
Edwards Surface Contact with Armor Cable (2505A-L)	2	\$	93.65	\$ 187.30
Open Options Subcontroller License	1	\$	101.67	\$ 101.67
Verint PSIM License	2	\$	92.50	\$ 185.00
Misc Installation Material (Conduit, Fittings, Back Boxes, Etc.)	1	\$	322.16	\$ 322.16
Total:				\$ 3,233.81

Additional Costs				
Tax	1	\$	-	\$ -
Warranty	1	\$	347.51	\$ 347.51
Freight	1	\$	64.68	\$ 64.68
Total:				\$ 412.19

Sale Price:	\$	9,100.00

TERMS AND CONDITIONS OF SALE

900512PITC R07/15/21

This quotation and any exhibits and attachments hereto (collectively, "Agreement") and any information contained herein, is the property of Schneider Electric Buildings Americas Inc. ("Company") and shall constitute proprietary and confidential information unless given to a public entity and required by law to be public information. The party to whom this quotation is addressed ("Customer") acknowledges the confidential nature of this Agreement and agrees to take all commercially reasonable and necessary precautions to ensure the confidential treatment of this Agreement and all information contained herein. This Agreement will not be used, copied, reproduced, disclosed or otherwise disseminated or made available, directly or indirectly, to any third party for any purpose whatsoever without the prior written consent of Company. The parties agree to be bound by the following terms and conditions.

1. **Quotations and Acceptance.** The quotation is based solely on the bid documents, which consist of the project drawings, specifications and/or instructions of the Customer only modified by written agreement or Company objection. Significant deviations between the actual conditions and circumstances of the work and those specified in the bid documents shall be cause for an adjustment in work scope, price and time allowed for performance. Written quotations shall be valid for no more than thirty (30) days from the date of issue, unless specifically stated otherwise herein. Customer may accept the quotation by signing and returning a copy to Company or by returning Customer's own written instrument or order expressly acknowledging the quotation and terms set forth herein, provided, however, Company hereby gives notice of its objection to any different or additional terms or conditions contained or referenced in Customer's order, which will be of no force or effect except as may be expressly agreed to by Company in writing. It is the intent of the parties that these Terms and Conditions of Sale shall govern the sale of goods delivered and services performed. Upon acceptance, this Agreement constitutes the entire understanding between the parties respecting the goods or services delineated herein and supersede all prior oral or written understandings or representations relating to such goods or services. This Agreement may not be discharged, extended, amended or modified in any way except by a written instrument signed by a duly authorized representative of each party. Company assumes that the Subcontract Agreement offered will contain terms that are substantively similar to the AIA provisions that are in accordance with the provisions of the prime contract, including any supplements. Upon award, Company assumes that contract provisions will be reviewed and negotiated in good faith to reach a mutual acceptance of both parties.
2. **Payment.** Absent a contrary provision herein, Customer will pay Company monthly progress payments on a net thirty (30) days basis from date of invoice for materials delivered (or stored at an off-site storage facility) and services performed, less any retained reserve which will be mutually agreed upon in writing by the parties. The aggregate amount of any such retained reserves shall be paid by Customer to Company within thirty (30) days after the date of substantial completion. If Company provides a Certificate of Substantial Completion, such certificate shall conclusively establish such date. All invoices due and payable to Company, less any applicable retained reserve, shall accrue interest at a compounded per annum rate not to exceed 1½% per month (18% per annum) or the maximum rate permitted by law. Acceptance and endorsement by Company of an instrument for less than the full amount which Company claims to be due shall not be deemed to be an admission of payment in full and any conditions to the contrary which are noted on such an instrument shall not be binding on Company. If Customer does not pay Company, through no fault of Company, within seven (7) days from the time payment was due, Company may, without prejudice to any other remedy it may have, upon seven (7) additional days' written notice to Customer, stop its work until payment of the amount owing has been received and the contract sum shall be equitably adjusted for reasonable costs of shutdown, delay and startup or in the alternative Company may terminate this contract for material breach and all monies due Company for services performed and materials delivered shall be paid upon demand. Company shall be entitled to recover from Customer all costs for collection, including reasonable attorneys' and professionals' fees. To the extent payments are received and as required by law, and upon Customer's request, Company will furnish lien waivers as the work progresses.

Company reserves a security interest in any goods sold to the extent of the invoiced amount to secure payment of Customer's obligation. In event of payment default, Company may repossess such goods and a copy of the invoice may be filed with appropriate authorities as a financing statement to event or perfect Company's security interest in the goods. At Company's request, Customer will execute any necessary instrument to perfect Company's security interest.
3. **Price and Taxes.** The price for the goods and services hereunder are those shown on the face of this Agreement. The price of this Agreement does not include sales, use, excise, duties or other similar taxes, unless otherwise expressly provided herein. Any taxes (other than taxes due on Company's net income) that are payable hereunder shall be the responsibility of Customer. If applicable, Customer shall provide Company a copy of any appropriate tax exemption certificate for the state(s) into which the goods are to be shipped.
4. **Changes and Claims.** All materials and labor furnished hereunder shall be in accordance with shop drawings submitted by Company and approved by Customer. Any changes in the work as set forth in approved shop drawings, or from the scope of work as described herein, will require a written change order submitted to Company by Customer. An equitable adjustment will be made in the contract price or delivery dates or both, and this Agreement will be modified accordingly in writing. The cost or credit to Customer for performance of such change order shall be determined by mutual written agreement prior to the commencement of any work under such change order. Customer shall notify Company promptly in writing of any circumstances arising from the performance of the work herein described which reasonably may be anticipated to result in a claim or back charge to Company. Upon Company's receipt of such notification, Company shall have five (5) working days in which to remedy such circumstances and to avoid the imposition of such claim or back charge. Company will not be liable for any claim or back charge where Company has not been notified in the manner as set forth above.
5. **Access and Overtime.** This Agreement is based upon the use of straight time labor only during regular working hours (8:00 a.m. to 5:00 p.m., Monday through Friday, excluding Company's holidays). If Customer requests Company to perform any work outside of regular working hours, overtime and other additional expense occasioned thereby will be charged to and paid by Customer. If Company's work is to be performed on the project site, Customer will afford unrestricted access to Company and its employees and agents to all work areas.
6. **Damage or Loss to Equipment.** In the case of equipment not to be installed by or under supervision of Company, Company shall not be liable for damage to or loss of equipment after delivery of such equipment to the point of shipment. In the case of equipment to be installed by or under supervision of Company, Company shall not be liable for damage or loss after delivery by the carrier to the site of installation; if thereafter, pending installation or completion of installation or full performance by

Company, any such equipment is damaged or destroyed by any cause whatsoever, other than by the fault of Company, Customer agrees to promptly pay or reimburse Company an amount equal to the damage or loss which Company incurs as a result thereof, in addition to or apart from, any and all other sums due or to become due hereunder.

7. **Delays.** Customer shall prepare all work areas so as to be acceptable for Company's work required hereunder. Customer acknowledges that the contract sum is based upon Company being able to perform the work in an orderly and sequential manner, as Company so determines. If Company's performance is delayed, interfered with, suspended, or otherwise interrupted, in whole or in part, by Customer, other contractors on the project site, or by any other third party or by any act within the power and/or duty of Customer to control, then Customer agrees that it will be liable to Company for all increased costs and damages which Company incurs as a result thereof. Furthermore, if Company is delayed at any time in the progress of the work by any act or neglect of Customer, or by any separate contractor employed by Customer, or by changes ordered in the work or by labor disputes, fire, delay in transportation, adverse weather conditions, casualties, or any other causes beyond Company's control, then the time for completion of the work shall be extended for a period equal to the time lost by reason of such delay.
8. **Warranty.** Company warrants to Customer that all tangible articles manufactured by Company will be free of defects in workmanship and material and that the work performed will be of good quality and will conform to the requirements of the bid documents. If the article is installed by Company, Company's sole obligation under this warranty shall be to provide, without charge, parts and labor necessary to remedy defects which appear within twelve (12) months from the date of beneficial use or occupancy, as applicable. If Company provides a Certificate of Substantial Completion, such certificate shall conclusively establish such date. If article is not installed by Company, the warranty period shall be within twelve (12) months of shipment of said article. Warranty claim must be made to Company in writing within such twelve (12) month period. All transportation charges incurred in connection with the warranty for equipment not installed by Company shall be borne by Customer. Company warrants that for equipment furnished and or installed, but not manufactured by Company, Company will extend the same warranty terms and conditions which Company receives from the manufacturer of said equipment.

This warranty is the sole and exclusive warranty given with respect to any articles delivered or services performed by Company. THE WARRANTIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED (EXCEPT WARRANTIES OF TITLE), INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. This warranty is subject to proper installation of the articles (if installation is not performed by Company or authorized subcontractors of the Company) and maintenance and storage of the articles in accordance with the specifications and directions supplied by Company. This warranty does not apply to any defect, malfunction or failure caused by repairs made by other than or without the consent of Company or the article has been subject to abuse, misuse, neglect, tampering, accident or damage by circumstances beyond Company's control, including without limitation, acts of God, war, acts of government, corrosion, power fluctuations, freeze-ups, labor disputes, differences with workmen, riots, explosions, vandalism, or malicious mischief, nor to defective associated equipment or use of the articles with equipment for which they were not sold. All of Company's obligations under this warranty will immediately terminate and be of no further force or effect if all or any part of the purchase price (including any installment payment) with respect to any article covered by this warranty is not paid to Company when due. If cause of defect is found not to be Company's responsibility, standard rates for repair or replacement and labor shall apply.

9. **Limitation of Liability.** In no event will Company's total aggregate liability in warranty or contract exceed the contract price paid for the specific product or service that gives rise to the claim excluding third party claims for personal injury, death or as may be required by law. IN NO EVENT SHALL COMPANY BE LIABLE FOR ANY LOST PROFITS, LOSS OF USE, DATA, LOSS OF GOODWILL, BUSINESS INTERRUPTION OR ANY OTHER SPECIAL, INDIRECT, INCIDENTAL, PUNITIVE OR CONSEQUENTIAL DAMAGES OF ANY KIND EVEN IF COMPANY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.
10. **Laws and Permits.** Company shall comply with all applicable federal, state, and local laws and regulation and shall obtain all temporary licenses and permits required for the prosecution of the work. Licenses and permits of a permanent nature shall be procured and paid for by the Customer. This contract shall be interpreted and governed under and in accordance with the laws of the jurisdiction in which the goods are delivered or services are performed without regard to its choice of law provisions.
11. **Disputes.** Any controversy or claim arising out of or relating to this Contract, or the breach thereof, shall be settled by good faith consultation and negotiation. If those attempts fail, either party shall provide written notice within thirty (30) days to the other to mutually agree on an arbitration process. If a process is not agreed upon within thirty (30) days, final and binding arbitration in accordance with the then current Construction Industry Arbitration Rules of the American Arbitration Association shall commence and judgment upon the award rendered may be entered in any court having jurisdiction thereof. The arbitration shall be held in the federal, state or municipal courts serving the county in which the project is located unless the parties mutually agree otherwise. The prevailing party shall recover all reasonable legal costs and attorney's fees incurred as a result, which shall be promptly paid by the non-prevailing party. Any dispute or demand for arbitration must be commenced within one (1) year after the cause of action has accrued. Nothing herein shall limit any rights Company may have under construction mechanic or materialmen lien laws. Company shall have the right to suspend affected services pending resolution of disputes.
12. **Insurance.** The parties shall each maintain insurance coverage including without limitation, Workers' Compensation and Employer's Liability at statutory limits, Automobile Liability covering all owned, hired and other non-owned vehicles, and Commercial General Liability covering public liability and property damage with limits generally required for its respective industry with not less than \$1,000,000 minimum coverage per occurrence. Such insurance shall be with reputable and financially responsible carriers authorized to transact business in the jurisdiction in which the project and services are being performed. No credit will be given or premium paid by Company for insurance afforded by others.
13. **Clean Up.** Company agrees to keep the job site clean of debris arising out of its operations. Customer shall not back charge Company for any costs or expenses for clean up or otherwise without prior written notice and Company's written consent.
14. **Severability.** The invalidity or unenforceability of any provision herein shall in no way affect the validity or enforceability of any other provision.
15. **Disclaimer.** Company reserves the right to amend, withdraw or otherwise alter this submission without penalty or charge as a result of any event beyond its control arising from or due to the current COVID-19 epidemic or events subsequent to this epidemic / pandemic including changes in laws, regulations, by laws or direction from a competent authority. The Customer

acknowledges that the products or part thereof are produced in, or otherwise sourced from, or will be installed areas already affected by, or that may be affected in the future by, the prevailing COVID-19 epidemics/pandemic and that the situation may trigger stoppage, hindrance or delays in Company's (or its subcontractors) capacity to produce, deliver, install or service the products, irrespective of whether such stoppage, hindrance or delays are due to measures imposed by authorities or deliberately implemented by the Company (or its subcontractors) as preventive or curative measures to avoid harmful contamination exposure of Company's (or its subcontractors') employees. The Customer therefore recognizes that such circumstances shall be considered as a cause for excusable delay not exposing the Company to contractual sanctions including without limitation delay penalties, liquidated or other damages or termination for default.

16. **Ethics and Compliance with Laws.** Each party shall comply in all respects with all applicable legal requirements governing the duties, obligations, and business practices of that party. Neither party shall take any action in violation of any applicable legal requirement that could result in liability being imposed on the other party. In the event Customer has concerns related to ethics, compliance, or Company's Principles of Responsibility, and/or any potential violations of these policies, Customer is welcome to make use of Company's GreenLine. The GreenLine is Company's global helpline for external stakeholders. It is a confidential channel through which Customers can ask questions and raise concerns. Reports can be made using the link: <https://secure.ethicspoint.eu/domain/media/en/gui/104677/index.html>.

17. **Cybersecurity.**

- 17.1. Customer's Obligations for Its Systems: Customer is solely responsible for the implementation and maintenance of a comprehensive security program ("Security Program") that contains reasonable and appropriate security measures and safeguards to protect its computer network, systems, machines, and data (collectively, "Systems"), including those Systems on which it runs the Products or Services provided by Company, against Cyber Threats. "Cyber Threat" means any circumstance or event with the potential to adversely impact, compromise, damage, or disrupt Customer's Systems or that may result in any unauthorized access, acquisition, loss, misuse, destruction, disclosure, and/or modification of Customer's Systems, including any data, including through malware, hacking, or similar attacks.

- 17.2. Without limiting the foregoing, Customer shall at a minimum:

- (a) have qualified and experienced personnel with appropriate expertise in cybersecurity maintain Customer's Security Program, and have such personnel regularly monitor cyber intelligence feeds and security advisories applicable to Customer's Systems or Customer's industry;
- (b) promptly update or patch its Systems or implement other appropriate measures based on any reported Cyber Threats and in compliance with any security notifications or bulletins, whether publicly disclosed on Company's security notification webpage at <https://www.se.com/ww/en/work/support/cybersecurity/security-notifications.jsp> or otherwise provided to Customer;
- (c) regularly monitor its Systems for possible Cyber Threats;
- (d) regularly conduct vulnerability scanning, penetration testing, intrusion scanning, and other cybersecurity testing on its Systems; and
- (e) meet the recommendations of Company's Recommended Cybersecurity Best Practices, available at <https://www.se.com/us/en/download/document/7EN52-0390/>, as may be updated by Company from time to time, and then-current industry standards.

- 17.3. Customer's Use of the Products, Software, and Services: Company may release Updates and Patches for its Products, Software, and Services from time to time. Customer shall promptly install any Updates and Patches for such Products, Software, or Services as soon as they are available in accordance with Company's installation instructions and using the latest version of the Products or Software, where applicable. An "Update" means any software that contains a correction of errors in a Product, Software, or Service and/or minor enhancements or improvements for a Product, Software, or Service, but does not contain significant new features. A "Patch" is an Update that fixes a vulnerability in a Product, Software, or Service. Customer understands that failing to promptly and properly install Updates or Patches for the Products, Software, or Services may result in the Products, Software, or Services or Customer's Systems becoming vulnerable to certain Cyber Threats or result in impaired functionality, and Company shall not be liable or responsible for any losses or damages that may result.

- 17.4. Identification of Cyber Threats: If Customer identifies or otherwise becomes aware of any vulnerabilities or other Cyber Threats relating to the Products, Software, or Services for which Company has not released a Patch, Customer shall promptly notify Company of such vulnerability or other Cyber Threat(s) via the Company's Report a Vulnerability page (<https://www.se.com/ww/en/work/support/cybersecurity/report-a-vulnerability.jsp#Customers>) and further provide Company with any reasonably requested information relating to such vulnerability (collectively, "Feedback"). Company shall have a non-exclusive, perpetual and irrevocable right to use, display, reproduce, modify, and distribute the Feedback (including any confidential information or intellectual property contained therein) in whole or part, including to analyze and fix the vulnerability, to create Patches or Updates for its customers, and to otherwise modify its Products, Software, or Services, in any manner without restrictions, and without any obligation of attribution or compensation to Customer; provided, however, Company shall not publicly disclose Customer's name in connection with such use or the Feedback (unless Customer consents otherwise). By submitting Feedback, Customer represents and warrants to Company that Customer has all necessary rights in and to such Feedback and all information it contains, including to grant the rights to Company described herein, and that such Feedback does not infringe any proprietary or other rights of third parties or contain any unlawful information.

18. **Import and Export.**

- 18.1. The Products and Services provided by Company under this Contract contain or may contain components and/or technologies from the United States of America ("US"), the European Union ("EU") and/or other nations. Customer acknowledges and agrees that the Products, assignment and/or usage of the Products, Software, Services, information, other deliverables and/or the embedded technologies (hereinafter referred to as "Deliverables") under these Terms and

Conditions of Sale shall fully comply with related applicable US, EU and other national and international export control laws and/or regulations.

- 18.2. Unless applicable export license/s has been obtained from the relevant authority and Company has approved, the Deliverables shall not (i) be exported and/or re-exported to any destination and party (may include but not limited to an individual, group and/or legal entity) restricted by the applicable export control laws and/or regulations; or (ii) be used for those purposes and fields restricted by the applicable export control laws and/or regulations. Customer also agrees that the Deliverables will not be used either directly or indirectly in any rocket systems or unmanned air vehicles; nor be used in any nuclear weapons delivery systems; and will not be used in any design, development, production or use for any weapons which may include but not limited to chemical, biological or nuclear weapons.
- 18.3. If any necessary or advisable licenses, authorizations or approvals are not obtained, whether arising from inaction by any relevant government authority or otherwise, or if any such licenses, authorizations or approvals are denied or revoked, or if the applicable export control laws and/or regulations would prohibit Company from fulfilling any order, or would in Company's judgment otherwise expose Company to a risk of liability under the applicable export control laws and/or regulations if it fulfilled the order, Company shall be excused from all obligations under such order and/or these Terms and Conditions of Sale.

PROPOSAL

PA DGS Central Plant - Fire Alarm

PREPARED BY

Siemens Industry, Inc. ("Siemens")

PREPARED FOR

Bidding Contractors

DELIVERED ON

January 05, 2026

SMART BUILDINGS

Transforming the Everyday



Table of Contents

SIEMENS PROPOSAL 3

 Contact Information 3

 Scope of Work 11-26-25.docx 4

 Equipment List 5

 Sell Price..... 6

 Payment Terms..... 7

TERMS OF SALE 8

 Siemens Terms of Sale (STS) 8

Signature Page 9

 Signature Page 9

Contact Information

Proposal #:	10281483
Date:	January 05, 2026

Sales Executive:	Kevin Hayden
Branch Address:	5095 Ritter Road Mechanicsburg, PA 17055
Telephone:	717-329-9514
Email Address:	kevin.hayden@siemens.com

Customer Contact:	
Customer:	Bidding Contractors
Address:	
Services shall be provided at:	
	Harrisburg, PA

PA Capitol Complex Central Plant – Fire Alarm Scope of Work

Siemens Industry is pleased to present the following scope of work for the PA Capitol Complex Central Plant project. Please note, Siemens scope of work is based on drawings dated 8-27-2025.

This proposal is based on approximate start date of February 2026 and approximate completion of June 2026.

Please be aware that the following proposal and device quantities are per plans and specifications and are to provide complete and operational systems. However, due to necessary design and/or engineering changes, final submittal quantities are subject to change.

Scope of Work:

1. Siemens to provide new fire alarm devices per plans
2. Siemens to provide device terminations
3. Includes device testing
4. Includes engineered drawings
5. Includes project supervision
6. Includes one year warranty

Electrical Contractor Responsibilities:

1. Provide and install necessary wiring and conduit to new device locations
2. Per State of PA requirements, leave 6' excess whip in flex cable at each device

Clarifications:

1. Professional engineer stamped or sealed drawings are not included
2. Pricing does not include providing or installing cabling and/or back boxes
3. Pricing includes project management for the duration of the tentative project schedule.
4. Materials pricing is for the extent of the tentative project schedule.
5. Work is assumed to be completed during normal business hours Monday – Friday (8am-5pm).
6. Pricing includes standard ground shipping.
7. Painting and Patching are excluded.
8. PA Sales Tax is excluded and a current tax exemption form will need to be provided or the applicable taxes will be added to the invoiced amount.
9. Any and all permits are the customers responsibility
10. Unless otherwise stated, this proposal is based on one phase for commissioning, testing and AHJ inspection. Should additional phases, testing and/or inspections be required, they will be provided at additional cost.
11. Prevailing wage labor IS INCLUDED

Equipment List

Fire Alarm Additions

Fire Alarm Additions

Qty	Ref #	Description
3	S54320-F7-A1	Multi-Crit. Fire Det.
3	500-094151	DETECTOR BASE ASSY
5	S54361-F3-A2	Spkr/Str (Wall,Wht,Fire)
5	S54370-F59-A1	SS Surface Mount Box Wht Wall
5	S54370-F44-A1	Wall (square) white standard cover alert text.

Sell Price

Total Quote Price	\$9,850.00*

This price is firm for 30 days from the date of this proposal.

**Siemens reserves the right to adjust prices to reflect the impact of any new or modified taxes, duties, tariffs, or equivalent measures, whether direct or indirect, imposed by any U.S. or foreign governmental authority that are applicable to our offering, including any hardware, software, or service components contained therein.*

Payment Terms

Payment Terms Acceptance Agreement

The total price of: \$9,850.00 and the estimated return on investment are based on the items outlined in this proposal. ANY STATEMENTS MADE HEREIN REGARDING SAVINGS THAT MAY BE ACHIEVED BY IMPLEMENTING THE SERVICES OFFERED IN THIS PROPOSAL ARE ESTIMATES ONLY. NO WARRANTY, EITHER EXPRESSED OR IMPLIED, SHALL BE CONSTRUED TO ARISE FROM SUCH STATEMENTS, NOR SHALL SUCH STATEMENTS BE CONSTRUED AS CONSTITUTING A GUARANTEE BY SIEMENS THAT SUCH SAVINGS WILL OCCUR IF THE SERVICES ARE IMPLEMENTED.

The Buyer acknowledges that when accepted by the Buyer as proposed by Siemens Industry, Inc., this Proposal and the Siemens Buildings Projects Business Standard Terms and Conditions, (together with any other documents incorporated into the forgoing) shall constitute the entire agreement of the parties with respect to its subject matter. BY EXECUTION HEREOF, THE SIGNER CERTIFIES THAT (S)HE HAS READ ALL OF THE TERMS AND CONDITIONS AND DOCUMENTS, THAT SIEMENS OR ITS REPRESENTATIVES HAVE MADE NO AGREEMENTS OR REPRESENTATIONS EXCEPT AS SET FORTH THEREIN, AND THAT (S)HE IS DULY AUTHORIZED TO EXECUTE THE SIGNATURE PAGE ON BEHALF OF THE BUYER.

Proposal is valid for thirty (30) days from the delivery date of January 05, 2026. Payment is due within 30 days of invoice date.

Payment Terms: 25% mobilization in advance, progress payments

Total: \$9,850.00

Siemens Industry, Inc. invoices paid by credit card may be subject to a surcharge of up to 2%.

Siemens Terms of Sale (STS)

Terms of Sale (Click to download)

[Base Terms \(United States\)](#)

Price Escalation. If, during the term of this Contract, the price of various materials or labor or logistics are increased as reflected by CRU/IHS Markit/CMAI/COMEX market index, then Siemens may increase the Contract Sum or apply a surcharge to Customer accordingly.

To the extent applicable, the following Supplements are incorporated and made part of the Siemens Terms of Sale:

Click on supplement(s) below to read/download

[Solutions Supplemental Terms](#)

[Hardware Supplemental Terms](#)

The order of precedence is stated in the Base Terms (United States).

To the extent the Offerings are purchased through an existing master or frame agreement, the terms and conditions of that agreement shall apply instead of the Siemens Terms of Sale.

Siemens reserves the right to adjust prices to reflect the impact of any new or modified taxes, duties, tariffs, or equivalent measures, whether direct or indirect, imposed by any U.S. or foreign governmental authority that are applicable to the Offerings, including any hardware, software, or service components contained therein.

Siemens is entitled to amend these terms and conditions at any time without prior notice. Previous and Retired versions of Base Terms & Supplemental Terms can be found here: www.siemens.com/terms-of-sale

Signature Page

Proposed by:

Siemens Industry, Inc.

Company

Kevin Hayden

Name

10281483

Proposal #

\$9,850.00

Proposal Amount

January 05, 2026

Date

Accepted by:

Bidding Contractors

Company

Name (Printed)

Signature

Title

Date

Purchase Order # ☐ PO for billing/pmnt only ☐ PO not required



**Quote for
IB Abel
2745 Black Bridge Road
York, PA 17406
Re: DGS Central Plant Upgrades
January 11, 2026**

Electric Line Excavation

Excavating electric line trenches, triads, and box totaling approx.
740' L x 49" D x 36" W.

Disposal of all excavated spoils.

Bring in and pour 20" of concrete in trenches (not the 12' x 10' x 4' D box)
after contractor installs lines and rebar.

Bring in and place 4" of Aashto #57 over concrete. Sidewalk locations will be
backfilled with Aashto #57 to ground level.

Bring in fill and backfill trenches to ground level. \$74,975.00 _____

or

Backfill trenches with Aashto #57 instead of fill. \$79,250.00 _____

- *Hauling of Hazmat materials is not included. Certain Hazmat materials can be hauled for an additional cost.*
- *Compaction is not included in price, but can be done for an additional cost.*
- *Does not include cutting/removing sidewalks or replacing/repairing them.*

We try to make our estimates as accurate as possible. Unfortunately, there are times when unforeseen issues making the job more difficult or more expensive than originally estimated. Fluctuating prices in fuel, aggregates, black top and other products can cause changes in the original estimated amount too. Prior to any price change we will contact you to discuss options or alternatives.

- All permits, inspections and other owner, county and township requirements are the responsibility of the IB Abel or acting agent for corporate, state, or federal owners or agent handling bids.
- General Contractor or IB Abel is responsible for calling PA One call prior to start of work.
- All measurements are estimates.
- Delays in job (not the result of PCEP) for engineering delays, inspections, testing, spec changes, etc. will result in additional costs.
- The discovery of limestone or any stone/rock that our on-site equipment is unable to move which requires supplementary equipment and/or contracting a blasting company, will result in additional costs.

- Payment is due within thirty (30) days of the date invoiced. All payments, not made by the agreed upon date, will incur late fees of 18% per month or maximum amount permitted by law.
- All legal fees, filing fees, and any other costs incurred to collect amounts due will be the responsibility of the IB Abel.

Concrete Supplier rules and fees

- The concrete included herein does not include any admixtures, ice or special aggregates.
- The quoted concrete prices do not include the testing of cement, aggregates, trial mixes, test cores, or cylinders.
- Concrete price allows unloading time for 1st cu. yd. - 15Min. Unloading time for each additional cu. yd. - 5 Min. Extended unloading time charge \$3.00/minute
- HOLD TIME CHARGES: Orders that deviate from their scheduled time will be subject to a hold time charge. If an order is placed for a specified time and is not released within 45 minutes of that scheduled time, a hold charge will be billed. The hold time charge is \$175.00 per hour per truck. There will also be a plant charge, if no other orders are scheduled at that specific plant while in a hold status. The plant charge is \$150.00 per hour.
- If an order is cancelled less than 2 hours of the scheduled order time, a cancellation charge will be billed in the amount of \$500.00.

Value Added Charges per CY.			
Non-Chloride per %	\$8.00	Front Discharge	\$5.00
Chloride Accel per %	\$6.00	Ice per 40 lbs. Bag	\$30.00
Retarder per %	\$4.00	#8 Stone	\$6.00
Pump Mix 6"-8" slump	\$6.00	Environmental S/C	\$25.00
Microfiber	\$9.00	Test Cylinders	\$25.00 ea.
Exposed Agg ½" or ¾"	\$130.00	Cylinder Breaks	\$35.00
River Jack	\$130.00	Dye Clean Out	\$85.00 per load
Winter Concrete	\$9.00	Fuel S/C	\$50.00 per load
Straight Cement	\$6.00		

Tara Dawn Hazen

Tara Dawn Hazen/ President - Hauler

Tara-Dawn Hazen

Printed Name

January 11, 2026

Date

Authorized Signature – Contractor

Printed Name of Authorized Signer

Date



Manna Supply, Inc
PO Box 4601
Lancaster, PA 17604
+16102224775
billing@mannasupply.com
www.mannasupply.com

MBE and WBE Certified Small Business

Quote

ADDRESS

Abel, I.B., Inc.
I.B. Abel, Inc.
2745 Black Bridge Rd
York, PA 17406

SHIP TO

Abel, I.B., Inc.
I.B. Abel, Inc.
2745 Black Bridge Rd
York, PA 17406

QUOTE #	DATE	
10796	01/19/2026	

SHIP VIA
Best Way

PRODUCT/VENDOR
Gear Update

PROJECT NAME
DGS Capitol Complex Central Pla

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
MBE/WBE/DBE	Manna Supply, Inc. is a certified Minority Business Enterprise (MBE), Women Business Enterprise (WBE) and Disadvantaged Business Enterprise (DBE). See attached certificates.	0	0.00	0.00T
Space		0	0.00	0.00
Gear (26)	Lot Electrical Distribution Equipment - BASE BID #1 Note: See below breakouts for UPS and VFD's	1	4,069,500.00	4,069,500.00T
Gear (26)	Lot Electrical Distribution Equipment - BASE BID #2/#3	0	4,430,500.00	0.00T
Gear (26)	Lot Electrical Distribution Equipment - BASE BID #4	0	5,166,300.00	0.00T
Space		0	0.00	0.00
Space		1	0.00	0.00
MV Swgr	MV Switchgear (MDS15) - Base Bid #1- #4 Siemens (1) 15kV Main-Tie-Main, 1200A Metal Clad Swgr, N1, 15kV, 50kA, N1, with ATO, Meters and Relays Lead Time: 38-40 weeks	1	0.00	0.00T
MV Swgr	MV Switchgear (MDS5) - Base Bid #1- #4 Siemens (1) 5kV, Main-Main, Metal Clad/Metal, 2000A Enclosed Swgr, 5kV, 25kA, with Key Interlocked Vacuum Main Breakers and Fused Feeder Switches, and meters and relays Lead Time: 38-40 weeks	1	0.00	0.00T
Busway	Non-Segregated Busway (MV) - Existing T3/T4 to new MDS5 - Base Bid #1- #4 Siemens OEM COPPER BUSBAR WITH TIN PLATING AT CONNECTION PARTS & EXTRUDED ALUMINUM	135	0.00	0.00T

THANK YOU FOR YOUR ORDER!

Please pay from this invoice; no other statement will be sent. Thank you!
A 2% finance charge must be applied to all balances over 30 days.

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Battery Sys (26)	HOUSING (60ft) T3 to MDS5: 2000A (2) Horizontal Elbow (2) Vertical Elbow (2) Flange End Box (2) Wall Flange (75ft) T4 to MDS5: 2000A (2) Horizontal Elbow (2) Vertical Elbow (2) Flange End Box (2) Wall Flange Lead Time: 20-22 weeks			
	Lot Station Battery System - For MDS15 and MDS5 - Base Bid #1- #4 Hoppecke (1) 48VDC Battery Cells to support both 15kV and 5kV Swgr (1) Battery Rack (1) Battery Rack Spill Kit (1) Battery Charger (1) Battery Isolation Switch (1) DC Panel (1) Freight (1) Installation Inspection Lead Time: 8-10 weeks	1	0.00	0.00T
Trans-Sub	Substation Transformer (T5 and T6) - Base Bid #1- #4 Hitachi (2) 3500kVA, VPI Transformers, 80 Dg C Rise, Copper Windings, 12.47kV to 480/277V, N1 3 Phase 60 Hertz, 80/80 Degree C Rise, AN/Future AF HIGH VOLTAGE 12470 Delta 95 kV BIL Copper Conductor Termination in ANSI segment 2 Primary Cable Connection - HV 15 kV 12.7 MCOV Distribution Class Polymer Surge Arresters (Set of 3) - HV LOW VOLTAGE 480Y/277 Copper Conductor Braided Flex Connectors - LV Lead Time: 20-22 weeks	2	0.00	0.00T
Switchgear	Switchgear (T5 and T6) - Base Bid #1- #4 Siemens (1) 5000A DO Main Breakers, 480/277V, N1 (1) 5000A/100A DO Main Breakers, 480/277V, N1 Lead Time: 30-32 weeks	2	0.00	0.00T
Switchboard	Switchboard (MTM1) - Base Bid #1 Siemens (1) 3200A Main-Tie-Main, 480/277V, 65kA, N1, Fixed Breakers, UL891, with PQ Metering Lead Time: 20-24 weeks	1	0.00	0.00T
Switchgear	Switchgear (MTM1) - Base Bid #2- #4 Siemens (1) 3200A Main-Tie-Main, 480/277V, 65kA, N1, DO	1	0.00	0.00T

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Switchgear	Breakers, UL1558, with PQ Metering Lead Time: 30-32 weeks Switchgear (MTM2) - Base Bid #1- #4 Siemens (1) 5000A Main-Tie-Main, 480/277V, 100kA, N1, DO Breakers, UL1558, with PQ Metering Lead Time: 30-32 weeks	1	0.00	0.00T
Busway	Busway (LV) - Base Bid #1- #4 Siemens (140ft) MTM1 to MDS1: 2500A (120ft) MTM1 to MDS2: 2500A 19 - Elbow: SX425C14ES 26 - Trapeze Hanger: SXTH2 2 - Flanged End: SX425C14FRND Lead Time: 34-40 weeks	260	0.00	0.00T
Busway	Busway (LV) - Base Bid #4 Siemens (170ft) T1 to MTM1: 2500A (180ft) T2 to MTM1: 2500A 20 - Elbow: SX425C14ES 70 - Trapeze Hanger: SXTH2 2 - Flanged End: SX425C14FRND Lead Time: 34-40 weeks	350	0.00	0.00T
Busway	Busway (LV) - Base Bid #4 Siemens (210ft) T5 to MTM2: 5000A (200ft) T6 to MTM2: 5000A 15 - Elbow: SX450C14ES 2 - Flanged End: SX450C14FRND 82 - Trapeze Hanger: SXTH1 Lead Time: 34-40 weeks	410	0.00	0.00T
UPS	Uninterruptible Power Supply (UPS) - Base Bid #1- #4 Named Mfg (1) 75kVA/kW UPS with 3-Breaker Main ByPass and 8-min battery system Includes: - Start-up - Extended Warranty - Load Bank Test - PM Note: We have excluded "Additional Battery Monitoring" called out in 263353-1 section 2.15 as this is not applicable/appropriate to this small size UPS Lead Time: 18-20 weeks	1	107,500.00	107,500.00T
VFD	Variable Frequency Drives (VFD's) - Base Bid #1- #4 (8) ABB VFD's Tags: CHWP-1, 3, 4 Model: (3) ACH580-3PCR-302A-4 Ultra Low Harmonic (ULH) Input Voltage: 480 VAC Three Phase Rated Output Current: 302A Enclosure: UL (NEMA) Type 1 Nominal Horsepower: 250 HP	1	390,900.00	390,900.00T

THANK YOU FOR YOUR ORDER!

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
	Frame Size: R11 Input Disconnecting Means: Circuit Breaker Bypass: None Input Impedance: 10% LCL High Frequency Filter Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP) Includes freight and start-up Tags: CTF-1, 2, 3 Model: (3) ACH580-3BCR-180A-4+F267+G390 Ultra Low Harmonic (ULH) Input Voltage: 480 VAC Three Phase Rated Output Current: 180A Enclosure: UL (NEMA) Type 1 Nominal Horsepower: 150 HP Frame Size: R8 Input Disconnecting Means: Circuit Breaker Bypass: E-Clipse Soft Start Bypass (Box) Input Impedance: 10% LCL High Frequency Filter Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP) Other Options: Service Switch Tags: EF-1, 2 Model: (2) ACH580-BCR-04A8-4+F267 Six Pulse Input Voltage: 480 VAC Three Phase Rated Output Current: 4.8A Enclosure: UL (NEMA) Type 1 Nominal Horsepower: 3 HP Frame Size: R1 Input Disconnecting Means: Circuit Breaker Bypass: E-Clipse Bypass (Box) Input Impedance: 5% equivalent impedance Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Modbus RTU, BACnet (MS/TP) Other Options: Service Switch Includes: Start-up and 30 month warranty Lead Time: 18-20 weeks			
Panel	Panelboard - (HP, RP, NE2, MDP-NE, NE, N/E, CP, CP-1, V-1, V1A, LR, LP-LH, PPA, PP & Welder) Base Bid #1- #4 Siemens	15	0.00	0.00T
Trans-LV	LV Distribution Transformer - Base Bid #1- #4 Siemens (1) 30kVA, 480V to 208/120V, Cu, N1	1	0.00	0.00T
Study	Base Bid #1- #4 Electrical Engineering Study to include: 1) Short Circuit Study, 2) Coordination Study and 3) Arc Fault Analysis in a Study Report, including providing Arc Flash Labels for field installation. Existing Construction: Back to two levels prior to new equipment, unless previous study can be provided New Equipment: Back to the incoming normal and emergency service	1	0.00	0.00

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ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Gear Start-up	Data Collection: By others Mfg Start-up for MV Swgr and LV Swgr	1	0.00	0.00
Comments	Comments and Notes - Gear BOM does not include any temporary equipment for the Chiller plant including: - 5kV LIS - 1500kVA Transformer - 2000A Swbd	0	0.00	0.00
Comments	Comments and Notes - VFD Comments: Not Included Items and Clarifications: Harmonic analysis Field harmonic testing Additional harmonic filtration beyond what is mentioned above Passive filter / Output filter AC Line reactor - 6 Pulse VFDs come with 5% DC Bus Choke as standard LonWorks or BACnet IP communication cards Digital input interface Hauling, rigging, piping, wiring and installation Emergency service or regular maintenance Manual service switch provided in place of 3rd contactor in bypass configurations 18 Pulse Architecture - ULH Provided as Modern Solution (See Technical Note 032) VFDs come standard with built in overcurrent and overload protection (no external MPR), as well as motor I ² t (See Technical Note 072)	1	0.00	0.00
Prog Bill	Progress billing schedule: 20% - Receipt of approved submittals 30% - Equipment released to factory 50% - Shipment from factory	0	0.00	0.00
Space		0	0.00	0.00
Space		1	0.00	0.00
Optional	Optional Equipment/Services	0	0.00	0.00
Gear (26)	OPTIONAL ADDER TO BASE QUOTES Modifications to existing substation transformers T1/T2 and T3/T4: Bill of Material (BOM) and summary work scope for modifications to Transformers T1, T2, T3, and T4 based on the provided one-line diagrams and project specifications for relays and metering. Engineering and Design: • A short outage will be required in order to gather all information related to providing these modifications. After completion of this site visit, Vendor to design and integrate new relay and metering cubicles for T3 and T4. • We will develop updated one-line and three-line drawings reflecting added sections. • Relay settings for T3 and T4 (overcurrent, ground, voltage, frequency, negative sequence), to be	0	619,990.00	0.00T

THANK YOU FOR YOUR ORDER!

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A 2% finance charge must be applied to all balances over 30 days.

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
Trans-MV	provided by others. RESA Power will provide programming based on provided settings. • Configure meter scaling, CT/PT ratios, and communication protocols. Lead Time: 10-12 weeks after approvals. MV Transformer (T1 and T2) (2) Add Meter to vacuum breaker per notes on dwgs Transformers T1 and T2 (1500 kVA Substations) Bill of Material (BOM): 1. LV Power Meter Schneider Electric PM8000 (Type M2) or ION8650 2. 480 V Metering CT's 3. CT Shorting Terminal Block & Fusing 4. Communications Interface Module Material Summary Totals: • MV Relay & Metering Cubicles: 2 (T3, T4) • Protective Relays: 2 required (T3, T4). • Meters: 4 total (T1–T4) • CT Sets: 6 total (4 MV for T3/T4, 2 LV for T1/T2) • PT/VT Sets: 2 total (T3, T4) • Communications Interfaces: 4 total Field Installation - T1 and T2: • Install LV power meters on 2500 A mains. • Install CTs, voltage references, and communication wiring. Testing and Commissioning: • Perform ratio, polarity, and insulation testing of new CTs and PTs. • Verify metering accuracy, phase rotation, and demand functions. • Confirm SCADA/monitoring communications. Actual SCADA set up and testing by others. Documentation: • Provide as-left settings, test reports, and updated one-line diagrams. • Label all new cubicles and devices and update equipment records.	2	0.00	0.00T
Trans-MV	MV Transformer (T3 and T4) (2) Add Meters, Relays and PT's per note 1 on the dwg This scope includes an additional medium-voltage cubicle that will be added to Transformers T3 and T4 to house protective relays, metering, CTs, and PTs. T3 and T4 will be equipped with multifunction protective relays providing the following functions: • 51 / 51G – Phase and Ground Overcurrent • 27 / 59 – Under/Overtvoltage • 47 – Negative Sequence / Phase Loss • 81 – Under/Over Frequency • Metering (M2) Bill of Material (BOM): Transformers T3 and T4 (10 MVA Unit Substations – With Added Cubicles) Item Description: 1. Medium-Voltage Relay & Metering Cubicle, Custom	2	0.00	0.00T

THANK YOU FOR YOUR ORDER!

Please pay from this invoice; no other statement will be sent. Thank you!
A 2% finance charge must be applied to all balances over 30 days.

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
	auxiliary section includes structure, bus extension, barriers 2. Feeder/Main Protective Relay Eaton EDR-5000 (or equal) 1 2 51, 51G, 27, 59, 47, 81, metering 3. MV Power Quality / Revenue Meter Schneider Electric ION9000 or PM8000 1 2 Ethernet-enabled 4. MV CT Set (Protection + Metering) Mounted in added cubicle 5. MV PT/VT 12.47 kV / 120 V Fused, drawout or fixed 6. Relay Test Switch & Terminal Hardware Various FT-style or equivalent 7. Communications Interface / Cabling for SCADA/monitoring Field Installation - T3 and T4: • De-energize and implement lockout/tagout procedures. • Provide assistance to contractor to remove end plates and extend lineup to install new cubicles. • Install CTs, PTs, protective relays, meters, and terminal blocks within new sections. • Extend bus, control wiring, and grounding to new cubicles. Testing and Commissioning: • Perform secondary injection testing on T3 and T4 protective relays. • Perform ratio, polarity, and insulation testing of new CTs and PTs. • Verify metering accuracy, phase rotation, and demand functions. • Confirm SCADA/monitoring communications. Actual SCADA set up and testing by others. Documentation: • Provide as-left settings, test reports, and updated one-line diagrams. • Label all new cubicles and devices and update equipment records.			
Space		0	0.00	0.00
Space		0	0.00	0.00
Price-30	Price valid for 30 days only due to changing market conditions and fluctuations, including both commodities and Tariffs. Equipment must also be released in a timely manner in accordance with each manufacturers requirements. Tariff increases may be assessed by mfgs at the time of shipment without prior notification or acceptance. Siemens has an announced price increase effective 1/1/2026, so all quotes must be executed prior to that date to be effective.	0	0.00	0.00
Tariff	Tariffs and Surcharges: Prices quoted include only current tariffs, duties, or government-imposed surcharges. If any such tariffs, duties, or surcharges are imposed or modified after the issuance of a quote, purchase order, or agreement, the additional costs will be the responsibility of the purchaser and will be	0	0.00	0.00

THANK YOU FOR YOUR ORDER!

Please pay from this invoice; no other statement will be sent. Thank you!
 A 2% finance charge must be applied to all balances over 30 days.

ACTIVITY	DESCRIPTION	QTY	RATE	AMOUNT
	added to the final invoice. Manna Supply reserves the right to adjust pricing accordingly to reflect these costs. This policy applies to all products and services offered and will remain in effect unless explicitly stated otherwise in writing by an authorized representative of Company.			

Thank you for your business! If you would like to pay by card, please note there will be an additional fee (outlined in your invoice).	SUBTOTAL	4,567,900.00
Thank you for the opportunity to support you on this project.	TAX	0.00
	TOTAL	\$4,567,900.00

Manna Supply, Inc. Terms:

- 1) Payments will be due 30 days after shipment of products or completion of services on all Invoices
- 2) Standard Freight is FOB Factory
- 3) Retainages will not be accepted
- 4) No payment discounts, unless agreed to in writing
- 5) Complete Manna Supply Terms and Conditions of Sales are available to review and download at www.mannasupply.com.
- 6) Sales and Use Tax to be determined upon acceptance of order.
- 7) All Quotes are valid for 30 days only, due to volatile market conditions.
- 8) Tariffs, known and unknown, may impact mfg's prices up to including at time of shipment, which may differ than what was quoted previously.

Accepted By

Accepted Date

THANK YOU FOR YOUR ORDER!

Please pay from this invoice; no other statement will be sent. Thank you!
A 2% finance charge must be applied to all balances over 30 days.

Keystone Electrical Supply
237 Pillow St.
Butler, PA 16001
Robstern7@aol.com
PH# 724-822-3508



Brian DeCesare
305 Gregson Drive
Cary, North Carolina 27511
Brian.DeCesare@us.abb.com
+1 215-384-6999

ABB

January 07, 2026

Quote No.: UAP-00000560

Doc Rev. 0

Project: Capital Complex Central Plant Chiller

Quote Version: Field quote with temporary

Quote Expiration: 02/07/2026

Dear Valued Customer,

Thank you for your inquiry for **Capital Complex Central Plant Chiller**. We are pleased to respond with our proposal based on the requirements of your inquiry. Please contact us with any questions. We look forward to working with you on this opportunity.

Best Regards,

Brian DeCesare
ABB

Notes

Project Level

a. Referenced Document(s)

Commonwealth of Pennsylvania

Department of General Services

Project No. DGS C-0948-0090 Phase 003

Drawings dated 27 August 2025...

E001, E100, E200, E201.D, E202.D, E401, E601, E604, E703, E704, E706,

Addendum 5 Drawings dated December 15, 2025...

E501.A, E501.D, E705

DGS-C-1101-0055 PHASE 1 specifications...

262200, 262816

DGS C-0948-0090 PHASE 3 specifications...

261116, 261323, 262300, 262413, 262416, 262500, 262713, 264313, 262813

b. Comment(s)

IMPORTANT NOTICE:

Any contract to sell the subject matter of the proposal shall be subject to prior mutual agreement as to price (which may be different than that shown herein), schedule, scope of work and terms.

Due to confusion on the drawings and specifications, we are quoting per this scope only.

As changes are requested, or as the design progresses, we are happy to revise our proposal and pricing.

Standard GE by ABB Design & Construction
GE/ABB to provide standard one-line nameplates.

Standard ABB lug size and quantities are provided based on amperage of the breaker(s) & equipment as shown in this proposal.

Cable length & voltage drop has not been considered.

Modifications may incur an adder/change order.

Only Standard Test Reports Provided, unless noted otherwise in this Bill of Material

Quoting standard GE by ABB Warranty - 1 year from energization or 18 months whichever occurs first.

For Extended Warranty see information at the end of the BOM.

Standard Terms and Conditions apply, including but not limited to FCA Factory, Progress Payments. (See terms at end of proposal)

ABB does not and will not represent, certify, or warrant that the products proposed herein satisfy any U.S. domestic preference requirement such as the Pennsylvania Steel Products Procurement Act. Purchaser agrees it is solely responsible for its obligations to its customer, such as adherence to any U.S. domestic preference requirement or requesting and obtaining an agency waiver, providing an equitable adjustment in scope, schedule, price, and other provisions to change ABB manufacturing location, manufacturing processes, and acquisition of components if mutually agreed to by ABB and Purchaser, or the supply and replacement of substitution products, and will defend and indemnify ABB from and against all liability resulting from any variance between the terms of this proposal and any of its contract terms with its customer. In no event shall Purchaser withhold payment due to ABB for any dispute or liability incurred between Purchaser and its customer. ST forms also will not be provided."

Country of Origin for the products in this proposal:

- Lighting panelboards=USA and Mexico
- Lighting panelboard outdoor enclosures=Mexico
- Power panelboards=Mexico
- Switchboards=Mexico
- LV Transformers=Mexico
- Tranquell Surge Protective devices=Mexico
- Disconnects and fuses = Mexico
- MV Switchgear Load Interrupter Switches = Mexico
- Breakmaster Load Interrupter Switches = Mexico
- Liquid filled substation Transformers = USA and Mexico
- Dry Type substation Transformers = USA
- Low Voltage Switchgear = USA
- Medium Voltage Switchgear = USA
- LV Busway = USA
- MV Busway = USA

Power Systems Studies specifications indicate studies are to be prepared by a PE who is a full time employee of the equipment manufacturer.

Specifications also indicate the study preparer is to provide Arc Flash Training certified for continuing education units.

Exception: We are including Power System Studies by a third party, who is a PE. (Not a Full Time Employee of ABB)

Exception: We are NOT including Training.

Any changes required as a result of Power Studies, may require revision of our proposal and pricing.

MV Switchgear specifications indicate to provide Arc-Resistant construction.

However, the room layouts do not appear to allow for venting to the outside.

We suspect that the specifications need to be edited.

We are quoting Fusible Load Interrupter SWGR as NON-Arc-Resistant.

We are quoting Primary and Secondary Unit Substation Breakers as NON-Arc-Resistant.

The 12.4kV Switchgear MDS15 is quoted with arc-resistant design features at the exterior (front, rear, and sides) and arc protection to the low voltage compartment (Type 2B). This means arcing does not cause holes in the walls isolating the low voltage instrument compartments.

Switchboard specifications call for Pull Boxes and Cable Supports.

Since all connections are via Busway, we are not providing either of these features.

Switchboard specifications call for Key Interlocks, and Mechanical Interlocks.
Since we are providing an Automatic Throw Over, we are not providing these features.

Panelboard specifications call for Main lug interiors up to 400A to be field convertible to Main Breaker (Not offered)

Panelboard specifications call for Interior Phase bus to be pre-drilled to accomodate field installable options (Sub-feed lugs, Sub-feed breakers, Thru-Feed Lugs) (Not offered)

Panelboard specifications call for Mono-Flat Front. (Not offered)

We take exception to these requirements.

Panelboard specification for Breakers appears to be un-edited.

We are only quoting breaker features as indicated on the plans.

c. Exclusion(s)

1. Programming of Schneider PM8000 meters, Programming of existing Power Monitoring System, Battery System for LV SWGR, UPS, VFD's, SPD for Panel "DC", Spare Fuses, Spare Fuse Cabinet, Starters, Temporary Trailer, Modifications to existing equipment. ****Quoting HV & LV Swgr on transformers T3 & T4 as New.****

Disconnects are included only if they are shown on the One-line drawings.

Busway Product Family - Notes

a. Comment(s)

1. The quoted Bill of Material (BOM) is based on estimates at the time of quote configuration. The actual footage/fitting quantities will be determined when the fully dimensioned ABB drawings are available. As a result, if there is a change in actual quantities verses quoted quantities the adder will be provided for the additional material released on the project at this time. The Change Order PO must be issued before ABB will proceed with completion of the busway project.

Low Voltage Switchgear Product Family - Notes

a. Comment(s)

1. This job is planned to be built in Mebane, North Carolina, USA. Please verify that this will be acceptable to end user.
2. ABB Low Voltage Switchgear It is designed and tested in conformance with applicable standards of UL 1558 , CSA C22.2 NO 31 , ANSI/IEEE 37.20.1, ANSI C37.51. Any equipment requiring a UL 1558 or CSA labeling will be provided with a cUL us label. The switchgear is manufactured in an ISO 9001-certified facility.
3. Unless negotiated differently Drawings (Submittals), Testing, Quality, Warranty, Delivery and Transportation are as outlined below.
4. OPTIONAL MAINTENANCE & SAFETY FEATURES:
 - Ekip T&P - Programming and Test Unit \$2,904.00 net each
 - Breaker Remote Racker \$13,957.00 net each
 - Breaker Remote Racker Plate (Reliagear)..... \$966.00 net each
 - Portable Breaker Hoist (Crane) \$1,792.00 net each
 - Breaker Transfer Cart \$978.00 net each
 - Electrically Operated Breaker Test Box \$5,789.00 net each
5. TYPICAL ADDERS:
 - Visual Inspection of Equipment \$3,500.00 net (per 8 hr day)
 - Customer Witness Tests \$5,500.00 net (per 8 hr day)(adds 1 week To ship cycle) Please note, If the customer does Not purchase Witness Test at time of equipment order placement, price must be negotiated with Project Management Team and a revised ship schedule will be established based on current factory capacity/loading.
 - Open Top Truck(NYC & Chicago) \$1,750.00 per truck

(maximum of 10 vertical sections per truck)

6. SPARE PARTS:

Spare parts are not included in current quote. A list can be made available after order is released from engineering to manufacturing. Seller takes exception to any non-standard format or requirements for this list.

7. TYPICAL START UP SPARE PACKAGE:

Startup package includes the following items for a single ended substation. If line-up should have multiple sources, buyer may choose to add one package for each source of incoming power.

=> Typical start up package \$1,750.00 net each

- 100% replacement fuses for primary of CPT and PT circuits
- 20% replacement secondary control fuses
- Qty 5 interconnect terminal blocks/plugs
- Qty 5 customer access terminal blocks
- 100 ft of SIS control wire
- Qty 10 spare lamps for indicating lights (5 for red, 5 for green)
- Qty 20 control wiring terminals

8. Factory equipment quotation does not provide programming of customer settings for protective devices (relay/trip unit) Or communication mapping. These items, selective coordination, And all system studies should be quoted And provided by ABB Lifecycle Solutions (Engineering Services) Or the installing contractor. Items mentioned above are Not included In quotation BOM Or pricing.

9. FACTORY TESTS:

Contact Low Voltage Proposals Group for prices on special tests not listed below.

Standard tests performed during factory testing and Witness Test (optional):

- Device check
- Control lead check
- Stationary instrument transformer ground test
- Meter check (3-phase) & polarity check
- Control power check (sequence tests)
- Heater, lights, receptacle, and fan check
- Bus check - visual check of phases, neutral, and ground per drawing.
- Clearance check - inspection of bus, neutral, and devices for proper clearance
- Connection tightness
- Nameplate check
- Current/voltage transformer polarity check (visual)

The following tests are also performed during standard factory testing.

- Secondary hi-pot of control wiring (1500vac for 1 minute)
- Primary hi-pot of primary bus (2200v, 19kv or 36kv as required)

An adder Is required If hi-pot tests are required To be performed during Customer Witness tests.

ABB does not allow for witness or hold points in the manufacturing process. Should the customer like to inspect the equipment at any point during the manufacturing cycle, the factory will advise within five working days in advance when those milestone dates are approached. Customer will have responsibility to make necessary arrangements to attend inspection dates as communicated. Customer inspection(CI) requirements must be established at the time Of the order, Or through a formal change order process If CI requirements arise later In the execution Of the order.

10. The ABB Standard Documentation Package includes:

** For Approval (when required)

- a) Front View/Floor Plan - Arrangement with basic dimensions, device locations, 1-line, cable space, shipping sections, etc. This Is Not certified For construction.
- b) Summary (Bill of Material) - Breaker, device and nameplates.
- c) Elementary Drawing - 3-line schematic of current, potential and control circuits. Preliminary - no terminal numbers.

** Final Drawings

- a) Front View/Floor Plan - Final dimensions for construction.
- b) Summary - Final breaker, device and nameplate list.
- c) Final Elementary Drawing - 3-line schematic of all circuits with terminal numbers.
- d) Connection Diagram - Internal unit wiring diagrams.
- e) Interconnect Drawings - External and inter-unit connections.
- f) Instruction Books - For switchgear and all major items.

(Relay instruction books include time curves.)

g) Installation Drawings - Foundation requirements, loading/unloading And installation methods.

h) Certified Test Reports (If ordered)

If changes are made during factory testing, the affected sheets of the final drawings are reissued.

11. For Low voltage switchgear, the standard practice for LV breakers is for them to arrive after the gear ships from the factory. This is to allow customers to have time to set the gear, pull cables, make inter-unit connections, and not have breakers in the way where they may get damaged. If breakers are required on site at the same time of the switchgear, they will be shipped external to the switchgear, and an adder will be required.
12. Clarification to job scope, many assumptions were made with this specification provided. This quote is only limited to the attached BOM. If any deviation is required, then Seller reserves the right to update BOM and price accordingly.
13. In the event of conflicting information in the documents provided, seller is using the following order: DATA SHEET, DRAWING, SPECIFICATION.
14. Proposed switchgear is in conformance with applicable standards of ANSI, IEEE, NEMA & UL. Exception is taken to all other codes & standards. Note that NEC & NFPA refer to the actual installation, operation & maintenance of the equipment, not the design of the equipment. Seller has reviewed the NFPA standards, only NFPA 70 (the NEC Code), NFPA 70B (Recommended Practice for Electrical Equipment Maintenance) and NFPA 70E (Standard for Electrical Safety Requirements for Employee Workplaces) have any relevance to our product. 70B and 70E both apply directly to the safety and use of electrical equip. NFPA 70, is commonly called the NEC Code.
15. Seller is quoting Switchgear which is provided with Trip Units and/or solid state relays. Most relay functions such as Ammeter, Ammeter Switch, Voltmeter, Voltmeter Switch and Demand are performed by the trip unit integrated into the front of each Breaker. Seller is taking exception to providing a dedicated device for these functions if they are required.
16. Seller is quoting standard factory lead times. If customer requires lead times sooner than these estimates field sales will need to prenegotiate with factory.
17. Seller is quoting standard factory Switchgear submittals which will be per the SHIPMENT AND DRAWING SCHEDULE section below. If customer requires a shipment sooner than these estimates field sales will need to prenegotiate with factory. Optional price adders have been provided below and can be added at order entry.
18. Switchgear will be shipped per the DELIVERY AND TRANSPORTATION section below. All exception is taken to any shipping methods. Optional price adders have been provided below and can be added at order entry. Any STORAGE AND HANDLING is to be quoted and provided by others.
19. Seller is quoting standard ABB Terms and Conditions per section below. All exception is taken to any other T&C's and Liquidated Damages. If buyer finds seller's proposal competitive, seller will be glad to negotiate, in good faith, a mutually agreeable set of terms & conditions before the order is placed.
20. Any possible execution of field services, site coordination between switchgear and other products/devices, performance bonding, testing & training, short circuit studies or preliminary trip unit/relay settings are to be quoted and provided by others.
21. If required, any DC voltage to be quoted and provided by others.
22. Seller has provided an option for remote racking. The remote racking device for Emax2 breaker requires a plate to be mounted on the face of the breaker for operation. Seller has provided one plate for each main and tie breaker and an additional plate that can be utilized for the feeders and moved from breaker to breaker. If a mounting plate is required for each feeder, seller would gladly revise the bill of material and price accordingly.

23. TPHE Series SPD

Providing an ABB TPHE Series SPD per the BOM in our bid. The TPHE Series SPD is engineered for reliability, flexibility, and long surge life in the most extreme transient surge environments. The true maximum single surge current ratings are not limited by fusing or other serial components within the

surge discharge path like some other manufacturer's SPD devices.

The full TPHE assembly, including all fusing and components, is 3rd party tested to confirm that it is capable of surviving a single IEEE 8x20us surge current impulse per each mode, up to *200kA. The TPHE protects all available modes of the power system (L-N, L-G, L-L and N-G) and is offered in per mode ratings of 125kA, 150kA, 200kA or 300kA per mode (equal to 250kA, 300kA, 400kA And 600kA per phase). Per phase ratings are the aggregate sum of the combined L-N and L-G tested modes and are provided for comparison only since per phase ratings are not specifically endorsed by standards organizations within the SPD industry.

ABB has not included a circuit breaker to feed the SPD device due to its additional impedance. The provided SPD comes with a surge rated 4-pole disconnect which allows the SPD to be 'turned off'.

b. Deviation(s)

1. The Project Specification Review attachment references important clarifications and deviations to customer's specifications and/or drawings that shall be applied in the equipment to be manufactured and offered in this quote. In case of discrepancy and/or clarification, notify and review with your sales representative.

Uploading in Empower saves a record of your original CDE file on the quote version for reference as needed. File attachment in empower cannot be edited or deleted by anyone but the file creator!

Medium Voltage Switchgear Product Family - Notes

a. Comment(s)

1. Material shortage clause

"The Parties are aware of the shortage of raw materials, electronic components worldwide which is likely to last for the foreseeable future, as well as of market fluctuations in the availability and cost of other raw materials, commodities, other critical components and transportation capacities. Notwithstanding anything to the contrary in the contract/terms and conditions/purchase order, if after the date of ABB's proposal / offer or during the term of the performance of the contract/purchase order there are any changes to availability and / or market conditions for electronic components, raw materials, commodities and transportation capabilities directly or indirectly affecting ABB's performance, ABB shall be entitled to relief in the schedule of the performance or delivery of the directly or indirectly affected scope of work under the contract/purchase order. In such circumstances, the Parties shall meet without delay and discuss in good faith to find a mutually agreeable solution, with equitable adjustment to the contract/purchase order date of delivery or completion. Customer hereby acknowledges and agrees that in said circumstances ABB may not be able to comply with the originally agreed delivery or completion schedule and that ABB shall not be liable for any liquidated or actual damages in connection thereto."

Transportation cost clause

"The offer is based on [CPT (Carriage Paid To) Destination: Switchgear is loaded onto truck and shipped to named destination. Offer does not include offloading of switchgear. ABB Standard inland packing applies]. Due to current fluctuations in transportation cost, the transportation cost is given as a separate line item and is to be considered a non-binding estimate based on current market prices. At the time of delivery, ABB will use reasonable efforts to get optimum transport arrangements, and the actual cost will be invoiced by ABB to the Purchaser. In no case will ABB be liable for any increase in transportation cost at the time of delivery."

Price escalation clause

Prices are firm until [30 days] except they are subject to adjustment as follows: On the day the Purchase Order is received, the prices are subject to adjustment if the cost of labor, copper and/or steel has increased by more than 2% since the date of bid submission or last price adjustment based on local labor index from the country of manufacture, London Metal Exchange (www.lme.com) LME Copper rates for copper and CRU Group (<https://cruonline.crugroup.com>) for steel. In such case ABB reserves the right to adjust the price to include the respective increase.

Standard Price Adjustment Clause 7A

The prices stated herein are subject to adjustment to reflect changes in the Producer Price Index, PPI, and the date of release for manufacture. The adjustment hereunder shall be determined from Bureau of Labor Statistics data.

1. Definitions

For the purpose of this provision the following definitions apply:

- a. The "Switchgear and Switchboard Apparatus Manufacturer Index" (Series Id: pcu335313335313) as determined and published monthly by the Bureau of Labor Statistics of the U.S. Department of Labor

in "Producer Prices and Price Indexes" will be applied to all products.

b. The "Base Switchgear and Switchboard Apparatus Manufacturer Index" shall be the latest final Switchgear and Switchboard Apparatus Manufacturer Index that is published on the date 12/17/2025. An index is "published" when it appears in an issue of "Monthly Labor Review" or "Producer Prices and Price Indexes", as applicable, which can be obtained from the Washington office of the Bureau of Labor Statistics.

c. An index is "final" when it appears in the appropriate publication given in (c) above, without a superscript "p" which identifies it as preliminary.

2. Adjustment for Increased of Index Costs:

a. Each payment shall be adjusted for any change relevant Index. The adjustment shall be equal to the percent by which the latest final Index, which is published at the time of release, is greater than the Baseline Index (Outlined above in 1 b), subject to the following bounds.

MV SWGR

Escalation Bounds: (Based on Standard Lead Time release to manufacturing date/drawing approval date when a PO is received by Planned Order Date - TBD)

Approval occurs:

1. Planned Order Date through Required Drawing Approval Date; Fixed Price

2. Required Drawing approval date through 30 days after required drawing approval date; the greater of the following:

- 2% increase over base price or;
 - Adjustment as defined in (a) above
3. Greater than 30 days from required drawing approval date;
- Remaining unreleased material to be repriced at market value

3. General

a. The Base Switchgear and Switchboard Apparatus Manufacturer Index shall be determined to the nearest first decimal place. In either case, if the next succeeding place is five or more, the preceding decimal place shall be raised to the next highest figure.

b. Should the indexes specified in the above paragraphs be discontinued, or should the basis of their calculation be modified, the Company shall substitute equivalent indexes.

c. Above Price Adjustment clause does not negate the need for schedule adjustments. Any delay in drawing approval can impact delivery schedule.

Reference Links

Producer Price Index SWGR - https://data.bls.gov/timeseries/PCU335313335313?data_tool=XGtable

Base Switchgear and Switchboard Apparatus Manufacturer Index

Series Id: pcu335313335313

Tarif Price Adjustment

Seller shall have the right to adjust the Agreement Price in the event of a Change in Law affecting the cost of materials, labor, or other contributory costs that are put into effect after the Effective Date of this Agreement which are beyond the reasonable control of the Seller. Such Change in Law events shall include, but not limited to, a change in national tariffs, tax treaties, or trade agreements. In the event of a Change in Law, Seller shall be entitled to a Change Order, in accordance with the terms of this Agreement, with an equitable adjustment to the Agreement Price and/or the schedule for performance.

Hyperinflation

In the event of unusual and significant changes in the raw material costs of produced products, due to hyperinflationary circumstances not captured by the Switchgear and Switchboard Apparatus Manufacturer Index, the Power and Distribution Transformers Manufacturer Index, or the Comex CU Spot Price, the Seller may adjust the discount multipliers by a factor other than the index as described in 1A above.

Unusual Market Volatility

The Parties are aware of the challenges related to outbreaks, epidemics, government regulations and acts of governmental authorities (including sanctions), civil unrest, and general shortages of electronic components and elements, market volatility, availability and cost of raw materials, commodities, costs and capacities that may impact the normal business activity and the delivery dates and/or the execution of the scope, the impacts of which are currently unknown. Notwithstanding anything in the proposal to the contrary, if as a result of any of the above aforementioned events, the costs of ABB's performance

increase or ABB's performance obligations are materially adversely affected or delayed, the Parties in the spirit of cooperation, will work together in good faith and within a reasonable time after the invocation of this Clause, to negotiate alternative contractual terms in terms of equitable adjustments to delivery and/or possible reductions of the contractually owed quantity of the Goods to be delivered to the Buyer. The aforementioned shall be performed with a view to employing reasonable efforts to ensure that the PO can be at least fulfilled in part.

Delivery Schedule:

Contract drawings, information submittals, manufacturing, and shipment schedules will follow the outline below and are contingent on customer approval in the timeframe indicated:

Approval Drawings – Class I & II: 10 - 12 weeks after receipt of purchase order.

Customer drawing approval time: 2 weeks to keep order timeline on schedule.

Switchgear Ready for Shipment: 28 weeks after return of approved drawings and release to manufacture.

TOTAL Typical LEAD TIME: 40– 42 weeks** (with 2 weeks customer approval)

**Lead time shall be confirmed at the time of Order acknowledgement.

If the approval drawings and all necessary information are not returned approved and released for manufacture within the timeframe specified above, this project becomes subject to delay.

Timeline is based on current production and engineering and shop loading at time of order placement and is subject to change based on loading at the time of order receipt.

Date span from "release for manufacturing" to "shipment" is determined by the lead time on that date.

The scheduled delivery dates shall be presented in the order acknowledgement letter provided by the project manager. If the approval drawings are not returned within the time frame listed above, the time of delay shall be given by the project manager.

To expedite order acceptance, please provide the following information on your purchase order documents:

- Reference to ABB Quote number and date of submittal.
- List items numbers included in the quotation by copying the item list & pricing information.
- Reference to the agreed terms and conditions, delivery terms and payment terms (Net 30). If order amount is greater than \$500,000.00, please include the following milestone payments on the PO
 - o 20% upon delivery of drawings
 - o 30% upon release of equipment
 - o 50% upon shipment
- Freight terms (CPT), "Ship To" address and required delivery date.
- E-mail address for the transmittal of drawings, and file.
- Agreed warranty period (months/years).
- Taxable status – if Tax Exempt, please send certificate with PO documents.
- P. O. must include multiple line items as defined per the ABB offering.
- Requested delivery date.

***For MV SWITCHGEAR COMMENTS and / or CLARIFICATIONS to Customer's Specification (s) and/or Drawing (s) please refer to "CDE-R0_UAP-00000560_MVSWGR.pdf" document attached at Empower quote Tab "Attachments". ***

PROPRIETARY AND CONFIDENTIAL INFORMATION

This document contains confidential and proprietary information. By accepting this document, the recipient agrees not to disclose its contents except to individuals within their organization who are directly involved in evaluating this proposal. No copies may be made without prior written permission. Upon written request, this document must be returned.

Summarized Bill of Material(s)

Quantity	Description	Item(s)	Mark(s)
5	Medium Voltage Switchgear	1	15KV SWGR 'MDS15'
		2	PLENUM
		3	ACCESSORIES
		4	SPARE PARTS
		5	FREIGHT
4	Low Voltage Switchgear	10	MTM1
		11	MTM2 - OPEN
		12	MAIN 1
		13	MAIN 2
2	Secondary Substation Transformer	15	3500 KVA
16	Panelboard	16	MDP-NE
		17	LP-LH
		18	CP
		19	LR
		20	CP-1
		21	V-1 RH
		22	V-1
		23	V1A
		24	PP
		25	WELDER/PLASMA CUTTER
		26	N/E
		27	NE
		28	NE2
		29	RP
		30	HP
		31	DC
1	Transformer	32	T-RP
15	Switches and Disconnects	33	VFD DISCONNECT
		34	ELEVATOR CONTROL SW
		50	450A FUSIBLE DISC
		51	500A FUSIBLE DISC
6	Busway	52	650A FUSIBLE DISC
		35	BUS MTM1-T1
		36	BUS MTM1-T2
		37	BUS MTM1-MDS1
		38	BUS MTM1-MDS2
2	Bus Duct	39	BUS MTM2-T5
		40	BUS MTM2-T6
2	Bus Duct	41	4160V 2000A NSB RUN1
		42	4160V 2000A NSB RUN2
1	Switchboard	49	TEMP SWBD
1	Load Interrupter Switch	53	TEMP CHILLER DISC
2	5kV Drawout Breaker 2000A Close Couple to XFMR with PM8240 Meter	6	
2	5kV Drawout Breaker 2000A Close Couple to LIS7 with PM8240 Meter	7	
2	12.4kV Drawout Breaker 600A Close Couple to XFMR	8	

Quantity	Description	Item(s)	Mark(s)
1	Switchgear "MDS5" - (2) 2000 Drawout Main Breakers, (5) Fusible Branch Switches with Fuses- PM8214	9	
4	Battery System for LV Switchgear	14	BATTERY SYSTEM
1	Power Study - Base Study	43	
1	Power Study - Load Flow Study Adder	44	
1	Power Study - Harmonic Study Adder	45	
1	Startup Assistance - SWGR and SWBD's		
1	Temporary Equipment	47	
1	Temporary 4160V-480V 1500kva XFMR	48	

Total Net Price

The total net price for the item(s) defined in this quotation is:

\$8,995,964. Net Contractor Cost

Quote includes Temporary Chiller 5kV Disconnect, Temporary 4160V Transformer, Temporary Switchboard, or Temporary Chiller Disconnects.

This version includes "MTM1" as LV Switchgear (BB#2, 3, & 4)

Note: They want BB#1 to have MTM1 as a SWBD. (I'm sure they expect the SWBD to be cheaper than the LV SWGR... it is not)

ADDER to Provide "MTM1" as Switchboard \$ 17,850

Includes Power Studies by third party (Not ABB as spec'd)

Does NOT include Arc Flash Training

Includes estimated line items for Substation T3 & T4 Primary and Secondary MV Breakers (Metal-Clad)(I have sent RFQ to Advance SWGR to quote these)

Includes MDS5 with Metal Clad Main Breakers, and Metal Enclosed LIS fused branches with PM8240 on each branch

This includes MV Busway (Contractor to verify lengths)

This includes LV Busway (Contractor to verify lengths).

Does not include VFD's, UPS's, PMCS System, Programming of PM8000's to communicate with PMCS, Loose PM8000's for other existing equipment, SPD for DC Panel (Not offered).

See the attached Marked Up One-Lines for your customer to review Green Items included in proposal, and Red items not included.

Summary of Proposal

Estimated Lead Time

The lead times contained in this proposal are for estimating purposes only and do not include approval drawing cycle, factory holidays/shutdowns, witness testing, or transit time. Lead-times are subject to change and may require staggered shipments beyond stated lead times. Please contact ABB if firm or alternate lead times are required.

Item No.	Product Description	Mark(s)	Estimated Lead Time (Weeks)	Quantity
1	Medium Voltage Switchgear, SafeGear, T2B/15kV/50kA/1200A (A01)	15KV SWGR 'MDS15'	42	1
2	Medium Voltage Switchgear, Plenum, (A02)	PLENUM	42	1
3	Medium Voltage Switchgear, Accessories, (A03)	ACCESSORIES	42	1
4	Medium Voltage Switchgear, Spare Parts, (A04)	SPARE PARTS	42	1
5	Medium Voltage Switchgear, Freight, (A05)	FREIGHT	42	1
6	5kV Drawout Breaker 2000A Close Couple to XFMR with PM8240 Meter		CONTACT ABB SALES	2
7	5kV Drawout Breaker 2000A Close Couple to LIS with PM8240 Meter		CONTACT ABB SALES	2
8	12.4kV Drawout Breaker 600A Close Couple to XFMR		CONTACT ABB SALES	2
9	Switchgear "MDS5" - (2) 2000 Drawout Main Breakers, (5) Fusible Branch Switches with Fuses- PM8214		CONTACT ABB SALES	1
10	Low Voltage Switchgear, Reliagear	MTM1	CONTACT ABB SALES	1
11	Low Voltage Switchgear, Reliagear	MTM2 - OPEN	CONTACT ABB SALES	1
12	Low Voltage Switchgear, Reliagear	MAIN 1	CONTACT ABB SALES	1
13	Low Voltage Switchgear, Reliagear	MAIN 2	CONTACT ABB SALES	1
14	Battery System for LV Switchgear	BATTERY SYSTEM	CONTACT ABB SALES	4
15	SEPS Secondary Substation Transformer, Vent Dry	3500 KVA	CONTACT ABB SALES	2
16	Power Panelboard, ReliaGear neXT	MDP-NE	8	1
17	Lighting Panelboard, ReliaGear RQ	LP-LH	8	1
18	Lighting Panelboard, ReliaGear RQ	CP	8	1
19	Lighting Panelboard, ReliaGear RQ	LR	8	1
20	Lighting Panelboard, ReliaGear RQ	CP-1	8	1
21	Lighting Panelboard, ReliaGear RS	V-1 RH	16	1
22	Lighting Panelboard, ReliaGear RS	V-1	16	1
23	Lighting Panelboard, ReliaGear RS	V1A	16	1
24	Lighting Panelboard, ReliaGear RS	PP	16	1
25	Lighting Panelboard, ReliaGear RS	WELDER/PLASMA CUTTER	16	1
26	Lighting Panelboard, ReliaGear RQ	N/E	8	1
27	Lighting Panelboard, ReliaGear RS	NE	16	1
28	Lighting Panelboard, ReliaGear RS	NE2	16	1
29	Lighting Panelboard, ReliaGear RQ	RP	8	1
30	Lighting Panelboard, ReliaGear RS	HP	16	1
31	Lighting Panelboard, ReliaGear RE	DC	6	1
32	Transformer, Copper, 9T10C1002G32	T-RP	6	1
33	Switches and Disconnects, Heavy Duty Safety Switch, THN3366A1	VFD DISCONNECT	CHECK AVAILABILITY	3
34	Switches and Disconnects, Elevator Disconnect, ES6T48R1KGN1A	ELEVATOR CONTROL SW	8	1
35	Busway, ReliaGear Series Busway	BUS MTM1-T1	28	1
36	Busway, ReliaGear Series Busway	BUS MTM1-T2	28	1
37	Busway, ReliaGear Series Busway	BUS MTM1-MDS1	28	1
38	Busway, ReliaGear Series Busway	BUS MTM1-MDS2	28	1
39	Busway, ReliaGear Series Busway	BUS MTM2-T5	28	1
40	Busway, ReliaGear Series Busway	BUS MTM2-T6	28	1
41	SEPS Bus Duct	4160V 2000A NSB RUN1	CONTACT ABB SALES	1
42	SEPS Bus Duct	4160V 2000A NSB RUN2	CONTACT ABB SALES	1
43	Power Study - Base Study		CONTACT ABB SALES	1
44	Power Study - Load Flow Study Adder		CONTACT ABB SALES	1

Item No.	Product Description	Mark(s)	Estimated Lead Time (Weeks)	Quantity
45	Power Study - Harmonic Study Adder		CONTACT ABB SALES	1
46	Startup Assistance - SWGR and SWBD's		CONTACT ABB SALES	1
47	Temporary Equipment		CONTACT ABB SALES	1
48	Temporary 4160V-480V 1500kva XFMR		CONTACT ABB SALES	1
49	Switchboard, ReliaGear Configured, RG-GM-CBSB-CTO	TEMP SWBD	16	1
50	Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR	450A FUSIBLE DISC	CHECK AVAILABILITY	3
51	Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR	500A FUSIBLE DISC	CHECK AVAILABILITY	5
52	Switches and Disconnects, Heavy Duty Safety Switch, TC72367R	650A FUSIBLE DISC	CHECK AVAILABILITY	3
53	Load Interrupter Switch, VersaRupter	TEMP CHILLER DISC	33	1

Bill of Material(s)

Item No.	Quantity	Description
1	1	Medium Voltage Switchgear, SafeGear, T2B/15kV/50kA/1200A (A01) Marks: 15KV SWGR 'MDS15' SafeGear® Arc-Resistant Metal-Clad Switchgear A/R-Rating Type 2B, 10-cycle arc duration per IEEE C37.20.7 Enclosure: Indoor, ANSI # 61 Light Gray enamel Bus System: 15 kV Max Rated Voltage, 60 Hz System Voltage - 13.80 kV Rated Main Bus Current - 1200 A Short-CircuitCurrent-50 kA 1 System, 3-phase, 3-wire Delta System Switchgear shall be designed and manufactured in accordance with the standards of ANSI / IEEE Dimensions and Weight (Estimated) Height: 95 Inches; Width : 252 Inches; Depth: 85 Inches Weight: 18711 lbs. Bus Insulation: Main Bus Support: Molded Epoxy Primary Bushings: Molded Epoxy Standoff Insulators: Molded Epoxy Bus Material is 98% Copper with silver-plated joints Bus Insulation is fluidized bed baked-on epoxy with vinyl boots over joints Ground Bus, ¼ in x 2 in, solid copper, tin plated, continuous throughout lineup and extended to the rear of the frame Wiring: AC Control Bus is 40 A, 1-ph, 3-wire circuit with #8 AWG connected to power terminal blocks DC Control Bus is 40 A, 2-wire circuit with #8 AWG connected to power terminal blocks Breaker Charging Motor Voltage 125 V dc Breaker Closing Voltage 125 V dc Breaker Opening Voltage 125 V dc All control wire is #14 AWG minimum, multi-stranded extra-flexible, SIS 600 V flame retardant wire gray color for control, green color for ground All CT circuits will be #10 AWG, multi-stranded extra-flexible, SIS 600 V flame retardant, gray wire UL-rated, 600 V, 30 A, 35 mm DIN-rail mount barrier type terminal block For control circuits a maximum of two wires per terminal point 20% additional terminal blocks per frame Ring-tongue, Vinyl pre-insulated Slip-on destination type wire markers, white with black letters Pre-wired harness to terminal block from the following devices: Breaker control secondary, 52TOC switch, CT's & PT's 2 EnRack Plus Pendant Controller, 120/240VAC 2 Cat 5E/6E Ethernet Cable, 50ft, used to connect pendant to cable port on LV door. RJ45 connectors at both ends Additional Features: Circuit breakers will be shipped in bottom breaker compartments. Circuit breakers belonging to top breaker compartments will be shipped separately 1 Breaker Control Transfer Scheme, 3-breaker, close-transition (25 / 27 / 47 / 59) 1 O&M Manuals, via electronic media on compact disc 2 Level 2 - Factory Witness Test (FWT), 3-people for # of days . A01 : Frame Sequence 1 (1200A FDRS) 1200A Feeder Breaker - LV Instrument Panel (19") - 1200A Feeder Breaker Breaker A/B: 1 CT Sec Wire Harness, multi ratio, set of (3) 3 CT / PT Production Test Reports 1 CT Sec Wire Harness, multi ratio, set of (3)

Bill of Material(s)

3	CT / PT Production Test Reports
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"A"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Breaker D/E:
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched

Bill of Material(s)

- 1 Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
- 1 EnRack Controller Module, Basic or Plus, 120VAC
- 1 EnRack Plus Relay Module, 120/240VAC
- 1 Racking Motor Overcurrent Relay
- 1 Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
- 1 RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
- 1 Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
- 1 Cable Harness, D-sub connector on top breaker to terminal blocks
- 1 Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
- 1 E90 Class CCFH 2P, 30A, 600V
- 1 Time Delay, 5A, 250V, Type ATDR

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, 2-high, 1.2 kAF Main or Feeder - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R End Panel Assembly - standard depth
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 2 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, End Frame - 1200 A
- 1 Cable Support Assembly
- 1 Cable Support Assembly
- 1 Cable Lug Boot, 3-ph, 1200 A
- 1 Cable Lug Boot, 3-ph, 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V
- 1 Ground Cable Lugs, compression type, #4/0 AWG
- 1 Cable Lugs, compression type, 2-hole, set of (3), up to #4/0 AWG
- 1 Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 19 in high, with MPL Door
- 3 Door Stop Assembly
- 1 DC Control Bus, 40 A 2-wire
- 1 AC Control Bus, 40 A 1ph 3-wire
- 1 DC Control Bus, MCCB, 40 A 250 V dc 2-pole, UL
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 1 Molded Case Circuit Breaker, 40 A 22 kA 480 V 3-pole, UL
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL
- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 2 Indicating Lamp LED
- 2 Indicating Lamp LED
- 4 Test Switch, ABB FT-1, 10-pole
- 2 PM8244 Intermediate Power Meter, DIN rail mount + remote display
- 2 (PM8) Digital I/O Module - 6 digital inputs, 2 relay outputs
 - # Note: All Devices for this frame that cannot be fit in the 19" Instrument
- 1 Compartment Door will be mounted on the adjacent 38" or 57" Instrument Compartment Door.
- 2 # P/N: 751001A1A0X0X85B200 (751#MHJB); SEL-751 Feeder Protection Relay

A01 : Frame Sequence 2 (MAIN 1)

LV Instrument Panel (57") - 1200A Main Breaker

Breaker D/E:

- 1 CT Sec Wire Harness, multi ratio, set of (3)

Bill of Material(s)

3	CT / PT Production Test Reports
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Surge Arrester Mounting Assembly, Dist / Intmed Class
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
1	Surge Arrester, Distribution Class, ABB POLIM-D, 18kV, 15.3kV MCOV (set of 3)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for
1	2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector,
1	Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45
1	connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC
1	and 90-300 VDC, Output 24 VDC / 10 A
1	Selector Switch 2-position, Type M2SS1-10B, 2 Position, Maintained, operator only
1	(needs holder & contact block)
1	Contact Block with Holder For Pilot Device, 1 NO & 1 NC, Type MCBH-11, Front
1	Mounting
1	Contact Block For Pilot Device, 1NC, Type MCB-01 (Without Holder)
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Frames:
1	Shipping Base Assembly - Indoor, set per cubicle
1	A/R type 2 Base Frame, 1-high, 1.2 kAF Main or Feeder - std depth
1	Main Bus, 1200 A, 50 kA, 3-phase, polyester support
1	A/R Rear Panels, Split Bolted with handles
1	A/R type 2B Construction, per frame
1	Front Door Adder - SmartRack Assembly (Electric Racking)
1	A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
1	Cable Support Assembly
1	Cable Lug Boot, 3-ph, 1200 A
1	Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
1	Strip Heater Circuit, Total 300 W applied at 1/2 V
2	Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM
	LV Instrument:
1	A/R type 2 Instrument Compartment - 57 in high, with MPL Door
2	Door Stop Assembly
1	DC Control Bus, 40 A 2-wire

Bill of Material(s)

- 1 AC Control Bus, 40 A 1ph 3-wire
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL
- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 2 Indicating Lamp LED
- 3 Test Switch, ABB FT-1, 10-pole
- 1 ION9200, Power Quality Meter, DIN mount, 7.56"-display, B2B adapter, HW kit
- 1 (9200) Remote Display, color touchscreen, 7.56" x 7.56" window
- 1 (9200) I/O Module, 2 relay outputs, 6 digital inputs
- 1 (86) Lockout Relay, ES - LOR, manual-reset, 2-deck (4)NO, (4)NC
- 1 # P/N: 751401ACACA7085A200 (751#F6C7); SEL-751 Feeder Protection Relay
- 1 # P/N: 2730M0ARAX1111CCCCX0 (2730M#28CN); Managed 24-Port Ethernet
- 1 Switch
- 1 # Lot of CAT6 Ethernet Cable and connectors for Relay and Ethernet Switch
- 1 (internal wiring)
- 1 # Senseor Power Supply
- 1 # Senseor HMI with mounting kit

.

A01 : Frame Sequence 3 (LPTs; BPTs)

Line PT - LV Instrument Panel (19") - Bus PT

PT A/B:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

PT D/E:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, Auxiliary, Tie Transition - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 2 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 19 in high, with MPL Door
 - 3 Door Stop Assembly
 - 1 DC Control Bus, 40 A 2-wire
 - 1 AC Control Bus, 40 A 1ph 3-wire
 - 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
 - 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
 - 1 20% Spare Terminal Blocks
 - 1 Wired to Terminal Block, unused relay contacts
 - 1 Wire Markers - SPECIAL
- .

Bill of Material(s)

A01 : Frame Sequence 4 (TIE)

LV Instrument Panel (57") - 1200A Tie Breaker

Breaker D/E:

- 1 CT Sec Wire Harness, single ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, single ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, multi ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 (C) Motorized truck 125VDC with protection
- 1 # 10 AWG, CT Secondary Wiring
- 1 ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
- 1 Breaker Interrupting Time = 3 cycle
- 1 Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
- 1 Breaker Auxiliary Switch, 16-pole (9a, 7b)
- 3 Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
- 3 Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
- 1 Circuit Breaker Production Test Reports
- 1 A/R type 2 Breaker Compartment, Pos "B" - 1200A (40&50kA) Epoxy
- 1 Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
- 1 (52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
- 3 Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
- 1 Padlock Provisions - Hinged Panel
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
- 1 Breaker Door Interlock with Defeat-Reset Features
- 1 Interlock, door with breaker in disconnect position, defeatable
- 1 Interlock, prevent breaker racking unless door is closed and latched
- 1 EnRack Controller Module, Basic or Plus, 120VAC
- 1 Tie and Transition Phase Bus Assembly, 1200 A
- 1 EnRack Plus Relay Module, 120/240VAC
- 1 Racking Motor Overcurrent Relay
- 1 Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
- 1 RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
- 1 Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
- 1 Cable Harness, D-sub connector on top breaker to terminal blocks
- 1 Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
- 1 E90 Class CCFH 2P, 30A, 600V
- 1 Time Delay, 5A, 250V, Type ATDR

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, 1-high, 1.2 kAF Tie Breaker - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 1 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 57 in high, with MPL Door
- 2 Door Stop Assembly
- 1 DC Control Bus, 40 A 2-wire
- 1 AC Control Bus, 40 A 1ph 3-wire
- 2 Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL

Bill of Material(s)

- 1 Breaker Control Switch, pistol, (1)C & (1)T
- 2 Indicating Lamp LED
- 3 Test Switch, ABB FT-1, 10-pole
- 2 (86) Lockout Relay, ES - LOR, manual-reset, 10-deck (20)NO, (20)NC
- 1 (86) Lockout Relay, ES - LOR, manual-reset, 2-deck (4)NO, (4)NC
- 1 # P/N: 751401AA0CA7085A200 (751#8MHJ); SEL-751 Feeder Protection Relay
- 1 # SEL M-T-M Quickset Design Template Parametrization
- 2 # P/N: 0587Z0X635312XX (587Z#F93X); SEL-587Z High-Impedance Differential Relay

.

A01 : Frame Sequence 5 (LPTs; BPTs)

Line PT - LV Instrument Panel (19") - Bus PT

PT A/B:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

PT D/E:

- 2 CT / PT Production Test Reports
- 1 PT Sec Wire Harness, Open-Delta
- 1 A/R type 2 PT Enclosure Assembly, 38 in high (40 and 50 kA)
- 1 PT Assembly, Drawout, 15 kV, Open-Delta connection
- 2 Potential Transformer, ABB type VIZ-11, 14400-120 V, Line-Line
- 4 PT Primary Fuse, Type 15CLPT-.5, 11-1/2 in Clip Centers
- 1 38 in PT Compt Parts Adder, Open-Delta - polyester, upper connection
- 1 Multi-Point Latch, Turn-Handle - A/R 38 in PT Door (50 kA)

Frames:

- 1 Shipping Base Assembly - Indoor, set per cubicle
- 1 A/R type 2 Base Frame, Auxiliary - std depth
- 1 Main Bus, 1200 A, 50 kA, 3-phase, polyester support
- 1 A/R Rear Panels, Split Bolted with handles
- 1 A/R type 2B Construction, per frame
- 2 Front Door Adder - SmartRack Assembly (Electric Racking)
- 1 A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
- 1 Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
- 1 Strip Heater Circuit, Total 300 W applied at 1/2 V

LV Instrument:

- 1 A/R type 2 Instrument Compartment - 19 in high, with MPL Door
- 3 Door Stop Assembly
- 1 DC Control Bus, 40 A 2-wire
- 1 AC Control Bus, 40 A 1ph 3-wire
- 1 Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
- 1 Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
- 1 20% Spare Terminal Blocks
- 1 Wired to Terminal Block, unused relay contacts
- 1 Wire Markers - SPECIAL

.

A01 : Frame Sequence 6 (MAIN 2)

LV Instrument Panel (57") - 1200A Main Breaker

Breaker D/E:

- 1 CT Sec Wire Harness, multi ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, single ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 CT Sec Wire Harness, multi ratio, set of (3)
- 3 CT / PT Production Test Reports
- 1 (C) Motorized truck 125VDC with protection
- 1 # 10 AWG, CT Secondary Wiring
- 1 ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA

Bill of Material(s)

1	Surge Arrester Mounting Assembly, Dist / Intmed Class
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
1	Surge Arrester, Distribution Class, ABB POLIM-D, 18kV, 15.3kV MCOV (set of 3)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
3	Current Transformer, ABB type SAB-1, 1200-5A multi-ratio, C200 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
1	Selector Switch 2-position, Type M2SS1-10B, 2 Position, Maintained, operator only (needs holder & contact block)
1	Contact Block with Holder For Pilot Device, 1 NO & 1 NC, Type MCBH-11, Front Mounting
1	Contact Block For Pilot Device, 1NC, Type MCB-01 (Without Holder)
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Frames:
1	Shipping Base Assembly - Indoor, set per cubicle
1	A/R type 2 Base Frame, 1-high, 1.2 kAF Main or Feeder - std depth
1	Main Bus, 1200 A, 50 kA, 3-phase, polyester support
1	A/R Rear Panels, Split Bolted with handles
1	A/R type 2B Construction, per frame
1	Front Door Adder - SmartRack Assembly (Electric Racking)
1	A/R External Plenum Assembly, 36 in W, Intermediate - 1200 A
1	Cable Support Assembly
1	Cable Lug Boot, 3-ph, 1200 A
1	Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
1	Strip Heater Circuit, Total 300 W applied at 1/2 V
2	Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM
	LV Instrument:
1	A/R type 2 Instrument Compartment - 57 in high, with MPL Door
2	Door Stop Assembly
1	DC Control Bus, 40 A 2-wire
1	AC Control Bus, 40 A 1ph 3-wire
2	Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
1	Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
1	Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
1	20% Spare Terminal Blocks
1	Wired to Terminal Block, unused relay contacts
1	Wire Markers - SPECIAL
1	Breaker Control Switch, pistol, (1)C & (1)T

Bill of Material(s)

2	Indicating Lamp LED
3	Test Switch, ABB FT-1, 10-pole
1	ION9200, Power Quality Meter, DIN mount, 7.56"-display, B2B adapter, HW kit
1	(9200) Remote Display, color touchscreen, 7.56" x 7.56" window
1	(9200) I/O Module, 2 relay outputs, 6 digital inputs
1	(86) Lockout Relay, ES - LOR, manual-reset, 2-deck (4)NO, (4)NC
1	# P/N: 751401ACACA7085A200 (751#F6C7); SEL-751 Feeder Protection Relay
1	# P/N: 2730M0ARAX1111CCCCX0 (2730M#28CN); Managed 24-Port Ethernet
1	Switch
1	# Lot of CAT6 Ethernet Cable and connectors for Relay and Ethernet Switch
1	(internal wiring)
1	# Sensor HMI with mounting kit
	.
	A01 : Frame Sequence 7 (1200A FDRS)
	1200A Feeder Breaker - LV Instrument Panel (19") - 1200A Feeder Breaker
	Breaker A/B:
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"A"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for
1	2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector,
1	Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45
1	connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC
1	and 90-300 VDC, Output 24 VDC / 10 A
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Breaker D/E:
1	CT Sec Wire Harness, single ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports
1	CT Sec Wire Harness, multi ratio, set of (3)
3	CT / PT Production Test Reports

Bill of Material(s)

1	(C) Motorized truck 125VDC with protection
1	# 10 AWG, CT Secondary Wiring
1	ADVAC M4 Circuit Breaker, Drawout, 15 kV, 1200 A, 50 kA
1	Breaker Interrupting Time = 3 cycle
1	Capacitor Switching Rating = 1,000 A C2 19 kA Peak 2.8 kHz
1	Breaker Auxiliary Switch, 16-pole (9a, 7b)
3	Current Transformer, ABB type SAB-1, 1200-5 A single-ratio, C200 accuracy
1	Circuit Breaker Production Test Reports
1	A/Rtype2BreakerCompartment,Pos"B"-1200A(40&50kA)Epoxy
1	Breaker Secondary Disconnect Assembly - dual plug - wired to terminal block
1	(52H) TOC Switch Assembly, 8-pole, (4) "a" and (4) "b" contacts
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
3	Current Transformer, ABB type SAB-1, 600-5A multi-ratio, C100 accuracy
1	Padlock Provisions - Hinged Panel
1	Breaker Interlock Assembly - padlocking
1	Multi-Point Latch, Turn-Handle - A/R 38 in Bkr Door (50 kA)
1	Breaker Door Interlock with Defeat-Reset Features
1	Interlock, door with breaker in disconnect position, defeatable
1	Interlock, prevent breaker racking unless door is closed and latched
1	Bus Riser to Lug Pad from breaker, bottom entry - 1200 A
1	EnRack Controller Module, Basic or Plus, 120VAC
1	EnRack Plus Relay Module, 120/240VAC
1	Racking Motor Overcurrent Relay
1	Socket, Plug-In Relay, 14 Pin, Screw Terminals, DIN Rail Mounting, Type CR-M4LS, for 2 or 4 c/o (SPDT) contacts
1	RJ45 Bulkhead Coupler for Cat5/Cat6, Female to Female Panel Mount RJ45 Connector, Shielded, Industrial, with Dust Cap Waterproof- IP68, TAA
1	Cat 5E/6E cable, used to connect cable port on LV door to Relay/Control Modules. RJ45 connector on one end only
1	Cable Harness, D-sub connector on top breaker to terminal blocks
1	Power Supply, Type CP-C.1 24/10.0 for DIN Rail Mounting, Input Voltage 100-240 VAC and 90-300 VDC, Output 24 VDC / 10 A
1	E90 Class CCFH 2P, 30A, 600V
1	Time Delay, 5A, 250V, Type ATDR
	Frames:
1	Shipping Base Assembly - Indoor, set per cubicle
1	A/R type 2 Base Frame, 2-high, 1.2 kAF Main or Feeder - std depth
1	A/R End Panel Assembly - standard depth
1	A/R Rear Panels, Split Bolted with handles
1	A/R type 2B Construction, per frame
2	Front Door Adder - SmartRack Assembly (Electric Racking)
1	A/R External Plenum Assembly, 36 in W, End Frame - 1200 A
1	Cable Support Assembly
1	Cable Support Assembly
1	Cable Lug Boot, 3-ph, 1200 A
1	Cable Lug Boot, 3-ph, 1200 A
1	Ground Bus Extension, 1/4 in x 2 in copper (rear of cubicle)
1	Strip Heater Circuit, Total 300 W applied at 1/2 V
1	Ground Cable Lugs, compression type, #4/0 AWG
1	Cable Lugs, compression type, 2-hole, set of (3), up to #4/0 AWG
1	Cable Lugs, compression type, 2-hole, set of (3), up to 500 MCM
	LV Instrument:
1	A/R type 2 Instrument Compartment - 19 in high, with MPL Door
3	Door Stop Assembly
1	DC Control Bus, 40 A 2-wire
1	AC Control Bus, 40 A 1ph 3-wire
2	Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
2	Fuse Holders, pull-type finger safe, 600 V ac / 250 V dc, 30 A, 2-pole, UL
1	Heater Circuit Protection, MCCB, 15 A 120 V ac 1-pole 10 kA, UL
1	Thermostat, +32 to 140 deg F, SPDT, 10 A / 250 V ac (Dev. 23), UL
1	20% Spare Terminal Blocks
1	Wired to Terminal Block, unused relay contacts
1	Wire Markers - SPECIAL

Bill of Material(s)		
	1	Breaker Control Switch, pistol, (1)C & (1)T
	1	Breaker Control Switch, pistol, (1)C & (1)T
	2	Indicating Lamp LED
	2	Indicating Lamp LED
	4	Test Switch, ABB FT-1, 10-pole
	2	PM8244 Intermediate Power Meter, DIN rail mount + remote display
	2	(PM8) Digital I/O Module - 6 digital inputs, 2 relay outputs
		# Note: All Devices for this frame that cannot be fit in the 19" Instrument
	1	Compartment Door will be mounted on the adjacent 38" or 57" Instrument
		Compartment Door.
	2	# P/N: 751001A1A0X0X85B200 (751#MHJB); SEL-751 Feeder Protection Relay
2	1	Medium Voltage Switchgear, Plenum, (A02)
		Marks: PLENUM
	6	A/R External Plenum Assembly, Straight Run, per foot
	1	A/R External Plenum Assembly, Wall Duct
3	1	Medium Voltage Switchgear, Accessories, (A03)
		Marks: ACCESSORIES
	1	Advac Breaker Accessory Kit
	1	CB Test Jumper, dual plug
	1	CB Test Station, dual plug, single trip, wall mounted (Advac, Amvac)
	1	Electric Racking Device, ABB SmartRack, 120V AC w/ 25ft cord
	1	Breaker Lift Truck - hydraulic operated (AD/SFG bolted or turn handle doors)
4	1	Medium Voltage Switchgear, Spare Parts, (A04)
		Marks: SPARE PARTS
	1	Lubricant, NO-OX-ID (1-pint can)
	3	Touch-Up Paint, 12 oz can, ANSI # 61 or ANSI # 70
	1	Test Plug, ABB type FT-1, current circuits
	1	Test Plug, ABB type FT-1, potential circuits
	12	Spare Indicating Lamp Assy w/ LED Bulb & color cap
	12	Spare Lamp Bulb, LED
	1	Spare Fuses, Breaker Control, 250V DC (box of 10)
	1	Spare PT Secondary Fuse, 250V AC (box of 10)
	6	Spare PT Primary Fuse, CLE-PT 8.25kV or 15kV
5	1	Medium Voltage Switchgear, Freight, (A05)
		Marks: FREIGHT
	1	INCO-Terms: CPT (Carriage Paid To) Destination: Switchgear is loaded onto truck and shipped to named destination. The offer does not include offloading of switchgear. Term: Carriage Paid To Place of Destination: Harrisburg, PA
6	2	5kV Drawout Breaker 2000A Close Couple to XFMR with PM8240 Meter
7	2	5kV Drawout Breaker 2000A Close Couple to LIS with PM8240 Meter
8	2	12.4kV Drawout Breaker 600A Close Couple to XFMR
9	1	Switchgear "MDS5" - (2) 2000 Drawout Main Breakers, (5) Fusible Branch Switches with Fuses- PM8214
10	1	Low Voltage Switchgear, Reliagear
		Marks: MTM1

Bill of Material(s)

5 Section(s), NEMA 1 Enclosure
3200 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 65 kA
Breaker Min Withstand Rating: 65 kA
Bus Bracing Rating: 65 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 152 in, Depth: 64.33 in, Weight: 13375 lbs

Main Breaker 1

2 E4.2S-A 3200 Ekip Hi-Touch LSIG
2 AUX 4Q 400 V E2.2...E6.2
2 YC E1.2..E6.2 110-120 V AC/DC
2 M E2.2...E6.2 100-130 V AC/DC
2 YO E1.2..E6.2 110-120 V AC/DC
2 UVR E1.2..E6.2 110-120 V AC/DC
2 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
2 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
2 Disabling Bluetooth
2 PLP Position padlock D=4/6/8mmE2.2..E6.2
2 None - Push Button Locking Options
2 MOC E2.2..E6.2
2 Breaker Compartment
2 Ekip Com Modbus RS-485 E1.2..E6.2
2 RELT
2 E4.2-A W Cradle UL
2 AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
2 RELT Switch

Tie Breaker 2

1 E4.2S-A 3200 Ekip Hi-Touch LSIG
1 AUX 4Q 400 V E2.2...E6.2
1 YC E1.2..E6.2 110-120 V AC/DC
1 M E2.2...E6.2 100-130 V AC/DC
1 YO E1.2..E6.2 110-120 V AC/DC
1 UVR E1.2..E6.2 110-120 V AC/DC
1 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1 Disabling Bluetooth
1 PLP Position padlock D=4/6/8mmE2.2..E6.2
1 None - Push Button Locking Options
1 MOC E2.2..E6.2
1 Breaker Compartment
1 Ekip Com Modbus RS-485 E1.2..E6.2
1 RELT
1 E4.2-A W Cradle UL
1 AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
1 RELT Switch

Feed Breaker 3

2 E4.2S-A 3200 Ekip Hi-Touch LSIG
2 AUX 4Q 400 V E2.2...E6.2
2 YC E1.2..E6.2 110-120 V AC/DC
2 M E2.2...E6.2 100-130 V AC/DC
2 YO E1.2..E6.2 110-120 V AC/DC
2 UVR E1.2..E6.2 110-120 V AC/DC
2 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
2 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
2 Disabling Bluetooth
2 PLP Position padlock D=4/6/8mmE2.2..E6.2
2 None - Push Button Locking Options
2 MOC E2.2..E6.2

Bill of Material(s)

2	Breaker Compartment
2	Ekip Com Modbus RS-485 E1.2..E6.2
2	RELT
2	E4.2-A W Cradle UL
2	None - AUP
2	RELT Switch
	Item Options
10	Wire Tags, Origin and/or Destination
3	Special #16 AWG SIS Control Wire
5	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
5	Shutters (3200A)
5	Bus Plating
5	Cable Supports
5	Rear Door Full Height, Bolted without Key
5	Rear Padlocking
2	Side Barrier Between Sections
5	Rail Padlock
1	UL Service Entrance Label/IL Isolation
1	Pull Box
5	Nameplate -
1	PRINT HOLDER
	Lineup
5	100% Neutral 30 in Stack
1	30 in 1-High Tie Breaker Stack
5	30 in Ground Bus 800A CU
5	Auxiliary Compartment (30 in W x 21 in H)
5	Auxiliary Compartment (30 in W x 42 in H)
5	Bus Construction -Bus Isolation/Insulation
1	GE Busway 30 in Aux Stack
1	GE Busway 30 in Aux Stack
1	GE Busway 30 in Aux Stack
1	GE Busway 30 in Aux Stack
1	Shipping Split
2	SPECTRA Riser 3200A-4W (F)
2	SPECTRA Riser 3200A-4W (R)
	Devices
1	10-Trip Selector Switch 4 POS
1	110V Remote Racker
12	288/120 Singe Phase PT
1	43-Auto/Manual Switch
2	ABB FT-1 Test Plug
6	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
3	Breaker Control Switch ATO
1	Breaker Lifting Spreader E2.2-E4.2
1	Breaker Portable Lift Truck
2	CPT 5KVA
1	CPT T/O Contactor
1	CPT T/O UV Relay
3	CT-3200/5A
12	CT-3200/5A
2	E4.2/E6.2 Neutral Sensor 1% Main/Tie
1	Ekip Programming Kit
1	Emax 2 racking handle E2.2-E6.2
4	Emax 2 Racking Plate
20	Fuse Block - 30A
2	Fuse Block-2P 30A
4	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
2	GE SPD TPHE277Y20SG w/Disc
11	IL-P9 LED (Std)

Bill of Material(s)

4 Infrared Viewport
1 Lifting Plate
1 MOXA-Serial to Ethernet
5 Pilot Light - Green
5 Pilot Light - Red
9 Relay- Aux-Light Duty 4NO
5 RELT Switch-Lighted
2 Schweitzer SEL-751 Relay
4 SCTB-4 pole
3 SP - PM 8214 Meter
1 SP - PM 8214 Meter
1 Spare Fuse Set-Control
1 Spare Fuse Set-Primary
1 Spare Fuse Set-Secondary
1 Spare IL-LED set
1 Spare Paint
2 THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil
1 Three Bkr Transfer (Relay)

11 1 Low Voltage Switchgear, Reliagear
Marks: MTM2 - OPEN

5 Section(s), NEMA 1 Enclosure
5000 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 100 kA
Breaker Min Withstand Rating: 85 kA
Bus Bracing Rating: 100 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 160 in, Depth: 71.33 in, Weight: 15344 lbs

Main Breaker 1

2 E6.2V-A 5000 Ekip Hi-Touch LSIG
2 AUX 4Q 400 V E2.2...E6.2
2 YC E1.2..E6.2 110-120 V AC/DC
2 M E2.2...E6.2 100-130 V AC/DC
2 YO E1.2..E6.2 110-120 V AC/DC
2 UVR E1.2..E6.2 110-120 V AC/DC
2 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
2 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
2 Disabling Bluetooth
2 PLP Position padlock D=4/6/8mmE2.2..E6.2
2 None - Push Button Locking Options
2 MOC E2.2..E6.2
2 Breaker Compartment
2 Ekip Com Modbus RS-485 E1.2..E6.2
2 RELT
2 E6.2-A W Cradle UL
2 AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
2 RELT Switch

Tie Breaker 2

1 E6.2V-A 5000 Ekip Hi-Touch LSIG
1 AUX 4Q 400 V E2.2...E6.2
1 YC E1.2..E6.2 110-120 V AC/DC
1 M E2.2...E6.2 100-130 V AC/DC
1 YO E1.2..E6.2 110-120 V AC/DC
1 UVR E1.2..E6.2 110-120 V AC/DC
1 Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1 None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1 Disabling Bluetooth
1 PLP Position padlock D=4/6/8mmE2.2..E6.2

Bill of Material(s)

1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E6.2-A W Cradle UL
1	AUP 5 cont. 400Vac SX E2.2...E6.2 UL / AUP 5 suppl.cont. 400Vac DX E2.2..E6.2UL
1	RELT Switch
	Feed Breaker 3
4	E2.2V-A 1600 Ekip Hi-Touch LSIG
4	AUX 4Q 400 V E2.2...E6.2
4	YC E1.2..E6.2 110-120 V AC/DC
4	M E2.2...E6.2 100-130 V AC/DC
4	YO E1.2..E6.2 110-120 V AC/DC
4	UVR E1.2..E6.2 110-120 V AC/DC
4	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
4	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
4	Disabling Bluetooth
4	PLP Position padlock D=4/6/8mmE2.2..E6.2
4	None - Push Button Locking Options
4	MOC E2.2..E6.2
4	Breaker Compartment
4	Ekip Com Modbus RS-485 E1.2..E6.2
4	RELT
4	E2.2-A W Cradle UL
4	None - AUP
4	RELT Switch
	Feed Breaker 4
1	E2.2V-A 1600 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	YC E1.2..E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2..E6.2 110-120 V AC/DC
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E2.2-A W Cradle UL
1	None - AUP
1	RELT Switch
	Feed Breaker 5
1	E2.2V-A 800 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	YC E1.2..E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2..E6.2 110-120 V AC/DC
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E2.2-A W Cradle UL

Bill of Material(s)

1	None - AUP
1	RELT Switch
	Item Options
11	Wire Tags, Origin and/or Destination
9	Special #16 AWG SIS Control Wire
9	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
1	Shutters (800A)
5	Shutters (1600A)
3	Shutters (5000A)
5	Bus Plating
5	Cable Supports
5	Rear Door Full Height, Bolted without Key
5	Rear Padlocking
4	Side Barrier Between Sections
9	Rail Padlock
1	UL Service Entrance Label/IL Isolation
3	Pull Box
5	Nameplate -
	Lineup
2	100% Neutral 22 in Stack
3	100% Neutral 38 in Stack
1	22 in 3-High Feeder Stack
1	22 in 3-High Feeder Stack
2	22 in Ground Bus 800A CU
1	38 in 1-High Tie Breaker Stack
3	38 in Ground Bus 800A CU
2	45 in Cable Compartment (22 in Stks)
3	45 in Cable Compartment (38 in Stks)
2	Auxiliary Compartment (22 in W x 21 in H)
3	Auxiliary Compartment (38 in W x 14 in H)
3	Auxiliary Compartment (38 in W x 42 in H)
3	Auxiliary Compartment (38 in W x 7 in H)
5	Bus Bracing 100,000 Amps
5	Bus Construction -Bus Isolation/Insulation
1	GE Busway 38 in Aux Stack
1	GE Busway 38 in Aux Stack
2	Shipping Split
1	SPECTRA Riser 5000A-4W (F)
1	SPECTRA Riser 5000A-4W (R)
	Devices
1	110V Remote Racker
1	25-Sync Check Relay, Basler BE1
2	27 UV Relay, Basler (ES)
12	288/120 Singe Phase PT
1	43-Auto/Manual Switch
2	47-PHASE BALANCE RELAY (ES)
3	5000A Fan Package
2	ABB FT-1 Test Plug
6	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
3	Breaker Control Switch ATO
1	Breaker Lifting Spreader E2.2-E4.2
1	Breaker Lifting Spreader E6.2
1	Breaker Portable Lift Truck
2	CPT 5KVA
1	CPT T/O Contactor
1	CPT T/O UV Relay
15	CT-1600/5A
12	CT-5000/5A
3	CT-5000/5A
3	CT-800/5A

Bill of Material(s)

6	E2.2 Neutral Sensor 1% Feeder
1	Ekip Programming Kit
2	Emax 2 racking handle E2.2-E6.2
4	Emax 2 Racking Plate
36	Fuse Block - 30A
2	Fuse Block-2P 30A
4	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
11	IL-P9 LED (Std)
8	Infrared Viewport
2	Lifting Plate
1	MOXA-Serial to Ethernet
9	Pilot Light - Green
9	Pilot Light - Red
9	Relay- Aux-Light Duty 4NO
9	RELT Switch-Lighted
2	Schweitzer SEL-751 Relay
10	SCTB-4 pole
8	SP - PM 8214 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
2	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil
44	THOMAS&BETTS CRIMP TERM FOR CU Cable 500kcmil
1	Three Bkr Transfer (Relay)
2	Timer-TDDO, Agastat
2	Timer-TDPU, Agastat

12 1 Low Voltage Switchgear, Reliagear Marks: MAIN 1

3 Section(s), NEMA 1 Enclosure
5000 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 100 kA
Breaker Min Withstand Rating: 85 kA
Bus Bracing Rating: 100 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 83 in, Depth: 71.33 in, Weight: 6898 lbs

Main Breaker 1

1	E6.2V-A 5000 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	None - Closing Coil (YC) and Redundant Closing Coil (YC2)
1	None - Spring Charging Motor (M) and Ekip Com Actuator
1	None - Opening Coil (YO)
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply 110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and Disabling Bluetooth
1	PLP Position padlock D=4/6/8mm E2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E6.2-A W Cradle UL
1	None - AUP
1	RELT Switch

Bill of Material(s)

Feed Breaker 2

1	E2.2V-A 800 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2..E6.2
1	YC E1.2..E6.2 110-120 V AC/DC
1	M E2.2...E6.2 100-130 V AC/DC
1	YO E1.2..E6.2 110-120 V AC/DC
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and
1	Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E2.2-A W Cradle UL
1	None - AUP
1	RELT Switch

Item Options

7	Wire Tags, Origin and/or Destination
2	Special #16 AWG SIS Control Wire
2	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
1	Shutters (5000A)
1	Shutters (800A)
3	Bus Plating
2	Cable Supports
2	Rear Door Full Height, Bolted without Key
3	Rear Padlocking
1	Side Barrier Between Sections
2	Rail Padlock
1	Pull Box
3	Nameplate -

Lineup

2	100% Neutral 22 in Stack
1	100% Neutral 38 in Stack
1	22 in 1-High Feeder Stack
2	22 in Ground Bus 800A CU
1	38 in Ground Bus 800A CU
1	45 in Cable Compartment (22 in Stks)
1	45 in Cable Compartment (38 in Stks)
1	53 in Transition Rear Compt (22 in Stks)
1	Auxiliary Compartment (22 in W x 21 in H)
3	Auxiliary Compartment (22 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 14 in H)
1	Auxiliary Compartment (38 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 7 in H)
3	Bus Bracing 100,000 Amps
2	Bus Construction -Bus Isolation/Insulation
1	GE Busway 38 in Aux Stack
1	GE/EPO Transformer Transition
1	SPECTRA Riser 5000A-4W (R)

Devices

1	110V Remote Racker
3	288/120 Singe Phase PT
1	5000A Fan Package
2	ABB FT-1 Test Plug
6	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
1	Breaker Lifting Spreader E2.2-E4.2
1	Breaker Lifting Spreader E6.2

Bill of Material(s)

1	Breaker Portable Lift Truck
1	CPT 5KVA
4	CT-5000/5A
3	CT-5000/5A
3	CT-800/5A
1	E2.2 Neutral Sensor 1% Feeder
1	Ekip Programming Kit
2	Emax 2 racking handle E2.2-E6.2
2	Emax 2 Racking Plate
6	Fuse Block - 30A
1	Fuse Block-2P 30A
1	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
3	Infrared Viewport
2	Lifting Plate
1	MOXA-Serial to Ethernet
2	Pilot Light - Green
2	Pilot Light - Red
2	RELT Switch-Lighted
3	SCTB-4 pole
3	SP - PM 8214 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
1	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil
4	THOMAS&BETTS CRIMP TERM FOR CU Cable 500kcmil

13 **1** **Low Voltage Switchgear, Reliagear**
Marks: MAIN 2

2 Section(s), NEMA 1 Enclosure
5000 A, 3 Phase 4 Wire, 480/277 V, 60Hz
Short Circuit Rating: 100 kA
Breaker Min Withstand Rating: 85 kA
Bus Bracing Rating: 100 kA
Incoming Feed: Top
Copper Full Silver Joint
UL 1558/CSA C22.2 No. 31 Certified
Sizing and Estimated Weight
Overall Footprint:
Height: 92 in, Width: 61 in, Depth: 71.33 in, Weight: 5283 lbs

Main Breaker 1

1	E6.2V-A 5000 Ekip Hi-Touch LSIG
1	AUX 4Q 400 V E2.2...E6.2
1	None - Closing Coil (YC) and Redundant Closing Coil (YC2)
1	None - Spring Charging Motor (M) and Ekip Com Actuator
1	None - Opening Coil (YO)
1	UVR E1.2..E6.2 110-120 V AC/DC
1	Top Supply / Ekip Supply110-240V AC/DC / Ekip Measuring 1%
1	None - Remote Reset (YR), 2nd Bell Alarm (S51/2), Ready to Close Contacts (RTC), and Disabling Bluetooth
1	PLP Position padlock D=4/6/8mmE2.2..E6.2
1	None - Push Button Locking Options
1	MOC E2.2..E6.2
1	Breaker Compartment
1	Ekip Com Modbus RS-485 E1.2..E6.2
1	RELT
1	E6.2-A W Cradle UL
1	None - AUP
1	RELT Switch

Item Options

Bill of Material(s)

5	Wire Tags, Origin and/or Destination
1	Special #16 AWG SIS Control Wire
1	Mimic Bus, Plastic w/Black Screws
1	Bkr Hoist Rails w/ Hoist
1	cUL 1558 Label
1	Shutters (5000A)
2	Bus Plating
1	Cable Supports
1	Rear Door Full Height, Bolted without Key
2	Rear Padlocking
	Side Barrier Between Sections
1	Rail Padlock
2	Nameplate -
	Lineup
1	100% Neutral 22 in Stack
1	100% Neutral 38 in Stack
1	22 in Ground Bus 800A CU
1	38 in Ground Bus 800A CU
1	45 in Cable Compartment (38 in Stks)
1	53 in Transition Rear Compt (22 in Stks)
2	Auxiliary Compartment (22 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 14 in H)
1	Auxiliary Compartment (38 in W x 42 in H)
1	Auxiliary Compartment (38 in W x 7 in H)
2	Bus Bracing 100,000 Amps
1	Bus Construction -Bus Isolation/Insulation
1	GE Busway 38 in Aux Stack
1	GE/EPO Transformer Transition
1	SPECTRA Riser 5000A-4W (R)
	Devices
1	110V Remote Racker
3	288/120 Singe Phase PT
1	5000A Fan Package
1	ABB FT-1 Test Plug
1	ABB FT-1 Test Switch
1	ABB Power Supply - 2.5A
1	Breaker Lifting Spreader E6.2
1	Breaker Portable Lift Truck
1	CPT 5KVA
1	CT-5000/5A
3	CT-5000/5A
1	Ekip Programming Kit
1	Emax 2 racking handle E2.2-E6.2
1	Emax 2 Racking Plate
2	Fuse Block - 30A
1	Fuse Block-2P 30A
1	Fuse Block-3P 30A
1	Fuse Cabinet Padlock Handle with Shelves
2	Infrared Viewport
1	Lifting Plate
1	MOXA-Serial to Ethernet
1	Pilot Light - Green
1	Pilot Light - Red
1	RELT Switch-Lighted
2	SCTB-4 pole
1	SP - PM 8000 Meter
1	Spare Fuse Set-Control
1	Spare Fuse Set-Primary
1	Spare Fuse Set-Secondary
1	Spare IL-LED set
1	Spare Paint
1	THOMAS&BETTS CRIMP TERM FOR AL/CU Cable 500kcmil

Bill of Material(s)		
14	4	Battery System for LV Switchgear Marks: BATTERY SYSTEM
15	2	SEPS Secondary Substation Transformer, Vent Dry Marks: 3500 KVA VPI/3500 KVA/12470 HV/480Y LV/CU/80Deg
16	1	Power Panelboard, ReliaGear neXT Marks: MDP-NE 1 Section(s), Nema 1 Enclosure 600 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz Minimum Interrupt Rating: 35kA Fully Rated Incoming Feed: Bottom Surface Mounted UL67 Certified Height: 72 Inches; Width: 40 Inches; Depth: 11 Inches; Est. Weight: 531 lbs 1 600 Amps Main Breaker XT5NU360BBYN000XXX 1 TMA Horiz. XT5 (2) 2/0-500 mcm, No Feed Through Lugs Main Option Details 1 Silver Plated Copper Bus Heat Rated 1 100% Rated Neutral 1 CU Neutral, Mech (CU Cables) 1 NEMA 1 Enclosure Feeders 3 Breaker Device 20 Amps 3 Poles XT1SU3020AYD000XXX 3 TMF 3 (1) 10 - 2/0 AWG 1 Breaker Device 50 Amps 3 Poles XT1SU3050AYD000XXX 1 TMF 1 (1) 10 - 2/0 AWG 1 Breaker Device 125 Amps 3 Poles XT1SU3125AYD000XXX 1 TMF 1 (1) 10 - 2/0 AWG 1 Breaker Device 225 Amps 3 Poles XT4SU3225AYJ000XXX 1 TMF 1 (1) 4 AWG-300 MCM 8 Breaker Space Device 20 Amps 3 Poles XT1SU3020AYD000XXX 8 TMF 8 (1) 10 - 2/0 AWG Modifications 1 Door within Door 1 Nameplates (75C141109P109) 1 Key Lock 1 Ground: GDBG47CU 1 Interior Bus Stack: IN2406NN3H2 1 Neutral: NL12I0NSTNDCU 1 Enclosure: ER7240B 1 Interior Frame: IF2440F 1 Door within Door Deadfront: DD4072AHFS 1 Door within Door Filler 1: DDFIL404509SF 1 Door within Door Filler 2: DDFIL404515SF 1 Door within Door Filler Support: DDSUP24 1 Surge Protection: RGPPSP277Y08T2 1 1X Filler & Blank: SR01BF 1 1X Blank only: SR01BB 1 5 XT1 Mtg Kit, Narrow: SR5XBR 1 5 XT1 Mtg Kit, Wide: SR5XBF 1 2 XT1 Mtg Kit, Wide: SR2XBF 1 1 XT1 Mtg Kit, Narrow: SR1XBR

Bill of Material(s)		
	8	XT1 Blank only: SRT1BB
	1	Lifting Bar: IL40F
	1	Circuit Directory Kit, Metal: RGRPCDKM
	1	Nameplates: 75C141109P109
	1	Disconnect for SPD: XT1SU3030AYD000XXX
	1	SPD Disc XT1 Mtg Kit: SR1XBR
	1	PPXT FA INT
	1	PPXT FA BOX
17	1	Lighting Panelboard, ReliaGear RQ Marks: LP-LH
		1 Section(s), Nema 1 Enclosure 400 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz Minimum Interrupt Rating: 22kA Fully Rated Incoming Feed: Bottom Surface Mounted 42 Circuits UL67 / CSA C22.2 No. 29 Certified cULus Certified Height: 64.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	400 Amps Main Lugs 1-lug/phase 1-cable/lug #4 -600 kcmil Or 1-lug/phase 2-cable/lug 1/0 -250 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	4	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	5	Breaker Device 30 Amps 1 Poles THHQB
	1	Breaker Device 30 Amps 3 Poles THHQB
	1	Breaker Device 20 Amps 3 Poles THHQB
	27	Breaker Device 20 Amps 1 Poles THHQB
	4	Breaker Space Device 20 Amps 1 Poles THHQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3424MBX AXT6B7
	1	Box: AB64B
	1	Front: AF64SDUM
18	1	Lighting Panelboard, ReliaGear RQ Marks: CP
		1 Section(s), Nema 1 Enclosure 225 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz Minimum Interrupt Rating: 10kA Fully Rated Incoming Feed: Bottom Surface Mounted 42 Circuits UL67 / CSA C22.2 No. 29 Certified cULus Certified Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	175 Amps Main Breaker A2A225 Al - 1-lug/phase 1-cable/lug 2/0 -300 kcmil Or Cu - 1-lug/phase 1-cable/lug #1 -250 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	4	Ground-Cu box bonded TGC2

Bill of Material(s)		
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	1	Breaker Device 100 Amps 3 Poles THQB
	39	Breaker Device 20 Amps 1 Poles THQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3422ABX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDUM
19	1	Lighting Panelboard, ReliaGear RQ
		Marks: LR
		1 Section(s), Nema 1 Enclosure
		400 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 22kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		60 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 82.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	300 Amps Main Breaker XT5N400
	1	TMA
		1-lug/phase 2-cable/lug 2/0 -500 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	5	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	10	Breaker Device 30 Amps 1 Poles THHQB
	1	Breaker Device 20 Amps 3 Poles THHQB
	47	Breaker Device 20 Amps 1 Poles THHQB
		Modifications
	1	Power Distribution Panel
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Quarter Turn Latch
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3604JBX AXT6B7
	1	Box: AB82B
	1	Front: AF82SDTUM
20	1	Lighting Panelboard, ReliaGear RQ
		Marks: CP-1
		1 Section(s), Nema 1 Enclosure
		250 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 10kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		24 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches

Bill of Material(s)		
	1	100 Amps Main Breaker XT4N250
	1	TMF
		1-lug/phase 1-cable/lug #4 -300 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	2	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	1	Breaker Device 40 Amps 2 Poles THQB
	1	Breaker Device 50 Amps 2 Poles THQB
	20	Breaker Device 20 Amps 1 Poles THQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3242JBX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDUM
21	1	Lighting Panelboard, ReliaGear RS
		Marks: V-1 RH
		1 Section(s), Nema 1 Enclosure
		225 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		48 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	225 Amps Main Lugs
		1-lug/phase 1-cable/lug #6 -350 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	4	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	10	Breaker Device 20 Amps 3 Poles TEYD
	4	Breaker Device 20 Amps 1 Poles TEYD
	14	Breaker Space Device 20 Amps 1 Poles TEYD
		Modifications
	1	Power Distribution Panel
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3482MBX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDLUM
22	1	Lighting Panelboard, ReliaGear RS
		Marks: V-1
		1 Section(s), Nema 1 Enclosure
		125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated

Bill of Material(s)

- Incoming Feed: Bottom
Surface Mounted
12 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 31.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 125 Amps Main Breaker TEYD
1-lug/phase 1-cable/lug #14 -1/0
- Main Option Details**
- 1 Copper Bus Heat Rated
2 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 3 Breaker Device 20 Amps 3 Poles TEYD
1 Breaker Device 60 Amps 3 Poles TEYD
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Corbin Latch Bolt 15767
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3121BBX AXT6B7
1 Box: AB31B
1 Front: AF31SDLUM

23 1 Lighting Panelboard, ReliaGear RS
Marks: V1A

- 1 Section(s), Nema 1 Enclosure
125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 25kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
30 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 43.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 125 Amps Main Lugs
1-lug/phase 1-cable/lug #14 -2/0
- Main Option Details**
- 1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 4 Breaker Device 20 Amps 3 Poles TEYD
1 Breaker Device 20 Amps 2 Poles TEYD
16 Breaker Space Device 20 Amps 1 Poles TEYD
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Corbin Latch Bolt 15767
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3301MBX AXT6B7
1 Box: AB43B
1 Front: AF43SDLUM

24 1 Lighting Panelboard, ReliaGear RS
Marks: PP

Bill of Material(s)

1 Section(s), Nema 1 Enclosure
400 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 42kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
48 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 76.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
1 300 Amps Main Breaker XT5S400
1 TMA
1-lug/phase 2-cable/lug 2/0 -500 kcmil
Main Option Details
1 Copper Bus Heat Rated
4 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
3 Breaker Device 20 Amps 3 Poles TEYL
4 Breaker Device 40 Amps 3 Poles TEYL
6 Breaker Space Device 20 Amps 1 Poles TEYL
1 Breaker Device 60 Amps 3 Poles TEYL
14 Breaker Device 20 Amps 1 Poles TEYL
Modifications
1 Power Distribution Panel
1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Quarter Turn Latch
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3484KBX AXT6B7
1 Box: AB76B
1 Front: AF76SDTUM

25 1 Lighting Panelboard, ReliaGear RS
Marks: WELDER/PLASMA CUTTER

1 Section(s), Nema 1 Enclosure
400 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 35kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
30 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 55.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
1 400 Amps Main Lugs
1-lug/phase 1-cable/lug #4 -600 kcmil
Or 1-lug/phase 2-cable/lug 1/0 -250 kcmil
Main Option Details
1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
1 Breaker Device 20 Amps 3 Poles TEYH
2 Breaker Device 30 Amps 3 Poles TEYH
12 Breaker Space Device 20 Amps 1 Poles TEYH
1 Breaker Device 60 Amps 3 Poles TEYH
2 Breaker Device 50 Amps 3 Poles TEYH

Bill of Material(s)		
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3304MBX AXT6B7
	1	Box: AB55B
	1	Front: AF55SDLUM
26	1	Lighting Panelboard, ReliaGear RQ
		Marks: N/E
		1 Section(s), Nema 1 Enclosure
		225 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 10kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		30 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 49.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	225 Amps Main Lugs
		1-lug/phase 1-cable/lug #6 -350 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	3	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	1	Breaker Device 25 Amps 2 Poles THQB
	1	Breaker Device 20 Amps 2 Poles THQB
	26	Breaker Device 20 Amps 1 Poles THQB
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
	1	Interior: AQF3302MBX AXT6B7
	1	Box: AB49B
	1	Front: AF49SDUM
27	1	Lighting Panelboard, ReliaGear RS
		Marks: NE
		1 Section(s), Nema 1 Enclosure
		250 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		42 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 64.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	225 Amps Main Breaker XT4N250
	1	TMF
		1-lug/phase 1-cable/lug #4 -300 kcmil
		Main Option Details
	1	Copper Bus Heat Rated
	4	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral

Bill of Material(s)		
	1	NEMA 1 Enclosure
		Feeders
	2	Breaker Device 30 Amps 3 Poles TEYD
	2	Breaker Device 20 Amps 2 Poles TEYD
	4	Breaker Device 20 Amps 3 Poles TEYD
	1	Breaker Device 50 Amps 3 Poles TEYD
	2	Breaker Device 15 Amps 3 Poles TEYD
	1	Breaker Device 30 Amps 1 Poles TEYD
	10	Breaker Device 20 Amps 1 Poles TEYD
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3422KBX AXT6B7
	1	Box: AB64B
	1	Front: AF64SDLUM
28	1	Lighting Panelboard, ReliaGear RS
		Marks: NE2
		1 Section(s), Nema 1 Enclosure
		125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
		Minimum Interrupt Rating: 25kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		24 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified
		Height: 37.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
	1	50 Amps Main Breaker TEYD
		1-lug/phase 1-cable/lug #14 -1/0
		Main Option Details
	1	Copper Bus Heat Rated
	2	Ground-Cu box bonded TGC2
	1	Ground main lug TGL20
	1	100% Rated Neutral
	1	NEMA 1 Enclosure
		Feeders
	4	Breaker Device 20 Amps 3 Poles TEYD
	12	Breaker Device 20 Amps 1 Poles TEYD
		Modifications
	1	Front Hinged To Box
	1	Metal Directory Card Hldr
	1	Screw-On Nameplate
	1	Corbin Latch Bolt 15767
	1	ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
	1	Interior: ASF3241BBX AXT6B7
	1	Box: AB37B
	1	Front: AF37SDLUM
29	1	Lighting Panelboard, ReliaGear RQ
		Marks: RP
		1 Section(s), Nema 1 Enclosure
		125 Amps, 3 Phase 4 Wire 208Y/120V, 50/60 Hz
		Minimum Interrupt Rating: 22kA Fully Rated
		Incoming Feed: Bottom
		Surface Mounted
		30 Circuits
		UL67 / CSA C22.2 No. 29 Certified
		cULus Certified

Bill of Material(s)

- Height: 43.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 100 Amps Main Breaker THHQB
1-lug/phase 1-cable/lug #14 -1/0
- Main Option Details**
- 1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 30 Breaker Device 20 Amps 1 Poles THHQB
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 ME, 65kA/mode,130kA/phase (RGLPSP120Y08T2)
1 Interior: AQF3301CBX AXT6B7
1 Box: AB43B
1 Front: AF43SDUM

30 1 Lighting Panelboard, ReliaGear RS
Marks: HP

- 1 Section(s), Nema 1 Enclosure
125 Amps, 3 Phase 4 Wire 480Y/277V, 50/60 Hz
Minimum Interrupt Rating: 35kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
30 Circuits
UL67 / CSA C22.2 No. 29 Certified
cULus Certified
Height: 43.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
- 1 100 Amps Main Breaker TEYH
1-lug/phase 1-cable/lug #14 -1/0
- Main Option Details**
- 1 Copper Bus Heat Rated
3 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
- Feeders**
- 8 Breaker Device 20 Amps 3 Poles TEYH
6 Breaker Device 20 Amps 1 Poles TEYH
- Modifications**
- 1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Corbin Latch Bolt 15767
1 ME, 65kA/mode,130kA/phase (RGLPSP277Y08T2)
1 Interior: ASF3301BBX AXT6B7
1 Box: AB43B
1 Front: AF43SDLUM

31 1 Lighting Panelboard, ReliaGear RE
Marks: DC

- 1 Section(s), Nema 1 Enclosure
125 Amps, 3 Wire 125/250V DC, 50/60 Hz, 1 & 2 Pole
Minimum Interrupt Rating: 10kA Fully Rated
Incoming Feed: Bottom
Surface Mounted
42 Circuits
UL67 / CSA C22.2 No. 29 Certified

Bill of Material(s)

- 1 cULus Certified
Height: 37.5 Inches; Width: 20 Inches; Depth: 5.75 Inches
125 Amps Main Lugs
1-lug/phase 1-cable/lug #14 -2/0
Main Option Details
1 Copper Bus Heat Rated
4 Ground-Cu box bonded TGC2
1 Ground main lug TGL20
1 100% Rated Neutral
1 NEMA 1 Enclosure
Feeders
20 Breaker Device 15 Amps 2 Poles TEYF
Modifications
1 Front Hinged To Box
1 Metal Directory Card Hldr
1 Screw-On Nameplate
1 Interior: AEF1421MBX AXB7
1 Box: AB37B
1 Front: AF37SDUM

32 1 Transformer, Copper, 9T10C1002G32
Marks: T-RP

- 1 3 Phase, 60 Hz, 30 kVA
Ambient Temperature : 40°C
Coil Material : Copper
Primary Voltage : 480, Primary Connection : Delta
Secondary Voltage : 208Y/120, Secondary Connection : Wye
Temperature Rise : 115
Energy Efficiency : DOE 2016 (Std)
Enclosure : NEMA 1/NEMA 2
Taps(Nominal) : 2 above 4 below 2.5%
Impedance (+/- 7.5%) : 3.7%
K Factor : K1
Sound Level : -3dB(42dB)
UL : Yes, cUL : No, CE : No,
Accessories :
1 9T18Y1072G10 Lug Kit included
1 9T18Y1071G11 Ground Bar Kit included
Factory Individualized Transformer Test Reports :
1 NEMA ST-20 Sound Level Test Report
IEEE std C57.12.91 Electrical Test Performance Report - Not Required

33 3 Switches and Disconnects, Heavy Duty Safety Switch, THN3366A1
Marks: VFD DISCONNECT

- 1 Suitable for use as Service Equipment
Heavy Duty 600 Amps
No Fuse 3 Poles 600VAC/250VDC
NEMA 1 (Indoor)
For Use Size With (2) 4-600* Copper or Size (2) 4-600* Aluminum wire
*600MCM restricted to side entry only
Height1: 49.39, Height2: 49.39, Width1: 23.65, Width2: 24.5, Depth1: 8.51, Depth2: 13.26, Weight: 107
Accessories:
1 TGL6 , Equipment Ground Kit, (3) #2-250MCM CU/AL
1 THAUX66DA , Aux Contact Kit-DPDT

34 1 Switches and Disconnects, Elevator Disconnect, ES6T48R1KGN1A
Marks: ELEVATOR CONTROL SW

- 1 Mersen Elevator Switch 30-100A N1
NEMA 1 Enclosure

Bill of Material(s)

60 A, 480 V ac Primary, 120 V ac Secondary Control Transformer
120 V ac Fire Safety Interface Relay
1 NO/NC Mechanical Interlock Auxiliary Contact
UL98, cULus 508 Listed
Dimensions and Weight (Estimated)
Height: 8.7 in, Width: 16.3 in, Length: 24.39 in
Gross Weight: 58 lb, Net Weight: 51 lb

Options

60 A (2/0-#14) Isolated Neutral Lug
Key to Test Switch
Green Pilot Light

Accessories

3 60 A, 600 V ac, Class J Time Delay, AJT60 Fuse

35 1 Busway, ReliaGear Series Busway
Marks: BUS MTM1-T1

Build America, Buy America (2 CFR Part 184) Compliant
176 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

1 ANSI - 61 Gray, Standard
1 Standard Warranty
176 Ft of Feeder Indoor (IP40)
12 Each 90 Degree Elbow Forming Charge
1 Each Expansion Section Forming Charge
1 Each Unfused Reducer / Phase Transposition Forming Charge
1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
1 Each Non ABB Switchboard Stub Forming Charge
10 Spring Hanger (Pair)

36 1 Busway, ReliaGear Series Busway
Marks: BUS MTM1-T2

Build America, Buy America (2 CFR Part 184) Compliant
181 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

1 ANSI - 61 Gray, Standard
1 Standard Warranty
181 Ft of Feeder Indoor (IP40)
12 Each 90 Degree Elbow Forming Charge
1 Each Expansion Section Forming Charge
1 Each Unfused Reducer / Phase Transposition Forming Charge
1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
1 Each Non ABB Switchboard Stub Forming Charge
10 Spring Hanger (Pair)

37 1 Busway, ReliaGear Series Busway

Bill of Material(s)

Marks: BUS MTM1-MDS1

Build America, Buy America (2 CFR Part 184) Compliant
151 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

- 1 ANSI - 61 Gray, Standard
- 1 Standard Warranty
- 151 Ft of Feeder Indoor (IP40)
- 11 Each 90 Degree Elbow Forming Charge
- 1 Each Expansion Section Forming Charge
- 1 Each Unfused Reducer / Phase Transposition Forming Charge
- 1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
- 1 Each Non ABB Switchboard Stub Forming Charge
- 10 Spring Hanger (Pair)

38 1 Busway, ReliaGear Series Busway**Marks: BUS MTM1-MDS2**

Build America, Buy America (2 CFR Part 184) Compliant
131 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
2500 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 150 kA for 3 Cycles, 150 kA for 1 s, and 107 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

- 1 ANSI - 61 Gray, Standard
- 1 Standard Warranty
- 131 Ft of Feeder Indoor (IP40)
- 12 Each 90 Degree Elbow Forming Charge
- 1 Each Expansion Section Forming Charge
- 1 Each Unfused Reducer / Phase Transposition Forming Charge
- 1 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge
- 1 Each Non ABB Switchboard Stub Forming Charge
- 10 Spring Hanger (Pair)

39 1 Busway, ReliaGear Series Busway**Marks: BUS MTM2-T5**

Build America, Buy America (2 CFR Part 184) Compliant
222 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s)
5000 A, 3 Phase 4 Wire, 600 V Maximum, ac
Short Circuit Withstand Ratings of 200 kA for 3 Cycles, 200 kA for 1 s, and 200 kA for 3 s
Tin Plated Copper Bus
100% Rated Neutral
50% Rated Internal Ground
ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA
IBC-2021, UBC Zone 4

List of Materials

- 1 ANSI - 61 Gray, Standard
- 1 Standard Warranty

Bill of Material(s)		
		222 Ft of Feeder Indoor (IP40) 14 Each 90 Degree Elbow Forming Charge 1 Each Expansion Section Forming Charge 1 Each Unfused Reducer / Phase Transposition Forming Charge 2 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge 10 Spring Hanger (Pair)
40	1	Busway, ReliaGear Series Busway Marks: BUS MTM2-T6 Build America, Buy America (2 CFR Part 184) Compliant 212 Total Feet of Bus, Indoor NEMA 1 IP-40 construction(s) 5000 A, 3 Phase 4 Wire, 600 V Maximum, ac Short Circuit Withstand Ratings of 200 kA for 3 Cycles, 200 kA for 1 s, and 200 kA for 3 s Tin Plated Copper Bus 100% Rated Neutral 50% Rated Internal Ground ANSI/UL 857, NEMA BU-1, Federal Specification W-B-811b, CSA And ASTA IBC-2021, UBC Zone 4 List of Materials 1 ANSI - 61 Gray, Standard 1 Standard Warranty 212 Ft of Feeder Indoor (IP40) 14 Each 90 Degree Elbow Forming Charge 1 Each Expansion Section Forming Charge 1 Each Unfused Reducer / Phase Transposition Forming Charge 2 Each ABB Switchboard Stub (ABB SWB/SWG) Forming Charge 10 Spring Hanger (Pair)
41	1	SEPS Bus Duct Marks: 4160V 2000A NSB RUN1 Non-Segregated/5KV/2000Amps
42	1	SEPS Bus Duct Marks: 4160V 2000A NSB RUN2 Non-Segregated/5KV/2000Amps
43	1	Power Study - Base Study
44	1	Power Study - Load Flow Study Adder
45	1	Power Study - Harmonic Study Adder
46	1	Startup Assistance - SWGR and SWBD's
47	1	Temporary Equipment
48	1	Temporary 4160V-480V 1500kva XFMR
49	1	Switchboard, ReliaGear Configured, RG-GM-CBSB-CTO Marks: TEMP SWBD 3 Section(s) Service Entrance Estimated Shipping Weight:2794 lbs

Bill of Material(s)	
1	Service Entrance Labeling 3P4W/480/277V/60Hz 2000A 65 kAIC Fully Rated Incoming Feed: Bottom Incoming Left Feeding Right Type 3R (non-walk-in) Enclosure Front/Rear Lineup Front Only Access Full Height Panel Bus Option
2	Hinged Wire Gutter Cover Configured Switchboard
1	ReliaGear Switchboard Lineup Estimated total factory connected wiring points for the lineup 28
1	Certified Test Reports requested (Per Lineup Item)
1	Evolution Main Section 30W 35D 90H (Est.) lbs 642
1	Group Mounted Feeder ReliaGear Panel Section 40W 35D 90H (Est.) lbs 1082
1	Group Mounted Feeder ReliaGear Panel Section 40W 35D 90H (Est.) lbs 1070
3	Bus Bracing 65000 AIC
3	Evolution - Fully Rated Aluminum Bus 750 A/Sq. in.
3	Ground: Equipment U/L With Lugs
1	Full Height Side Barriers
	Main Breaker
1	2000A 3 Pole E2.2SF 100% Rated (2000A Frame) Indiv. Mtd. Main Manually Operated MAIN Programmer(EKIP Touch) LSIG
1	RELT
1	RELT-EKIP SIGNALLING 2K3
1	(4Q) AUXILIARY CONTACTS - 400V
1	(S51/2) Bell Alarm - 250V
1	PADLOCK IN OPEN POSITION
1	DC SUPPLY - 24V - 48V
16	Mechanical (2 Hole) AL Line Lugs
	Feeders
3	700A 3 Pole XT6H800 (0A Frame)
3	Manually Operated Programmer (EKIP DIP) LSI
9	Mechanical AL Load Lugs
7	500A 3 Pole XT5H600 (600A Frame)
7	Manually Operated Programmer (EKIP DIP) LSI
14	Mechanical AL Load Lugs
3	450A 3 Pole XT5H600 (600A Frame)
3	Manually Operated Programmer (EKIP DIP) LSI
6	Mechanical AL Load Lugs
	Monitoring/Control Devices
1	Power Supply Plate
	Others
14	Engraved Nameplates
14	Screw-On Nameplates
	Others
1	Lifting Brackets
2	Reliagear (C/B feeders only) 40X Bus Stack
29	Neutral Lugs
1	Bonding Jumper
37	Equipment Ground Lugs
1	Ground Lug

50 3 Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR
Marks: 450A FUSIBLE DISC

- 1 Suitable for use as Service Equipment

Bill of Material(s)		
		Heavy Duty 600 Amps Fusible 3 Poles 600VAC/250VDC NEMA 3R (Outdoor) For Use Size With (2) 4-600* Copper or Size (2) 4-600* Aluminum wire *600MCM restricted to side entry only Height1: 54.49, Height2: 54.49, Width1: 23.65, Width2: 24.5, Depth1: 9.35, Depth2: 13.26, Weight: 117 Switch is NEC 2020 Article 230.62 compliant for service equipment barriers. Accessories: 1 TGL6 , Equipment Ground Kit, (3) #2-250MCM CU/AL 1 TRK66A , Class R Fuse Kit 3 A6D450R, 450 Amps, RK1 - Time Delay
51	5	Switches and Disconnects, Heavy Duty Safety Switch, THF3366AR Marks: 500A FUSIBLE DISC 1 Suitable for use as Service Equipment Heavy Duty 600 Amps Fusible 3 Poles 600VAC/250VDC NEMA 3R (Outdoor) For Use Size With (2) 4-600* Copper or Size (2) 4-600* Aluminum wire *600MCM restricted to side entry only Height1: 54.49, Height2: 54.49, Width1: 23.65, Width2: 24.5, Depth1: 9.35, Depth2: 13.26, Weight: 117 Switch is NEC 2020 Article 230.62 compliant for service equipment barriers. Accessories: 1 TGL6 , Equipment Ground Kit, (3) #2-250MCM CU/AL 1 TRK66A , Class R Fuse Kit 3 A6D500R, 500 Amps, RK1 - Time Delay
52	3	Switches and Disconnects, Heavy Duty Safety Switch, TC72367R Marks: 650A FUSIBLE DISC 1 Suitable for use as Service Equipment Heavy Duty 800 Amps Fusible 3 Poles 600VAC NEMA 3R (Outdoor) For Use Size With (6) 1/0-250 or (3) 2-600 Copper or Size (6) 1/0-250 or (3) 2-600 Aluminum wire Height1: 61.64, Height2: 65.35, Width1: 41.99, Width2: 44.19, Depth1: 11.92, Depth2: 17.71, Weight: 480 Switch is NEC 2017 compliant for service equipment. To make this switch compliant with NEC 2020 Article 230.62 for service equipment barriers, install kit THSHLD8 Accessories: Standard Fuse Clips Supplied 3 A4BY650, 650 Amps, L - Current Limiting Time Delay
53	1	Load Interrupter Switch, VersaRupter Marks: TEMP CHILLER DISC 1 Single Configuration, 1 Section(s), Indoor Enclosure 1200 A Bus, 3 Phase 3 Wire, 5 kV, 60 kV BIL, 50/60 Hz with solidly grounding system 61 kA Momentary, 61 kA Fault Closing, Silver Plated Contacts, Copper-Silver Bus Front and Rear Access Required IEEE C37.20.3 , ANSI C37.57 , IEEE C37.20.4, ANSI C37.58 , CSA C22.2 No. 31, CSA C22.2 No. 193 1 Certified Test Reports Enclosure Paint: ANSI-61 (Light Gray) tested to minimum withstand of 600 hour humidity and salt spray test Dimensions And Weight (Estimated) Section 1 - Single Switch: Width = 35 in; Height = 90 in; Depth = 60 in, Weight = 1200 lb

Bill of Material(s)

Options

- 1 UL Label
- 1 60 in Depth
- 1 Bus Boots
- 1 Fully Insulated Bus
- 1 Horizontal Barrier
- 2 Metal Screen Barriers
- 1 Front and Rear Door Pad Locks
- 1 Rear Door
- 1 Non-Removable Handle
- 1 Full Vertical Barrier

Single Switch

- 1 1200 A Switch Stand Alone, No Transition
- 1 Distribution Class Arrester, 9L20FXX006XHS
- 1 Top Entry, (1) 300 kcmil per Phase, NEMA Drill Only, Without Loop
- 1 Bottom Exit, (1) 300 kcmil per Phase, NEMA Drill Only

Fuses

- 1 Current Limiting Fuse Model, 9F62FCB300
 - 1 Set of 3 Spare Fuses
- Note: Fuses/Spare Fuses could be split from the order for shipment and invoice by separate.
- 1 Double Barrel Fuse Clips
 - 1 Ground Studs, Line Side
 - 1 Run Back Bus

TERMS AND CONDITIONS OF SALE

General Policies and Conditions

1. This Proposal is offered subject to the following: 1) attached TERMS AND CONDITIONS OF SALE, 2) an executed Master Supply Agreement ("MSA"), and 3) ABB Inc.'s current general Terms and Condition of Sale. Any conflict among the documents comprising the terms of this Proposal shall be resolved in accordance with the following order of precedence: (i) an executed MSA incorporating the following Terms and Conditions of Sale (ii) attached TERMS AND CONDITIONS OF SALE incorporating ABB Inc. General Terms and Conditions of Sale (iii) or ABB Inc. General Terms and Conditions of Sale. Non-ABB preprinted PO terms have no force and/or effect and are hereby rejected by ABB.
2. All quoted or agreed prices are subject to revision at any time in the event of: (i) a material increase in component, raw material, or energy costs; or (ii) governmental action such as new or increased tariffs.
3. Buyer represents and warrants that there are no federal, state, or local (collectively "Governmental") contracting provisions, regulations, flow-downs, or requirements that apply to this transaction, including without limitation any Governmental domestic preference or prevailing wage, other than such terms that have been disclosed and agreed to by Seller in writing. Buyer assumes sole responsibility for any costs associated with non-compliance of terms not agreed by Seller in writing. Unless expressly provided in writing, Seller makes no representation that the quoted product(s) or service(s) comply with any Governmental contracting provisions and regulations.
4. This proposal expires in 30 calendar days, unless terminated sooner by notice. This proposal is not inclusive of taxes of any kind, unless explicitly stated.
5. Orders not requiring engineered drawings for approval must be released by Buyer for manufacture within 90 days of PO receipt. If engineered drawings are required, they must be returned and approved by Buyer for release within 60 days of mailing. If not, and/or shipment is delayed for any reason the price will increase by 1.5% for each partial/full month that shipment release is delayed after the 90-day period. If project is delayed 6 months or more after PO receipt, project will be repriced based off current market values.
6. For MV Transformers (including Padmount, Substation, & Power transformers), refer to the factory proposal for applicable terms and conditions including, but not limited to quote validity, price validity, escalation, warranty, cancellation, estimated delivery, and freight terms.

Payment Terms

1. Net 30 days from the date of invoice
2. For projects up to \$1,000,000 net, terms of payment are 100% upon invoicing.
3. If project value exceeds \$1,000,000 net, progress payments are required payable at the following milestones. These milestones will be applied at a line-item level and will be tailored to the project schedule.
 - 20% upon delivery of drawings
 - 30% upon release of equipment
 - 50% upon shipment

Warranty

1. The warranty for Products shall expire one (1) year from date of installation or eighteen (18) months after date of shipment, whichever occurs first, except that software is warranted for ninety (90) days from delivery. The warranty for Services shall expire one (1) year after performance of the Service, except that software related Services are warranted for ninety (90) days.
2. Additional 12 months available for 2% adder, 24 months for 4% adder. Engage ABB representative if longer durations are needed.
3. All warranty claim remedies are provided under the General Terms and Conditions of Sale, or any applicable MSA, whichever is applicable between the parties.

Order Cancellation – Schedule of Charges

1. 10% - Order received.
2. 30% - Drawings for approval submitted, if required.
3. 50% - Revisions to approval drawings submitted, if required.
4. 80% - Order released for manufacturing and shipment.
5. 100% - Production started.

Delivery and Transportation

1. CPT/FCA ABB's facility, place of manufacture or warehouse (Incoterms 2020). Title and risk of loss passes upon shipment.
2. ABB will assume the risk of loss or damage to the destination for a 2% adder (but not less than \$500 net) applied to the total price of the equipment. "Destination" is defined as ABB's common carrier's delivery point nearest first destination or point of export within the continental U.S.
3. Transportation and handling are prepaid and billed, unless otherwise noted in this quotation or MSA.
4. Shipment via Air or Open Top/Flatbed/Lift gate truck not included unless specifically listed herein.
5. Special Instruction - The Receiving Associate is required to sign, date, and note specific visible or concealed damage on Bill of Lading at time of delivery. Freight Company Associate is required to witness Receiver's signature, date, and damage claim annotations. ABB's Post Sales Service Department must be provided with copy of annotated BOL within five (5) days of delivery or Shipper's responsibility ends.

Other Notes

1. Standard factory test procedures will be performed. Customer inspections, customer witness tests, and any other non-standard test procedures are not included unless specifically noted herein.
2. The accompanying Bill of Material is our interpretation of what is required to meet the intent of the listed Drawings and Specifications. Please review thoroughly for accuracy and completeness and advise immediately if any revisions are required. This proposal is limited to the attached Bill of Material only. Selective coordination of the system should be verified by a qualified engineer and may require changes to the design, Bill of Material, and price.
3. The Parties are aware of the shortage of raw materials, electronic components worldwide which is likely to last for the foreseeable future, as well as, of market fluctuations in the availability and cost of other raw materials, commodities, other critical components, and transportation capacities. Notwithstanding anything to the contrary in the contract terms and conditions / purchase order, if after the date of ABB's proposal / offer or during the term of the performance of the contract / purchase order there are any changes to availability and / or market conditions for electronic components, raw materials, commodities, and transportation capabilities directly or indirectly affecting ABB's performance, ABB shall be entitled to relief in the schedule of the performance or delivery of the directly or indirectly affected scope of work under the contract / purchase order. In such circumstances, the Parties shall meet without delay and discuss in good faith to find a mutually agreeable solution, with equitable adjustment to the contract / purchase order date of delivery or completion. Customer hereby acknowledges and agrees that in said circumstances ABB may not be able to comply with the originally agreed delivery or completion schedule and that ABB shall not be liable for any liquidated or actual damages in connection thereto.

ABB INC. GENERAL TERMS AND CONDITIONS OF SALE

(2025-02 U.S.)

1. General.

The terms and conditions contained herein, together with any additional or different terms contained or referenced in ABB's proposal or, quotation and ("Proposal"), any addenda to the Proposal, the purchase order (excluding any pre-printed terms and conditions and any terms that conflict with the Proposal or ABB's acknowledgment), and ABB's acknowledgement, submitted to Purchaser constitute the entire agreement (the "Agreement") between the parties with respect to the purchase order and supersede all other prior communications and agreements regarding the purchase order and ABB objects to any additional terms proposed by Purchaser. Acceptance by ABB of the purchase order, or Purchaser's acceptance of ABB's Proposal, is expressly limited to and conditioned upon Purchaser's acceptance of these terms and conditions, payment for or acceptance of any performance by ABB being acceptance. "Equipment" as used herein means all the equipment, parts, accessories sold, and all software and software documentation, if any, licensed to Purchaser by ABB ("Software") under the purchase order. "Services" as used herein means all labor, supervisory, technical and engineering, installation, repair, consulting or other services provided by ABB under the purchase order. "Purchaser" shall include the initial end user of the Equipment and/or services; provided, however, that Article 14(a) shall apply exclusively to the initial end user. "Hazardous Materials" means any toxic or hazardous substance, hazardous material, dangerous or hazardous waste, dangerous good, radioactive material, petroleum or petroleum-derived products or by-products, or any other chemical, substance, material or emission, that is regulated, listed or controlled pursuant to any national, state, provincial, or local law, statute, ordinance, directive, regulation or other legal requirement of the United States ("U.S.") or the country of the Site.

2. Prices.

(a) Unless otherwise specified in writing, all Proposals expire thirty (30) days from the date thereof and may be modified or withdrawn by ABB before receipt of Purchaser's conforming acceptance. All prices set forth in a purchase order may be revised by ABB at any time prior to delivery or performance based on ABB's sole but reasonable estimate of its cost increases (after the Proposal date) resulting directly or indirectly from factors such as: (i) a significant increase in raw material, component, labor, or energy costs or (ii) governmental actions, such as increased tariffs on the Equipment, raw material, or components.

(b) Unless otherwise stated herein, Services prices are based on normal business hours (8 a.m. to 5 p.m. Monday through Friday). Overtime and Saturday hours will be billed at one and one-half (1 1/2) times the hourly rate; and Sunday hours will be billed at two (2) times the hourly rate; holiday hours will be billed at three (3) times the hourly rate. If a Services rate sheet is attached hereto, the applicable Services rates shall be those set forth in the rate sheet. Rates are subject to change without notice.

(c) Except as otherwise agreed by ABB, the price does not include any federal, state or local property, license, privilege, sales, use, excise, gross receipts, tariffs or other like taxes ("Taxes") which may now or hereafter be applicable. Purchaser agrees to pay or reimburse any such Taxes, or ABB's reasonable estimated cost impact thereof, which ABB or its suppliers are required to pay or collect. If Purchaser is exempt from the payment of any Tax or holds a direct payment permit, Purchaser shall, upon purchase order placement, provide ABB a copy, acceptable to the relevant governmental authorities of any such certificate or permit.

3. Payment.

(a) Unless specified to the contrary in writing by ABB, payment terms are net cash, payable without offset, in United States Dollars, 30 days from date of invoice by wire transfer to the account designated by ABB in the Proposal. ABB is not required to commence or continue its performance unless and until invoiced payments have been received in a timely fashion. For each day of delay in receiving required payments, ABB shall be entitled to a matching extension of the schedule.

(b) If in the judgment of ABB, the financial condition of Purchaser at any time prior to delivery does not justify the terms of payment specified, ABB may require payment in advance, payment security satisfactory to ABB and suspend its performance until said advance payment or payment security is received or may terminate the purchase order, whereupon ABB shall be entitled to receive reasonable cancellation charges. If delivery is delayed by Purchaser, payment shall be due on the date ABB is prepared to make delivery. Delays in delivery or nonconformities in any installments delivered shall not relieve Purchaser of its obligation to accept and pay for remaining installments.

(c) Purchaser shall pay, in addition to the overdue payment, a late charge equal to the lesser of 1 1/2% per month or any part thereof or the highest applicable rate allowed by law on all such overdue amounts plus ABB's attorneys' fees and court costs incurred in connection with collection. If Purchaser fails to make payment of any amounts due under any purchase order and fails to cure such default within ten (10) days after receiving written notice specifying such default, then ABB may by written notice, at its option, suspend its performance under the purchase order until such time as the full balance is paid or terminate the purchase order, as of a date specified in such notice. In the event of suspension, cancellation or termination hereunder, ABB will be entitled to recover all costs for work performed to date, costs associated with suspension, cancellation or termination of the work and all other costs recoverable at law.

4. Changes.

(a) Any changes requested by Purchaser affecting the ordered scope of work must first be reviewed by ABB and any resulting adjustments to affected provisions, including price, schedule, and guarantees mutually agreed in writing prior to implementation of the change.

(b) ABB may, at its expense, make any changes in the Equipment or Services as it deems necessary, in its sole discretion, to conform the Equipment or Services to the applicable specifications (including but not limited to technical, standards, codes, performance, schedule, location or performance, plus applicable laws and regulations). If Purchaser objects to any such changes, ABB shall be relieved of its obligation to conform to the applicable specifications to the extent that conformance may be affected by such objection. ABB will not be obligated to meet specifications if not provided by Purchaser in the scope of work.

5. Delivery.

(a) All Equipment manufactured, assembled or warehoused in the continental United States is delivered FCA ABB point of shipment, Incoterms® 2020 unless otherwise mutually agreed in writing. Equipment shipped outside the continental United States is delivered FCA Incoterms® 2020 United States port of export unless otherwise mutually agreed in writing. Purchaser shall be responsible for any and all demurrage or detention charges.

(b) If the scheduled delivery of Equipment is delayed by Purchaser or by Force Majeure, ABB may move the Equipment to storage for the account of and at the risk of Purchaser whereupon it shall be deemed to be delivered.

(c) Shipping and delivery dates are contingent upon Purchaser's timely approvals and delivery by Purchaser of any documentation required for ABB's performance hereunder.

(d) Claims for shortages or other errors in delivery must be made in writing to ABB within ten (10) days of delivery. Equipment may not be returned except with the prior written consent of and subject to terms specified by ABB. Claims for damage after delivery shall be made directly by Purchaser with the common carrier.

6. Title & Risk of Loss.

Except with respect to Software (for which title shall not pass, use being licensed) title to Equipment shall transfer to Purchaser upon delivery according to the applicable freight term. Notwithstanding any agreement with respect to delivery terms or payment of transportation charges, risk of loss or damage with respect to the sale of Equipment shall pass from ABB to Purchaser at delivery as defined in this Agreement.

7. Inspection, Testing and Acceptance.

(a) Any inspection by Purchaser of Equipment on ABB's premises shall be scheduled in advance to be performed during normal working hours and subject to rules and regulations in place at the ABB premises.

(b) If the purchase order provides for factory acceptance testing, ABB shall notify Purchaser when ABB will conduct such testing prior to shipment. Unless Purchaser states specific objections in writing within ten (10) days after completion of factory acceptance testing, completion of the acceptance test constitutes Purchaser's factory acceptance of the Equipment and its authorization for shipment.

(c) If the purchase order provides for site acceptance testing, testing will be performed by ABB personnel to verify that the Equipment has arrived at site complete, without physical damage, and in good operating condition. Completion of site acceptance testing constitutes full and final acceptance of the Equipment. If, through no fault of ABB, acceptance testing is not completed within thirty (30) days after arrival of the Equipment at the site, the site acceptance test shall be deemed completed and the Equipment shall be deemed accepted.

8. Warranties and Remedies.

(a) Equipment and Services Warranty. ABB warrants that Equipment (excluding Software, which is warranted as specified in paragraph (d) below) shall be delivered free of defects in material and workmanship and that

Services shall be free of defects in workmanship. The Warranty Remedy Period for Equipment (excluding Software and spare parts) shall end twelve (12) months after installation or eighteen (18) months after date of shipment, whichever first occurs. The Warranty Remedy Period for new spare parts shall end twelve (12) months after date of shipment. If the purchase order includes the sale of refurbished or repaired parts, the Warranty Remedy Period for such parts shall end ninety (90) days after date of shipment. The Warranty Remedy Period for Services shall end ninety (90) days after the date of completion of Services.

(b) Equipment and Services Remedy. If a nonconformity to the foregoing warranty is discovered in the Equipment or Services during the applicable Warranty Remedy Period, as specified above, under normal and proper use and provided the Equipment has been properly stored, installed, operated and maintained and written notice of such nonconformity is provided to ABB promptly after such discovery and within the applicable Warranty Remedy Period, ABB shall, at its option, either (i) repair or replace the nonconforming portion of the Equipment or re-perform the nonconforming Services or (ii) refund the portion of the price applicable to the nonconforming portion of Equipment or Services. If any portion of the Equipment or Services so repaired, replaced or re-performed fails to conform to the foregoing warranty, and written notice of such nonconformity is provided to ABB promptly after discovery and within the original Warranty Remedy Period applicable to such Equipment or Services or thirty (30) days from completion of such repair, replacement or re-performance, whichever is later, ABB will repair or replace such nonconforming Equipment or re-perform the nonconforming Services. The original Warranty Remedy Period shall not otherwise be extended.

(c) Exceptions. ABB shall not be responsible for providing temporary power, removal, installation, reimbursement for labor costs or working access to the nonconforming Equipment, including disassembly and re-assembly of non-ABB supplied equipment, or for providing transportation to or from any repair facility, or for any other expenses incurred in connection with the repair or replacement, all of which shall be at Purchaser's risk and expense. ABB shall have no obligation hereunder with respect to any Equipment which (i) has been improperly repaired or altered; (ii) has been subjected to misuse, negligence or accident; (iii) has been used in a manner contrary to ABB's instructions; (iv) is comprised of materials provided by or a design specified by Purchaser; or (v) has failed as a result of ordinary wear and tear. Equipment supplied by ABB but manufactured by others is warranted only to the extent of the manufacturer's warranty, and only the remedies, if any, provided by the manufacturer will be allowed.

(d) Software Warranty and Remedies. ABB warrants that, except as specified below, the Software will, when properly installed, execute in accordance with ABB's published specification. If a nonconformity to the foregoing warranty is discovered during the period ending one (1) year after the date of shipment and written notice of such nonconformity is provided to ABB promptly after such discovery and within that period, including a description of the nonconformity and complete information about the manner of its discovery, ABB shall correct the nonconformity by, at its option, either (i) modifying or making available to the Purchaser instructions for modifying the Software; or (ii) making available at ABB's facility necessary corrected or replacement programs. ABB shall have no obligation with respect to any nonconformities resulting from (i) unauthorized modification of the Software or (ii) Purchaser-supplied software or interfacing. ABB does not warrant that the functions contained in the software will operate in combinations which may be selected for use by the Purchaser, or that the software products are free from errors in the nature of what is commonly categorized by the computer industry as "bugs".

(e) THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE, WHETHER WRITTEN, ORAL OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USAGE OF TRADE ARE HEREBY DISCLAIMED. THE REMEDIES STATED HEREIN CONSTITUTE PURCHASER'S EXCLUSIVE REMEDIES AND ABB'S ENTIRE LIABILITY FOR ANY BREACH OF WARRANTY.

9. Intellectual Property Infringement.

(a) ABB shall defend at its own expense any action brought against Purchaser alleging that the Equipment or the use of the Equipment to practice any process for which such Equipment is specified by ABB ("a Process") directly infringes a patent in effect in the United States, an European Union member state or the country of the Site (provided there is a corresponding patent issued by the U.S., UK or an EU member state), or any

copyright or trademark registered in the country of the Site and to pay all damages and costs finally awarded in any such action, provided that Purchaser has given ABB prompt written notice of such action, all necessary assistance in the defense thereof and the right to control all aspects of the defense thereof including the right to settle or otherwise terminate such action in behalf of Purchaser.

(b) ABB shall have no obligation hereunder and this provision shall not apply to: (i) any other equipment or processes, including Equipment or Processes which have been modified or combined with other equipment or process not supplied by ABB; (ii) any Equipment or Process supplied according to a design, other than an ABB design, required by Purchaser; (iii) any products manufactured by the Equipment or Process; (iv) any use of the Equipment or Process contrary to ABB instructions; (v) any patent issued after the date hereof; or (vi) any action settled or otherwise terminated without the prior written consent of ABB.

(c) If, in any such action, the Equipment is held to constitute an infringement, or the practice of any Process using the Equipment is finally enjoined, ABB shall, at its option and its own expense, procure for Purchaser the right to continue using said Equipment; or modify or replace it with non-infringing equipment or, with Purchaser's assistance, modify the Process so that it becomes non-infringing; or remove it and refund the portion of the price allocable to the infringing Equipment. THE FOREGOING PARAGRAPHS STATE THE EXCLUSIVE LIABILITY OF ABB AND EQUIPMENT MANUFACTURER FOR ANY INTELLECTUAL PROPERTY INFRINGEMENT.

(d) To the extent that said Equipment or any part thereof is modified by Purchaser, or combined by Purchaser with equipment or processes not furnished hereunder (except to the extent that ABB is a contributory infringer) or said Equipment or any part thereof is used by Purchaser to perform a process not furnished hereunder by ABB or to produce an article, and by reason of said modification, combination, performance or production, an action is brought against ABB, Purchaser shall defend and indemnify ABB in the same manner and to the same extent that ABB would be obligated to indemnify Purchaser under this "Intellectual Property Indemnification" provision.

10. Waiver of Consequential Damages.

In no event shall ABB, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, whether in contract, warranty, tort, negligence, strict liability or otherwise, including, but not limited to, loss of profits or revenue, loss of data, loss of use, loss of use of any of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities or services, downtime costs, delays, and claims of customers of the Purchaser or other third parties for any damages.

11. Limitation of Liability.

(a) ABB's aggregate liability for all claims whether in contract, warranty, tort, negligence, strict liability, or otherwise for any loss or damage arising out of, connected with, or resulting from this Agreement or the performance or breach thereof, or from the design, manufacture, sale, delivery, resale, repair, replacement, installation, technical direction of installation, inspection, operation or use of any equipment covered by or furnished under this Agreement, or from any services rendered in connection therewith, shall in no case (except as provided in the section entitled "Intellectual Property Indemnification") exceed the purchase order price.

(b) All causes of action against ABB arising out of or relating to this Agreement or the performance or breach hereof shall expire unless brought within one (1) year of the time of accrual thereof.

(c) In no event, regardless of cause, shall ABB be liable for penalties or penalty clauses of any description or for indemnification of Purchaser or others for costs, damages, or expenses arising out of or related to the Equipment and/Services.

(d) The rights and remedies of the parties contained under these terms and conditions shall be sole and exclusive.

12. Laws and Regulations.

ABB does not assume any responsibility for compliance with federal, state or local laws and regulations, except as expressly set forth in this Agreement, and compliance with any laws and regulations related to Purchaser's duties, obligations, and business practices including the application, operation, or use and disposal of the Equipment Services or Software is the sole responsibility of the Purchaser. All laws and regulations referenced in this Agreement shall be those in effect as of the original Proposal date. In the event of any subsequent revisions or changes thereto, ABB assumes no responsibility for compliance therewith. If Purchaser desires a modification as a result of any such change or revision, it shall be treated as a change per Article 4. Nothing contained herein shall be construed as imposing responsibility or liability upon ABB for obtaining any permits, licenses or approvals from any agency required in connection with the supply, erection or operation of the Equipment. This Agreement shall in all respects be governed by, and construed, interpreted and enforced in accordance with the laws of the State of New York, USA, excluding its conflicts of laws rules and the provisions of the United Nations Convention on Contracts for the International Sale of Goods, and both parties hereby agree that any litigation concerning, arising out of, or related to this Agreement, whether claims are based on contract, tort, equity or otherwise, shall be conducted only in the state or federal courts functioning in the State of New York, New York County and waive the defense of an inconvenient forum in respect to any such litigation. If any provision hereof, partly or completely, shall be held invalid or unenforceable, such invalidity or unenforceability shall not affect any other provision or portion hereof and these terms shall be construed as if such invalid or unenforceable provision or portion thereof had never existed.

13. OSHA.

ABB warrants that the Equipment will comply with the relevant standards of the Occupational Safety and Health Act of 1970 ("OSHA") and the regulations promulgated thereunder as of the date of the Proposal. Upon prompt written notice from the Purchaser of a breach of this warranty, ABB will replace the affected part or modify it so that it conforms to such standard or regulation. ABB's obligation shall be limited to such replacement or modification. In no event shall ABB be responsible for liability arising out of the violation of any OSHA standards relating to or caused by Purchaser's design, location, operation, or maintenance of the Equipment, its use in association with other equipment of Purchaser, or the alteration of the Equipment by any party other than ABB.

14. Software License. (a) ABB owns all rights in or has the right to sublicense all of the Software, if any, to be delivered to Purchaser under this Agreement. As part of the sale made hereunder Purchaser hereby obtains a limited license to use the Software, subject to the following: (i) the Software may be used only in conjunction with equipment specified by ABB; (ii) the Software shall be kept strictly confidential; (iii) the Software shall not be copied, reverse engineered, or modified; (iv) the Purchaser's right to use the Software shall terminate immediately when the specified equipment is no longer used by the Purchaser or when otherwise terminated, e.g. for breach, hereunder; and (v) the rights to use the Software are non-exclusive and non-transferable, except with ABB's prior written consent.

(b) Nothing in this Agreement shall be deemed to convey to Purchaser any title to or ownership in the Software or the intellectual property contained therein in whole or in part, nor to designate the Software a "work made for hire" under the Copyright Act, nor to confer upon any person who is not a named party to this Agreement any right or remedy under or by reason of this Agreement. In the event of termination of this License, Purchaser shall

immediately cease using the Software and, without retaining any copies, notes or excerpts thereof, return to ABB the Software and all copies thereof and shall remove all machine-readable Software from all of Purchaser's storage media.

15. Intellectual Property, Inventions and Information.

(a) "Intellectual Property Rights" means all current and future rights in copyrights, trade secrets, trademarks, mask works, patents, design rights, trade dress, and any other intellectual property rights that may exist anywhere in the world, including, in each case whether unregistered, registered or comprising an application for registration, and all rights and forms of protection of a similar nature or having equivalent or similar effect to any of the foregoing. "Technology" means all inventions, discoveries, ideas, concepts, methods, code, executables, manufacturing processes, unique compositions, mask works, designs, marks, and works of authorship fixed in the medium of expression, and materials pertaining to any of the preceding; whether or not patentable, copyrightable or subject to other forms of protection.

(b) ABB shall maintain all right, title and interest in any Technology and Intellectual Property Rights that ABB owned, created, conceived or discovered prior to entering into this Agreement, or owns, creates or discovers separately from the activities contemplated by this Agreement. Unless otherwise agreed in writing by ABB and Purchaser, ABB shall have all right, title and interest in any Technology and Intellectual Property Rights that ABB creates, conceives or discovers in furtherance of this Agreement, and ABB shall have all right, title and interest in any Technology and Intellectual Property Rights embodied in the Equipment and Services. Any design, manufacturing drawings or other information submitted to the Purchaser remains the exclusive property of ABB. Purchaser shall not, without ABB's prior written consent, copy or disclose such information to a third party, unless required by a public information request from a governmental body. Such information shall be used solely for the operation or maintenance of the Equipment and not for any other purpose, including the duplication thereof in whole or in part.

16. Force Majeure.

ABB shall neither be liable for loss, damage, detention or delay nor be deemed to be in default for failure to perform when prevented from doing so by causes beyond its reasonable control including but not limited to acts of war (declared or undeclared), delays attributable to outbreaks, epidemics and pandemics (including any variations),

Acts of God, fire, strike, labor difficulties, acts or omissions of any governmental authority or of Purchaser, compliance with government regulations, insurrection or riot, embargo, delays or shortages in transportation or inability to obtain necessary labor, materials, or manufacturing facilities from usual sources or from defects or delays in the performance of its suppliers or subcontractors due to any of the foregoing enumerated causes. In the event of delay due to any such cause, the date of delivery will be extended by period equal to the delay plus a reasonable time to resume production, and the price will be adjusted to compensate ABB for such delay.

17. Cancellation.

Special order, custom designed, and made-to-order Equipment are non-cancelable and non-returnable. Any other purchase order may be cancelled by Purchaser only upon prior written notice and payment of termination charges as set forth in the cancellation schedule included in the Proposal or payment of, including but not limited to, the purchase price of the work performed prior to the effective date of notice of termination, the costs identified to the purchase order incurred by ABB for work not completed, and all expenses incurred by ABB attributable to the termination, plus a fixed sum of ten (10) percent of the final total price to compensate for disruption in scheduling, planned production and other indirect costs.

18. Termination.

(a) No termination by Purchaser for material default shall be effective unless, within fifteen (15) days after receipt by ABB of Purchaser's written notice specifying such default, ABB shall have failed to initiate and pursue with due diligence correction of such specified default.

(b) If the event of termination for a material default, ABB shall reimburse Purchaser the difference between that portion of the Agreement price allocable to the terminated scope and the actual amounts reasonably incurred by Purchaser to complete that scope, and Purchaser shall pay to ABB the portion of the Agreement price allocable to Equipment completed and any amounts due for Services performed before the effective date of termination.

(c) ABB may terminate the Agreement (or any affected portion thereof) immediately for cause if Purchaser becomes insolvent/bankrupt, or materially breaches the Agreement, including, but not limited to, failure or delay in Purchaser making any payment when due, or fulfilling any payment conditions.

19. Export Control.

(a) The following definitions apply to this Article 19:

"Trade Control Laws" means all applicable trade and economic sanctions laws and regulations, specifically including but not limited to the U.S. International Traffic in Arms Regulations ("ITAR"), 22 C.F.R. 120 et seq.; the Export Administration Regulations ("EAR"), 15 C.F.R. 730-774; the Foreign Assets Control Regulations ("FACR"), 31 C.F.R. 500-598; the Foreign Trade Regulations ("FTR"), 15 C.F.R. 30-199; and, any administrative or regulatory decisions or guidelines adopted pursuant to Trade Control Laws.

"Purchaser Entities" means Purchaser's officers, directors, employees, parent company, subsidiaries and other affiliates, and if the Equipment, Software and/or Services are subject to resale or other distribution, Purchaser's customers and end-users of the same.

(b) Purchaser shall comply in all respects with Trade Control laws and shall not export, re-export, transfer, disclose or otherwise provide or make accessible the Equipment, Software, data or other information provided to Purchaser by ABB hereunder, to any non-U.S. person or entity (including Purchaser's dual and/or third-country national employees or third party contractors) without first complying with all requirements of the applicable Trade Control Laws. If Purchaser is a U.S. entity and is engaged in the business of either exporting or manufacturing (whether exporting or not) Defense Articles or furnishing Defense Services as defined in the ITAR, Purchaser represents that it shall maintain an active registration with the U.S. Department of State's Directorate of Defense Trade Controls ("DDTC"), as required by the ITAR, throughout the performance of this Contract, and that it maintains an effective export and import compliance program in accordance with the ITAR. If Purchaser is a U.S. entity and will export ABB's Equipment, Software, and/or data, Purchaser will be considered an exporter within the meaning of the U.S. export regulations. Therefore, ABB should not be listed as the exporter or U.S. Principal Party in Interest ("USPPI") on any documentation or filings relating to any export. Purchaser acknowledges it's acting on its own behalf and not as ABB's agent for export or any other purposes.

(c) Purchaser represents and warrants that the Equipment, Software and Services provided hereunder, and the "direct product" thereof are intended for civil use only and will not be used, directly or indirectly, for the production of chemical or biological weapons or of precursor chemicals for such weapons, or for any direct or indirect nuclear end use or any other end use prohibited by Trade Control Laws.

(d) Purchaser represents and warrants that: (1) neither Purchaser nor any Purchaser

Entity is included on any of the restricted party lists maintained by the U.S. Government, including the Specially Designated Nationals List administered by the U.S. Treasury Department's Office of Foreign Assets Control ("OFAC"), Denied Parties List, Unverified List or Entity List maintained by the U.S. Commerce Department's Bureau of Industry and Security ("BIS"), or the List of Statutorily Debarred Parties maintained by the U.S. State Department's Directorate of Defense Trade Controls, listed, the ITAR §126.1 Restricted Parties List, or the consolidated list of asset freeze targets designated by the United Nations, European Union, and United States or any similar list maintained by the European Union or European member state (collectively "Restricted Parties List"); and (2) no entity or person listed on the Restricted Parties List (or owned directly or indirectly, in whole or in part, by an entity or person on the Restricted Parties List) has any property, financial or other interest in the Equipment, Software or Services, and that the same shall not be transferred, reexported, disclosed to or otherwise provided to an entity or person on the Restricted Parties List. Purchaser shall notify ABB immediately if Purchaser or a Purchaser Entity becomes listed on the Restricted Party List.

(e) Purchaser shall notify ABB immediately upon awareness of any breach or suspected breach of this Article 19. Any violation of Purchaser's obligations under this Article 19 is a material breach of this Agreement and ABB reserves the right to terminate the Agreement immediately upon written notice for Purchaser's default. Purchaser shall indemnify, defend and hold harmless ABB, its officers, directors, employees, agents, affiliates, successors, and permitted assigns from and against all claims, causes of action, damages, liabilities, and expenses, including attorney's fees arising from Purchaser's breach of this Article 19 and any resulting termination of this Agreement.

(f) If agreed to by the Parties pursuant to a written statement of work or elsewhere in this Agreement, ABB shall file for a U.S. export license, but only after appropriate documentation for the license application has been provided by Purchaser. Purchaser shall furnish such documentation within a reasonable time after purchase order acceptance. Any delay in obtaining such license shall suspend performance of this Agreement by ABB. If an export license is not granted or, if once granted, is thereafter revoked or modified by the appropriate authorities, this Agreement may be canceled by ABB without liability for damages of any kind resulting from such cancellation. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

(g) When applicable, the party considered the exporter of the Equipment, Software, Services and/or data, will apply for the export license in compliance with all applicable Trade Control Laws. If ABB is the applicant of the export license, the Purchaser agrees to immediately provide all the necessary information and documentation (i.e. End-User/End-Use Certificate and Letter of Assurance) required to apply for the license. If an export license is denied or revoked, the applicant must notify the other party immediately and this Agreement may be terminated by ABB without liability for damages of any kind resulting from such termination.

20. Trade Controls

a) The Parties agree to comply with all applicable sanctions and export control laws in connection with this Agreement. Sanctions and export control laws and regulations include any applicable laws, regulations, or administrative or regulatory decisions or guidelines that sanction, prohibit or restrict certain activities including, but not limited to, (i) import, export, re-export, transfer, or transshipment of goods, services, technology, or software; (ii) financing of, in-vestment in, or direct or indirect transactions or dealings with certain countries, territories, regions, governments, projects, or specifically designated persons or entities, including any future amendments to these provisions; or (iii) any other laws, regulations, administrative or regulatory decisions, or guidelines adopted, maintained, or enforced by any Sanctions Agency on or after the date of the [purchase order] (collectively, "Trade Control Laws"). "Sanctions Agency" means any governmental or regulatory body, instrumentality, authority, institution, agency or court that promulgates or administers Trade Control Laws including, but not limited to, the aforementioned governmental and regulatory bodies of (i) the United Nations, (ii) the United States of America (including the U.S. Department of Treasury Office of Foreign Assets Control, U.S. Department of State and U.S. Department of Commerce), (iii) the European Union or (iv) Switzerland.

(b) The Parties confirm that they have not violated, shall not violate, and shall not cause the other Party to violate, any applicable Trade Control Laws. Each Party represents and warrants that, to the best of its knowledge, at the date of the [purchase Order] neither it, nor any of their respective directors or officers are a Restricted Person. Each Party agrees that it shall promptly notify the other Party if it becomes a Restricted Person. "Restricted Person" means any entity or person included on a list (including U.S. and EU lists) of targeted parties, blocked parties, or persons subject to asset-freezing or other restrictions introduced under any applicable Trade Control Laws (and includes any entity that is directly or indirectly owned fifty (50) percent or more, in the aggregate or individually, or otherwise controlled by any Restricted Person).

(c) If, as a result of Trade Control Laws issued or amended after the date of the [purchase order], including, but not limited to, (i) the Purchaser or the end-user is/becomes a Restricted Person, or (ii) any necessary export license or authorization from a Sanctions Agency is not granted, the performance by ABB or any of its affiliates becomes illegal or impracticable, ABB shall be entitled to either immediately suspend the performance of the affected obligation under the [purchase Order] until such time as ABB may lawfully discharge such obligation or unilaterally terminate the [purchase order] in whole or in part. ABB will not be liable to the Purchaser for any costs, expenses or damages associated with such suspension or termination of the [purchase order].

(d) The Parties undertake to obtain all the necessary licenses and/or permits from the competent authorities for the import or export, re-export, or in-country transfer of Equipment and Services, Equipment and Software, and the "direct product" thereof, that originate from the United States are subject to the U.S. Export Administration Regulations ("EAR") and must not be exported, re-exported, or transferred (in-country) without obtaining the necessary valid li-censes/authorizations of the competent US authorities. At ABB's request, Purchaser shall provide to ABB a Letter of Assurance and End-User Statement in a form reasonably satisfactory to ABB.

(e) The Purchaser represents and warrants that the Equipment and Services are for civil use only. The Purchaser further represents that it will not directly or indirectly sell, export, re-export, release, transmit or otherwise transfer any items received from ABB to any Restricted Parties, or parties that operate, or whose end use will be, in a jurisdiction/region prohibited by ABB including Belarus, Crimea, Cuba, Iran, North Korea, Russia, Syria, as well as the Donetsk, Luhansk, Kherson, and Zaporizhzhia regions of Ukraine (such list may be amended by ABB at any time).

(f) If the Purchaser infringes any obligations in this Trade Controls clause in connection with the [purchase order], the Purchaser must immediately notify ABB. Failure to comply with these Trade Compliance obligations shall be con-sidered a material breach, and ABB shall have the right to unilaterally terminate the Agreement with immediate effect. Such termination would be without prejudice to all rights of recourse which could be exercised by ABB, and ABB shall not be liable to Purchaser for any claim, losses or damages whatsoever related to its decision to terminate performance under this provision. Further, Purchaser shall indemnify ABB for all liabilities, damages, costs, or expenses incurred as a result of any such violation, breach and/or termination of the Agreement. ABB may report such violations to relevant authorities as required by applicable Trade Control Laws.

(g) For the avoidance of doubt, no provision in this Agreement shall be interpreted or applied in a way that would require any Party to do, or refrain from doing, any act which would constitute a violation of, or result in a loss of economic benefit under, applicable Trade Control Laws.

21. Bribery and Corruption.

(a) Purchaser hereby warrants that it will not, directly or indirectly, and it has no knowledge that other persons will, directly or indirectly, make any payment, gift or other commitment to its customers, to government officials or to agents, directors and employees of ABB or any other party in a manner contrary to applicable laws (including but not limited to the Corruption of Foreign Public Officials Act (Canada), the Foreign Corrupt Practices Act (United States) and, where applicable, legislation enacted by member States and signatories implementing the OECD Convention Combating Bribery of Foreign Officials) and shall comply with all relevant laws, regulations, ordinances and rules regarding bribery and corruption.

(b) Nothing hereunder shall render ABB liable to reimburse Purchaser for any such consideration given or promised.

(c) Purchaser's material violation of any of the obligations contained in Article 20(a) above may be considered by Seller to be a material breach hereunder and shall entitle Seller to terminate this agreement with immediate effect and without prejudice to any further right or remedies on the part of Seller hereunder or applicable law. Purchaser shall indemnify Seller for all liabilities, damages, costs or expenses incurred as a result of any such violation of the above-mentioned obligations and termination of this agreement.

(d) Purchaser understands that Seller's Code of Conduct is available for consultation online at <http://www.abb.com/integrity>. Purchaser agrees to perform its contractual obligations hereunder with substantially similar standards of ethical behavior as those found in Supplier's Code of Conduct.

(e) Seller has established the following reporting channels where Purchaser and its employees may report suspected violations of applicable laws, policies or standards of conduct:

Web portal: www.abb.com/integrity

Telephone: number specified on the above Web portal

Mail: address specified on the above Web portal

22. Assignment.

Any assignment of this Agreement or of any rights or obligations under the Agreement without prior written consent of ABB shall be void.

23. Nuclear.

Equipment and Services sold hereunder are not intended for use in connection with any nuclear facility or activity, and Purchaser warrants that it shall not use or permit others to use Equipment or Services for such purposes, without the advance written consent of ABB. If, in breach of this, any such use occurs, ABB (and its parent, affiliates, suppliers and subcontractors) disclaims all liability for any nuclear or other damage, injury or contamination, including without limitation any physical damage to a nuclear facility itself, resulting from a nuclear incident and, in addition to any other rights of ABB, Purchaser shall indemnify and hold ABB (and its parent, affiliates, suppliers and subcontractors) harmless against all such liability including, but not limited to, any physical damage to the nuclear facility or surrounding properties, if any. Consent of ABB to any such use, if any, will be conditioned upon additional terms and conditions that ABB determines to be acceptable for protection against nuclear liability including but not limited to the requirement that the Purchaser and/or its end user customer shall have complete insurance protection against liability and property damage including without limitation physical damage to a nuclear facility itself or any surrounding properties, if any, resulting from a nuclear incident and shall indemnify ABB, its subcontractors, suppliers and vendors against all claims resulting from a nuclear incident including, but not limited to, any physical damage to the nuclear facility.

24. Resale.

If Purchaser resells any of the Equipment or Services, the sale terms shall limit ABB's liability to the buyer to the same extent that ABB's liability to Purchaser is limited hereunder. Additionally, if the end-user intends to use the Equipment or Services in connection with any nuclear facility or activity, the Purchaser shall require the end-user comply with the financial requirements under Price-Anderson Act (PAA) and secure a written release of liability which flows from the end-user to the benefit of ABB.

25. Environmental, Health and Safety Matters.

(a) Purchaser shall be obligated to maintain safe working conditions at its facility or location (the "Site"), including the implementing of appropriate procedures regarding Hazardous Materials, confined space entry, and energization and de-energization of power systems (electrical, mechanical and hydraulic) using safe and effective lock- out/tag-out ("LOTO") procedures including physical LOTO or a mutually agreed upon alternative method.

(b) Purchaser shall immediately advise ABB in writing of all applicable Site-specific health, safety, security and environmental requirements and procedures. Without limiting Purchaser's responsibilities hereunder, ABB has the right but not the obligation to, from time to time, review, audit and inspect applicable health, safety, security and environmental documentation, procedures and conditions at the Site.

(c) If, in ABB's reasonable opinion, the health, safety, or security of personnel or the Site is, or is likely to be, imperiled by security risks, the presence of or threat of exposure to Hazardous Materials, or unsafe working conditions, ABB may, in addition to other rights or remedies available to it, remove some or all of its personnel from Site, suspend performance of all or any part of the purchase order, and/or remotely perform or supervise work. Any such occurrence shall be considered a Force Majeure event. Purchaser shall reasonably assist in ensuring the safe departure of personnel from the Site.

(d) Purchaser shall not require or permit ABB's personnel to operate Purchaser's equipment at Site.

(e) Purchaser will make its Site medical facilities and resources reasonably available to ABB personnel who need medical attention.

(f) ABB has no responsibility or liability for the pre-existing condition of Purchaser's equipment or the Site, which is the sole responsibility of Purchaser. Prior to ABB starting any work at Site, Purchaser will provide documentation that identifies the presence and condition of any Hazardous Materials existing in or about Purchaser's equipment or the Site that ABB may encounter while performing under this Agreement. The provision of such documentation shall in no way release Purchaser from its responsibility for said conditions. Purchaser shall disclose to ABB industrial hygiene and environmental monitoring data regarding conditions that may affect ABB's work or personnel at the Site. Purchaser shall keep ABB informed of changes in any such conditions.

(g) ABB shall promptly notify Purchaser if ABB becomes aware of: (i) conditions at the Site differing materially from those disclosed by Purchaser, or (ii) previously unknown physical conditions at Site differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Agreement. If any such conditions cause an increase in ABB's cost of, or the time required for, performance of any part of the work under the Agreement, an equitable adjustment in price and schedule shall be made.

(h) If ABB encounters Hazardous Materials in Purchaser's equipment or at the Site that require special handling or disposal, ABB is not obligated to continue work affected by the hazardous conditions. In such an event, Purchaser shall at its sole cost and expense eliminate the hazardous conditions in accordance with applicable laws and regulations so that ABB's work under the Agreement may safely proceed, and ABB shall be entitled to an equitable adjustment of the price and schedule to compensate for any increase in ABB's cost of, or time required for, performance of any part of the work. Purchaser shall properly store, transport and dispose of all Hazardous Materials introduced, produced or generated in the course of ABB's work at the Site. (i) Purchaser shall indemnify ABB for any and all claims, damages, losses, and expenses arising out of or relating to any Hazardous Materials which are or were (i) present in or about Purchaser's equipment or the Site prior to the commencement of ABB's work, (ii) improperly handled or disposed of by Purchaser or Purchaser's employees, agents, contractors or subcontractors, or (iii) brought, generated, produced or released on Site by parties other than ABB.

26. Confidentiality.

a) ABB and Purchaser (as to information disclosed, the "Disclosing Party") may each provide the other party (as to information received, the "Receiving Party") with Confidential Information in connection with this Agreement. "Confidential Information" means (a) information that is designated in writing as "confidential" or "proprietary" by Disclosing Party at the time of written disclosure, and (b) information that is orally designated as "confidential" or "proprietary" by Disclosing Party at the time of oral or visual disclosure and is confirmed to be "confidential" or "proprietary" in writing within fifteen (15) days after the oral or visual disclosure. In addition, prices for Products and Services shall be considered ABB's Confidential Information.

(b) Receiving Party agrees: (i) to use the Confidential Information only in connection with the Agreement and use of Products and Services, (ii) to take reasonable measures to prevent disclosure of the Confidential Information to third parties, and (iii) not to disclose the Confidential Information to a competitor of Disclosing Party. Notwithstanding these restrictions, each party shall permit access to the other's Confidential Information only to its employees who: (i) reasonably require access to Confidential Information for purposes approved by this Agreement, and (ii) have undertaken a binding obligation of confidentiality with respect to the confidential information of others entrusted to him or her, and (iii) have been apprised of the confidentiality obligations hereunder. ABB may disclose Confidential Information to its affiliates and subcontractors in connection with performance of the purchase order. A Receiving Party may only disclose Confidential Information to any other third party with the prior written permission of Disclosing Party, and in each case, only so long as the Receiving Party obtains a non-disclosure commitment from any such third party that prohibits disclosure of the Confidential Information and provided further that the Receiving Party remains responsible for any unauthorized use or disclosure of the Confidential Information. Receiving Party shall upon request return to Disclosing Party or destroy all copies of Confidential Information except to the extent that a specific provision of the Agreement entitles Receiving Party to retain an item of Confidential Information. ABB may also retain one archive copy of Purchaser's Confidential Information.

(c) The obligations under this Article 25 shall not apply to any portion of the Confidential Information that: (i) is or becomes generally available to the public other than as a result of disclosure by Receiving Party, its representatives or its affiliates; (ii) is or becomes available to Receiving Party on a non-confidential basis from a source other than Disclosing Party when the source is not, to the best of Receiving Party's knowledge, subject to a confidentiality obligation to Disclosing Party; (iii) is independently developed by Receiving Party, its representatives or affiliates, without reference to the Confidential Information; (iv) is required to be disclosed by law or valid legal process provided that the Receiving Party intending to make disclosure in response to such requirements or process shall promptly notify the Disclosing Party in advance of such disclosure and reasonably cooperate in attempts to maintain the confidentiality of the Confidential Information.

(d) As to any individual item of Confidential Information, the restrictions under this Article 25 shall expire five (5) years after the date of disclosure. This Article 25 does not supersede any separate confidentiality or nondisclosure agreement signed by the parties.

27. Non-Survival.

The following Articles shall not survive termination or cancellation of this Agreement: 5, 7, 8, 17 and 18. All other Articles shall survive the termination or cancellation of the Agreement.

28. Entire Agreement.

This Agreement constitutes the entire agreement between ABB and Purchaser. There are no agreements, understandings, restrictions, warranties, or representations between ABB and Purchaser other than those set forth herein or herein provided. As stated in Article 1 of this Agreement, ABB's Proposal, policies, addendum(s), if any, submitted to Purchaser, shall control over any conflicting terms. ABB specifically rejects any exceptions to this Agreement, Proposals, policies, and/or addendum(s) on the face of any purchase order. Purchaser shall advise ABB in writing of all conflicts, errors, omissions, or discrepancies among the Proposal, Policies, Addendum(s) and this Agreement immediately upon discovery. This Agreement shall supersede any standard, preprinted terms and conditions that are automatically attached to purchase orders issued by Purchaser.

29. US Government Contracts.

This Article 28 applies only if the Agreement is for the direct or indirect sale, or is funded in whole or in part by, an agency of the U.S. federal government, or a state government, or any other U.S. government instrumentality or political subdivision (collectively "U.S. government entity"). Unless otherwise expressly stated and specifically agreed in ABB's Proposal:

(a) Purchaser agrees that:

(i) all Equipment, Software, and Services provided by ABB meet the definition of "commercial-off-the-shelf" ("COTS") or "commercial product" or "commercial service" or "commercial computer software" as those terms are defined in Federal Acquisition Regulation ("FAR") 2.101.

(ii) ABB technical data and computer software are developed at ABB's private expense and not in performance of the Agreement. ABB retains ownership and proprietary rights in all technical data and computer software provided to Purchaser under the Agreement and under a U.S. Government contract or subcontract. Neither the Purchaser, the U.S. Government nor any higher-tier contractor under a U.S. Government contract will obtain any rights in ABB technical data or computer software beyond the rights provided under ABB's standard commercial licenses consistent with FAR 12.211 and 12.212.

(iii) to the extent the Buy American Act (41 U.S.C. §§ 8301 – 8305, as amended), Trade Agreements Act (19 U.S.C. §§ 2501 – 2581, as amended), Build America, Buy America (Pub. L. 117-58, December 29, 2022, as amended) or other domestic preference requirements are applicable to this Agreement, the country of origin of Equipment or Software is unknown.

(iv) the version of any applicable FAR clause listed in this Article 28 shall be the one in effect on the effective date of this Agreement.

(b) If Purchaser is an agency of the U.S. Government, then as permitted by FAR 12.302, Purchaser agrees that:

(i) all paragraphs of FAR 52.212-4 (except those listed in 12.302(b)) are replaced with these Terms and Conditions.

(ii) only the clauses identified in FAR 52.212-5 apply and only to the extent applicable for sale of COTS and/or commercial products and/or commercial services and as appropriate for the purchase order price.

(iii) any Services offered by ABB are exempt from the Service Contract Act of 1965 (41 U.S.C. §§ 6701 - 6707, as amended).

(iv) all other U.S. Government agency contract provisions are rejected.

(c) If Purchaser is procuring as a contractor, or subcontractor at any tier, on behalf of an agency of a U.S. government entity, then Purchaser agrees that:

(i) only the clauses identified in FAR 52.212-5(e)(1) or 52.244-6(c)(1) (whichever is applicable) apply and only to the extent applicable for sale of COTS and/or commercial products and/or services and as appropriate for the purchase order price.

(ii) Purchaser shall notify ABB prior to transmitting any Controlled Unclassified Information ("CUI") to ABB, and only upon written authorization by ABB may Purchaser transmit CUI to ABB. Purchaser shall transmit CUI to ABB in accordance with applicable CUI safeguarding and/or dissemination authority requirements.

(iii) prevailing wage and related public works labor and employment laws or regulations are not applicable to ABB's services offered in the Proposal.

(iv) Purchaser is solely responsible for its obligations to its customer(s), including validating that ABB's Proposal fulfills Purchaser's U.S. Government contracting obligations, if any. To the extent the terms and conditions of Purchaser's customer contract(s) are different from the terms and conditions of this Agreement, Purchaser shall defend, indemnify and hold ABB harmless from and against all losses, liabilities, cost, expense (including attorney's fees and expenses of litigation and/or settlement), damages, allegations, claims, causes of action and judgments resulting from such difference. In no event will Purchaser withhold payment due to ABB for any dispute or liability incurred between Purchaser and its customer(s).

30. Data Protection.

(a) The parties agree that the protection of Personal Data is very important. If Purchaser discloses Personal Data to ABB, ABB shall comply with all applicable data protection laws and regulations. Purchaser shall comply with all applicable data protection laws and regulations in respect of any Personal Data it receives from ABB in the course of receiving the Equipment or Services.

(b) The parties agree that neither will withhold or delay its consent to any changes to this clause which are required to be made in order to comply with applicable data protection laws and regulations and/or with guidelines and order from any competent supervisory authority, and their application to the Equipment or Services from time to time, and agrees to implement any such changes at no additional cost to the other party.

(c) The parties acknowledge that the processing of Personal Data in accordance with this purchase order may require the conclusion of additional data processing agreements or additional data protection agreements. If and to the extent such additional data processing agreements or additional data protection agreements are not initially concluded as part of the purchase order, the parties shall, and shall ensure that their relevant affiliates or subcontractors shall, upon the other's request promptly enter into any such agreement with an affiliate, as designated by the other party and as required by mandatory law or a competent data protection or other competent authority.