

CITY OF NAPLES, FLORIDA
AGREEMENT
(CONSTRUCTION SERVICES)

Bid/Proposal No. 20-030

Clerk Tracking No. 2020-00059

Project Name: WTP-Water Treatment Plant Switchgear and MCC Replacement

THIS AGREEMENT (the "Agreement") is made and entered into this 20th day of May 2020 by and between the City of Naples, a Florida municipal corporation, (the "CITY") and Eau Gallie Electric, Inc., a Florida Corporation, located at: 2012 Aurora Road; Melbourne, Florida 32935 (the "CONTRACTOR").

WHEREAS, the CITY desires to obtain the services of the CONTRACTOR concerning certain services specified in this Agreement (referred to as the "Project"); and

WHEREAS, the CONTRACTOR has submitted an (ITB) Invitation to Bid No. 20-030 for provision of those services; and

WHEREAS, the CONTRACTOR represents that it has expertise in the type of services that will be required for the Project.

NOW, THEREFORE, in consideration of the mutual covenants and provisions contained herein, the parties hereto agree as follows:

ARTICLE ONE
CONTRACTOR'S RESPONSIBILITY

1.1. The Services to be performed by the CONTRACTOR are generally described as WTP-Water Treatment Plant Switchgear and MCC Replacement and may be more fully described in the Scope of Services, attached as **EXHIBIT A** and made a part of this Agreement.

1.2. The CONTRACTOR agrees to obtain and maintain throughout the period of this Agreement all such licenses as are required to do business in the State of Florida, the City of Naples, and in Collier County, Florida, including, but not limited to, all licenses required by the respective state boards and other governmental agencies responsible for regulating and licensing the services to be provided and performed by the CONTRACTOR pursuant to this Agreement.

1.3. The CONTRACTOR agrees that, when the services to be provided hereunder relate to a professional service which, under Florida Statutes, requires a license, registration, certificate of authorization or other form of legal entitlement to practice such services, it shall employ or retain only qualified personnel to provide such services.

1.4. The CONTRACTOR agrees to employ and designate, in writing, within 5 calendar days after receiving its Notice to Proceed, or other directive from the CITY, a qualified employee to serve as the CONTRACTOR's project manager (the "Project Manager"). The Project Manager shall be authorized and responsible to act on behalf of the CONTRACTOR with respect to directing, coordinating and administering all aspects of the services to be provided and performed under this Agreement.

1.5. The CONTRACTOR has represented to the CITY that it has expertise in the type of services that will be required for the Project. The CONTRACTOR agrees that all services to be provided by CONTRACTOR pursuant to this Agreement shall be subject to the CITY's review and approval and shall be in accordance with the generally accepted standards of practice in the State of Florida, as may be applied to the type of services to be rendered, as well as in accordance with all published laws, statutes, ordinances, codes, rules, regulations and requirements of any governmental agencies that regulate or have jurisdiction over the Project or the services to be provided and performed by the CONTRACTOR. In the event of any conflicts in these requirements, the CONTRACTOR shall notify the CITY of such conflict and utilize its best professional judgment to advise CITY regarding resolution of the conflict.

1.6. The CONTRACTOR agrees not to divulge, furnish or make available to any third person, firm or organization, without CITY's prior written consent, or unless incident to the proper performance of the CONTRACTOR's obligations hereunder, or in the course of judicial or legislative proceedings where such information has been properly subpoenaed, any non-public information concerning the services to be rendered by the CONTRACTOR hereunder, and the CONTRACTOR shall require all of its employees, agents, sub-consultants and subcontractors to comply with the provisions of this paragraph. However, the CONTRACTOR shall comply with the Florida Public Records laws including those requirements set out in ARTICLE FIVE, below.

1.7. The CONTRACTOR agrees not to employ or offer to employ any Elected Officer or City Managerial Employee of the CITY who in any way deals with, coordinates on, or assists with, the services provided in this Agreement, for a period of 2 years after termination of all provisions of this Agreement. For purposes of this paragraph, the term "Elected Officer" shall mean any member of the City Council. For purposes of this paragraph, the term "City Managerial Employee" shall mean the City Manager, the Assistant City Manager, the City Clerk, and any City department head or director. If the CONTRACTOR violates the provisions of this paragraph, the CONTRACTOR shall be required to pay damages to the CITY in an amount equal to any and all compensation that is received by the former Elected Officer or City Managerial Employee of the CITY from or on behalf of the contracting person or entity, or an amount equal to the former Elected Officer's or City Managerial Employee's last 2 years of gross compensation from the CITY, whichever is greater.

1.8. The CONTRACTOR agrees not to provide services for compensation to any party that is contracting with the CITY on the same subject matter, same project, or scope of services as set forth in this Agreement without approval from the CITY. This section does not prevent the CONTRACTOR from contracting with other firms or government organizations for similar services.

1.9. Except as otherwise provided in this Agreement, the CONTRACTOR agrees not to disclose or use any information not available to members of the general public and gained by reason of the CONTRACTOR's contractual relationship with the CITY for the special gain or benefit of the CONTRACTOR or for the special gain or benefit of any other person or entity.

ARTICLE TWO CITY'S RESPONSIBILITIES

2.1. The CITY shall designate in writing a project coordinator to act as the CITY's representative with respect to the services to be rendered under this Agreement (the "Project Coordinator"). The Project Coordinator shall have authority to transmit instructions, receive information, interpret and define the CITY's policies and decisions with respect to the CONTRACTOR's services for the Project. However, the Project Coordinator is not authorized to issue any verbal or written orders or instructions to the CONTRACTOR that would have the effect, or be interpreted to have the effect, of modifying or changing

in any way whatever:

- (a) The scope of services to be provided and performed by the CONTRACTOR;
- (b) The time the CONTRACTOR is obligated to commence and complete all such services;
or
- (c) The amount of compensation the CITY is obligated or committed to pay the CONTRACTOR.

Any such modifications or changes shall only be made by or upon the authorization of the CITY's city manager as authorized by city council in the enabling legislation or in the CITY's procurement policies.

2.2. The Project Coordinator shall:

- (a) Review and make appropriate recommendations on all requests submitted by the CONTRACTOR for payment for services and work provided and performed in accordance with this Agreement;
- (b) Arrange for access to and make all provisions for the CONTRACTOR to enter the Project site to perform the services to be provided by the CONTRACTOR under this Agreement; and
- (c) Provide notice to the CONTRACTOR of any deficiencies or defects discovered by the CITY with respect to the services to be rendered by the CONTRACTOR hereunder.

2.3. The CONTRACTOR acknowledges that access to the Project Site, to be arranged by the CITY for the CONTRACTOR, may be provided during times that are not the normal business hours of the CONTRACTOR.

ARTICLE THREE TIME

3.1. Services to be rendered by the CONTRACTOR shall be commenced subsequent to the execution of this Agreement upon written Notice to Proceed from the CITY for all or any designated portion of the Projects assigned to this Agreement and **must be performed with a final completion by March 31, 2021. Project is being assigned an Administrative 60-day Close-out time frame.** Time is of the essence with respect to the performance of this Agreement.

3.2. Should the CONTRACTOR be obstructed or delayed in the prosecution or completion of its services as a result of unforeseeable causes beyond the control of the CONTRACTOR, and not due to its own fault or neglect, including but not restricted to acts of God or of public enemy, acts of government or of the CITY, fires, floods, epidemics, quarantine regulations, strikes or lock-outs, then the CONTRACTOR shall notify the CITY in writing within 5 working days after commencement of such delay, stating the cause or causes thereof, or be deemed to have waived any right which the CONTRACTOR may have had to request a time extension.

3.3. No interruption, interference, inefficiency, suspension or delay in the commencement or progress of the CONTRACTOR's services from any cause whatsoever, including those for which the CITY may be responsible in whole or in part, shall relieve the CONTRACTOR of its duty to perform or give rise to any right to damages or additional compensation from the CITY. The CONTRACTOR's sole remedy against the CITY will be the right to seek an extension of time to its schedule. This paragraph shall expressly apply to claims for early completion, as well as claims based on late completion.

3.4. Should the CONTRACTOR fail to commence, provide, perform or complete any of the services to be provided hereunder in a timely and reasonable manner, in addition to any other rights or remedies available to the CITY hereunder, the CITY at its sole discretion and option may withhold any and all payments due and owing to the CONTRACTOR until such time as the CONTRACTOR resumes performance of its obligations hereunder in such a manner so as to reasonably establish to the CITY's satisfaction that the CONTRACTOR's performance is or will shortly be back on schedule.

3.5 Liquidated Damages: Services to be rendered by the CONTRACTOR shall be commenced subsequent to the execution of this Agreement upon written Notice-to-Proceed from the CITY for all or any designated portion of the Project must be completed by the contract dates specified within the Notice-to-Proceed for construction. Should CONTRACTOR fail to complete the project within this timeframe, daily liquidated damages in an amount consistent with the current Sec. 8-10.2 (FDOT) Florida Department of Transportation Standard Specifications will be assessed.

3.6 Bond. A Payment & Performance Bond will be acquired by the CONTRACTOR and be issued by a surety insurer authorized to do business in this state as surety. CONTRACTOR prior to commencement of work, will record Payment & Performance Bond in the public records of the Clerk of Collier County and furnish a copy of the original recorded Bonds to the CITY Purchasing Department.

ARTICLE FOUR COMPENSATION

4.1. The total compensation to be paid the CONTRACTOR by the CITY for all Services **is not to exceed \$2,817,000.00 that includes a \$100,000.00 CITY controlled Contingency** and shall be paid in the manner set forth in the "Basis of Compensation", which is attached as **EXHIBIT B** and made a part of this Agreement.

ARTICLE FIVE MAINTENANCE OF RECORDS

5.1. The CONTRACTOR will keep adequate records and supporting documentation which concern or reflect its services hereunder. The records and documentation will be retained by the CONTRACTOR for a minimum of five 5 years from the date of termination of this Agreement or the date the Project is completed, whichever is later. The CITY, or any duly authorized agents or representatives of the CITY, shall have the right to audit, inspect and copy all such records and documentation as often as they deem necessary during the period of this Agreement and during the 5 year period noted above; provided, however, such activity shall be conducted only during normal business hours. If the CONTRACTOR desires to destroy records prior to the minimum period, it shall first obtain permission from the CITY in accordance with the Florida Public Records laws.

5.2 119.0701 F.S. CONTACT INFORMATION FOR CITY OF NAPLES' CUSTODIAN OF PUBLIC RECORDS, CITY CLERK'S OFFICE

If the CONTRACTOR has questions regarding the application of Chapter 119, Florida Statutes, to the CONTRACTOR'S duty to provide public records relating to this contract, contact the City of Naples' Custodian of Public records, the City Clerk at Telephone: 239-213-1015; Email: PublicRecordsRequest@naplesgov.com;



Address: 735 8th Street S., Naples, Florida 34102; Mailing address: same as street address.

5.3 The CONTRACTOR shall:

- (a) Keep and maintain public records required by the CITY to perform the service.
- (b) Upon request from the CITY's custodian of public records, provide the CITY with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in this chapter 119.0701 F.S. or as otherwise provided by law.
- (c) Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the CONTRACTOR does not transfer the records to the CITY.
- (d) Upon completion of the contract, transfer, at no cost, to the CITY all public records in possession of the CONTRACTOR or keep and maintain public records required by the CITY to perform the service. If the CONTRACTOR transfers all public records to the CITY upon completion of the contract, the CONTRACTOR shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the CONTRACTOR keeps and maintains public records upon completion of the contract, the CONTRACTOR shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the CITY, upon request from the CITY's custodian of public records, in a format that is compatible with the information technology systems of the CITY.

**ARTICLE SIX
INDEMNIFICATION**

6.1. The CONTRACTOR agrees to indemnify and hold harmless the CITY from liabilities, damages, losses and costs, including, but not limited to, all attorneys' fees, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of the CONTRACTOR and persons employed or utilized by the CONTRACTOR in the performance of the Contract.

**ARTICLE SEVEN
INSURANCE**

7.1. The CONTRACTOR shall obtain and carry, at all times during its performance under this Agreement, insurance of the types and in the amounts set forth in the document titled General Insurance Requirements, which is attached as **EXHIBIT C** and made a part of this Agreement.

**ARTICLE EIGHT
SERVICES BY CONTRACTOR'S OWN STAFF**

8.1. The services to be performed hereunder shall be performed by the CONTRACTOR's own staff, unless otherwise authorized in writing by the CITY. The employment of, contract with, or use of the services of any other person or firm by the CONTRACTOR, as independent contractor or otherwise, shall be subject to the prior written approval of the CITY. No provision of this Agreement shall, however,

be construed as constituting an agreement between the CITY and any such other person or firm. Nor shall anything contained in this Agreement be deemed to give any such party or any third party any claim or right of action against the CITY beyond such as may otherwise exist without regard to this Agreement.

**ARTICLE NINE
WAIVER OF CLAIMS**

9.1. The CONTRACTOR's acceptance of final payment shall constitute a full waiver of any and all claims, except for insurance company subrogation claims, by it against the CITY arising out of this Agreement or otherwise related to the Project, except those previously made in writing and identified by the CONTRACTOR as unsettled at the time of the final payment. Neither the acceptance of the CONTRACTOR's services nor payment by the CITY shall be deemed to be a waiver of any of the CITY's rights against the CONTRACTOR.

**ARTICLE TEN
TERMINATION OR SUSPENSION**

10.1. The CONTRACTOR shall be considered in material default of this Agreement and such default will be considered cause for the CITY to terminate this Agreement, in whole or in part, as further set forth in this section, for any of the following reasons: (a) failure to begin work under the Agreement within the times specified under the Notice(s) to Proceed, or (b) failure to properly and timely perform the services to be provided hereunder or as directed by the CITY, or (c) the bankruptcy or insolvency or a general assignment for the benefit of creditors by the CONTRACTOR or by any of the CONTRACTOR's principals, officers or directors, or (d) failure to obey laws, ordinances, regulations or other codes of conduct, or (e) failure to perform or abide by the terms or spirit of this Agreement, or (f) for any other just cause. The CITY may so terminate this Agreement, in whole or in part, by giving the CONTRACTOR at least 3 calendar days written notice.

10.2. If, after notice of termination of this Agreement as provided for in paragraph 10.1 above, it is determined for any reason that the CONTRACTOR was not in default, or that its default was excusable, or that the CITY otherwise was not entitled to the remedy against the CONTRACTOR provided for in paragraph 10.1, then the notice of termination given pursuant to paragraph 10.1 shall be deemed to be the notice of termination provided for in paragraph 10.3 below and the CONTRACTOR's remedies against the CITY shall be the same as and limited to those afforded the CONTRACTOR under paragraph 10.3 below.

10.3. The CITY shall have the right to terminate this Agreement, in whole or in part, without cause upon 7 calendar days written notice to the CONTRACTOR. In the event of such termination for convenience, the CONTRACTOR's recovery against the CITY shall be limited to that portion of the fee earned through the date of termination, together with any retainage withheld and any costs reasonably incurred by the CONTRACTOR that are directly attributable to the termination, but the CONTRACTOR shall not be entitled to any other or further recovery against the CITY, including, but not limited to, anticipated fees or profits on work not required to be performed.

**ARTICLE ELEVEN
CONFLICT OF INTEREST**

11.1. The CONTRACTOR represents that it presently has no interest and shall acquire no interest, either direct or indirect, which would conflict in any manner with the performance of services required hereunder. The CONTRACTOR further represents that no persons having any such interest shall be

employed to perform those services.

ARTICLE TWELVE MODIFICATION

12.1. No modification or change in this Agreement shall be valid or binding upon the parties unless in writing and executed by the party or parties intended to be bound by it.

ARTICLE THIRTEEN NOTICES AND ADDRESS OF RECORD

13.1. All notices required or made pursuant to this Agreement to be given by the CONTRACTOR to the CITY shall be in writing and shall be delivered by hand or by United States Postal Service Department, first class mail service, postage prepaid, return receipt requested, addressed to the following CITY's address of record:

City of Naples
735 Eighth Street South; Naples, Florida 34102-3796
Attention: **Charles T. Chapman IV**, City Manager

13.2. All notices required or made pursuant to this Agreement to be given by the CITY to the CONTRACTOR shall be made in writing and shall be delivered by hand or by the United States Postal Service Department, first class mail service, postage prepaid, return receipt requested, addressed to the following CONTRACTOR's address of record:

Eau Gallie Electric, Inc.
2012 Aurora Road; Melbourne, Florida 32935
Attention: **Christopher Hughes**, President
FEI/EIN Number: On File

13.3. Either party may change its address of record by written notice to the other party given in accordance with requirements of this Article.

ARTICLE FOURTEEN MISCELLANEOUS

14.1. The CONTRACTOR assumes toward the CITY a duty of care commensurate with that which is imposed upon persons or firms in contractor's profession. CONTRACTOR will make reasonable efforts to ensure that its employees and agents maintain a professional demeanor and that the work area is compliant with CITY property maintenance and Project standards.

14.2. No modification, waiver, suspension or termination of the Agreement or of any terms thereof shall impair the rights or liabilities of either party.

14.3. This Agreement is not assignable, in whole or in part, by the CONTRACTOR without the prior written consent of the CITY.

14.4. Waiver by either party of a breach of any provision of this Agreement shall not be deemed to be a waiver of any other breach and shall not be construed to be a modification of the terms of this Agreement.

14.5. The headings of the Articles, Exhibits, Parts and Attachments as contained in this Agreement

are for the purpose of convenience only and shall not be deemed to expand, limit or change the provisions in such Articles, Exhibits, Parts and Attachments.

14.6. This Agreement constitutes the entire agreement between the parties hereto and shall supersede, replace and nullify any and all prior agreements or understandings, written or oral, relating to the matter set forth herein, and any such prior agreements or understanding shall have no force or effect whatever on this Agreement.

14.7. The CONTRACTOR shall comply fully with all provisions of state and federal law, including without limitation all provisions of the Immigration Reform and Control Act of 1986 ("IRCA") as amended, as well as all related immigration laws, rules, and regulations pertaining to proper employee work authorization in the United States. The CONTRACTOR shall execute the Certification of Compliance with Immigration Laws, attached hereto as **EXHIBIT D**.

14.8 To the extent that any provision in the Specifications or any other Contract Documents pertaining to this Project conflict with any provision of this Agreement, this Agreement controls.

14.9 Attorneys' fees. Except as otherwise provided herein, each party shall be responsible for its own attorneys' fees.


ARTICLE FIFTEEN APPLICABLE LAW

15.1. Unless otherwise specified, this Agreement shall be governed by the laws, rules, and regulations of the State of Florida, and by the laws, rules and regulations of the United States when providing services funded by the United States government. Any suit or action brought by either party to this Agreement against the other party relating to or arising out of this Agreement must be brought in the appropriate Florida state court in Collier County, Florida.

END OF ARTICLE PAGE


IN WITNESS WHEREOF, the parties hereto have executed this Agreement for the day and year first written above.

ATTEST:

By: 
Patricia L. Rambosk, City Clerk

CITY:

CITY OF NAPLES, FLORIDA,
A Municipal Corporation

By: 
Charles T. Chapman IV, City Manager

Approved as to form
and legal sufficiency:

By: 
James D. Fox, City Attorney

CONTRACTOR:

EAU GALLIE ELECTRIC, INC.
2012 Aurora Road
Melbourne, Florida 32935
Attention: Christopher Hughes, President

CONTRACTOR:



Witness

Kim A. Lanham

Witness Printed Name

By: 

Printed Name: Christopher Hughes

Title: President

FEI/EIN Number: On File
A Florida Corporation - (FL)

(CORPORATE SEAL)



EXHIBIT A

SCOPE OF SERVICES

The Scope of Services to be provided under this Agreement are included in Attachment A-1 which is attached and made a part of this Agreement and those set out in the Bid, any issued Addendum(s)(two), City of Naples Website documents, screen shot below of SUPPORTING DOCUMENTS, Vendor's Submittal of (ITB) Invitation To Bid No.20-030, titled WTP Switchgear and MCC Replacement Projects - ITB, all herein referenced and made a part of this Agreement.

20-030 WTP Switchgear and MCC Replacement Projects - ITB

Bid/RFP Status: Closed - no longer accepting bids and proposals

Bid/RFP Due Date: Friday, April 17, 2020 - 2:00pm

Bid/RFP Reference Number: 20-030 WTP Switchgear and MCC Replacement Projects - ITB

Designer/Engineer: Johnson Engineering Inc.

Engineer's Estimate: 2.5 Million








[Back to Bids/RFPs](#)

PROJECT DESCRIPTION

The purpose of this Invitation to Bid (ITB) is for the City of Naples to obtain prices from pre-qualified vendors to furnish all equipment, materials, and services needed for the replacement of electrical distribution equipment at the City of Naples (CITY) WTP located at 1000 Fleischmann Boulevard in Naples, Florida. The majority of the 480V distribution equipment shall be replaced, including the service entrance switchgear (SWITCHGEAR) and all the plant Motor Control Centers (MCC's) MCC-1A, MCC-1B, MCC-2, MCC-3, MCC-4, MCC-5 and MCC-6.

A site visit to the Water Plant located at 1000 Fleischmann Boulevard will take place directly after the Mandatory Pre-Bid. Prospective Bidders are strongly encouraged to attend since the Water Plant is a fenced/secured area and this will be their only opportunity to access it.

SUPPORTING DOCUMENTS

-  20-030 WTP Switchgear and MCC Replacement Projects - ITB (3 MB)
-  ATTACHMENT A - WTP NEW ELECTRICAL RM & SWGR & MCCs REPLACEMENT PLANS (35 MB)
-  20-030 Pre-Bid Conference Sign-In Sheet (258 KB)
-  20-030 WTP Switchgear and MCC Replacement Projects - ITB - Addendum 1 (3 MB)
-  20-030 WTP Switchgear and MCC Replacement Projects - ITB - Addendum 2 (26 KB)
-  20-030 WTP Switchgear and MCC Replacement Projects - ITB - Bid Tabulation (58 KB)
-  20-030 WTP Switchgear and MCC Replacement Projects - ITB Declaration of Intent to Award (148 KB)

END OF EXHIBIT A

STS-01000 TECHNICAL SPECIFICATIONS

Contract Documents CITY of Naples Water Treatment Plant (WTP)



**CITY of Naples
380 Riverside Circle
Naples, Florida 34102**

WTP New Electrical Room and Switchgear and Motor Control Centers Replacement

JOHNSON

ENGINEERING

Johnson Engineering, Inc.

2122 Johnson Street

Fort Myers, Florida 33901

Phone: (239) 334-0046

E.B. #642

www.JohnsonEngineering.com

REV. 2-1-20

20150110-016

STS-0100
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SUPPLEMENTAL TECHNICAL SPECIFICATIONS – JOHNSON ENGINEERING

These specifications supplement the standards of the CITY of Naples

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STS-01026	MEASUREMENT and PAYMENT
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STS-26 05 00	MATERIALS and METHODS
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STS-26 05 19	LOW VOLTAGE CONDUCTORS
STS-26 05 26	GROUNDING AND BONDING SYSTEMS
STS-26 05 29	HANGERS AND SUPPORTS
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STS-26 05 37	CABLE BUS
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STS-26 08 00	ELECTRICAL RELIABILITY VERIFICATION
STS-26 23 00.11	LOW VOLTAGE SWITCHGEAR
STS-26 24 19.30	LOW VOLTAGE MOTOR CONTROL CENTERS
STS-26 28 20.09	LOW VOLTAGE PANELBOARDS
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TECHNICAL SPECIFICATIONS – STANDARDS OF THE CITY OF NAPLES

See web link <https://www.naplesgov.com/utilities/page/utilities-specifications-and-standards-manual> for other applicable general CITY standards below:

DIVISION 1 GENERAL REQUIREMENTS

01400 QUALITY CONTROL
01500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS
01600 MATERIALS AND EQUIPMENT
01710 CLEANING
01730 OPERATIONS & MAINTENANCE MANUALS
01750 PROJECT RECORD DOCUMENTS

DIVISION 2 SITE WORK

02050 DEMOLITION
02110 SITE CLEANING

DIVISION 3 CONCRETE

03100 CONCRETE FORMWORK
03200 CONCRETE REINFORCEMENT
03310 CONCRETE, MASONRY, MORTAR and GROUT

END OF SECTION

STS 01010
SUMMARY OF WORK

PART 1 GENERAL

A. Description of Work and Major Equipment

1. This Section pertains to the replacement of electrical distribution equipment at the City of Naples (CITY) WTP located at 10th St. N. & Fleischmann Blvd. in Naples, Florida. The majority of the 480V distribution equipment shall be replaced, including the service entrance switchgear (SWITCHGEAR) and all the plant Motor Control Centers (MCC's) MCC-1A, MCC-1B, MCC-2, MCC-3, MCC-4, MCC-5 and MCC-6.
2. The existing Generator Room will be re-purposed as the new plant Electrical Room. The existing Switchgear and motor control in MCC-1A, MCC-1B, MCC-2, MCC-5, and MCC-6 will be relocated to the Electrical Room as the new MCC-1, MCC-2, Xfmr-6, LP-6 and PNLBD-1. The Existing motor control in MCC-4 will remain in the Vacuum Filter Building as the new MCC-3.
3. There will be no major loads added or removed as part of this project.
4. Local motor disconnect switches with auxiliary interlocks will be added to all motor loads.
5. The existing East Generator and West Generator shall be replaced as part of a separate project which is scheduled to be completed prior to the start of the replacement of the distribution equipment. This will effectively abandon the Generator Room equipment in preparation for the modifications required for the new Electrical Room. All of the existing generator equipment, auxiliary equipment, appurtenances and external radiators shall be demoed as part of this project. The diesel fuel lines shall only be partially demoed outside on HSP Room #6-12 as needed, since the existing High Service Pump #12 is diesel driven. HSP #12 shall be replaced by a 300HP motor as part of a future project.
6. The existing distribution equipment is primarily located in four areas. Some of the equipment is color coded to indicate electrical interconnection.

A. Generator Room

1. East Generator
2. West Generator
3. MCC-6 and auxiliary equipment

B. High Service Pump Room #1 - #5 (aka "Old High Service Pump (HSP) Room")

1. MCC-1A (Blue)
2. MCC-1B (Blue)

3. MCC-2 (Blue)

- C. High Service Pump Room #6 - #12 (aka "New High Service Pump (HSP) Room")

1. Main Switchgear "A"
2. Generator Switchgear "B"
3. MCC-3 (Green)

- i. Transformer T-4
 - ii. Panel PNL-4

4. MCC-5 (Orange)

- D. Vacuum Filter Building

1. MCC-4
2. Washwater Recovery Basin Pump Panels #1, #2, #3

- B. Equipment Replacement

1. Background

The WTP 480V 3-phase electrical distribution system is either supplied by power from the electric utility or by emergency standby power from two stand-alone generator systems.

2. Project Justification

The 480V 3-phase electrical distribution system is considered critical infrastructure. The distribution system has exceeded its useful life and requires replacement due to the unavailability of spare parts, maintainability, and reliability. As the likelihood of hardware failures increases due to the age and condition of the equipment, there is a concern of an increasing risk of equipment failures in operating the system which could lead to significant equipment downtime, particularly with the long lead times associated with the replacement of this type of equipment. There have already been recent catastrophic failures of the switchgear and the generators.

3. NEW ELECTRICAL ROOM

The existing Generator Room shall be converted into an Electrical Room. The conversion will include:

- Demo of all related Generator equipment and cap the existing diesel lines
- Add cooling system
- Add overhead lights
- Add Rolling Sheet Door

- Add window
- Close existing wall openings
- Re-finish the floor, fill in diesel line trenches, and add equipment pads
- Close the ceiling openings to be identical to the rest of the existing ceiling.

4. RACEWAYS

The Utility and Generator feeders shall utilize cable bus systems. The major raceways extending from the new Electrical Room shall utilize cable trays.

5. GENERATOR ROOM

The existing EAST GENERATOR and WEST GENERATOR are both rated 750KW and operate at 480/277V, 3PH, 4-WIRE in a stand-alone arrangement to provide emergency standby power. The two generators will be replaced by three 500KW generators that will operate in a parallel configuration and be provided with complete on-board paralleling controls. All of the existing generator equipment shall be demoed, as part of this project.

6. MCC-1A, MCC-1B and MCC-2 Replacement (HSP Rm. #1 - #5)

MCC-1A feeds HSP-1. MCC-1B feeds HSP-3. (HSP-2 is abandoned) The existing MCC-1A and MCC-1B are physically connected into a single line-up but separately fed. MCC-2 feeds HSP-4, HSP-5 and other loads. The existing MCC-1A, MCC-1B and MCC-2 motor loads will be replaced and relocated to new MCC-1 and MCC-2. The non-motor loads will be relocated to new PANELBOARD #1 (PNLBD-1).

7. Main SWITCHGEAR "A" Replacement (HSP Rm. #6 - #12)

The existing SWITCHGEAR "A" is the service entrance equipment for the WTP. It is rated 3000A, 480/277V. The new SWITCHGEAR will be rated 3200A, 480/277V. The new switchgear power meter will monitor utility power and notify the new switchgear control panel CP-SWGR to operate the switchgear circuit breakers accordingly for transfer and re-transfer between normal and emergency power. CP-SWGR will in turn notify the generator controller of the need for standby power.

8. Generator SWITCHGEAR "B" Demo (High Service Pump Room #6 - #12)

The existing SWITCHGEAR "B" will be demoed. The functionality of SWITCHGEAR "B" will be incorporated into the new SWITCHGEAR, so there will be no direct replacement for SWITCHGEAR "B".

9. MCC-3 and MCC-5 Replacement (High Service Pump Room #6 - #12)

The existing MCC-3 serves HSP-6, HSP-7, HSP-8, Transformer-7, Lighting Panel LP-7 and other loads. The existing MCC-5 serves HSP-9, HSP-10, HSP-11 as branch feeders to remote VFD panels and other loads. HSP-12 is diesel-powered. The existing MCC-3 and MCC-5 motor loads will be relocated to the new electrical room. The non-motor loads will be relocated to new PNLBD-1. The MCC-3 transformer T-7 will be demoed and replaced by new transformer T-6, 30KVA, 120/208. The MCC-3

distribution panel LP-4 will be demoed and replaced by new Panel LP-6. Existing lighting circuits from existing LP-4 shall be butt-spliced for connection to new LP-6 in the electrical room. 480V, 3PH exhaust fan loads shall be butt-spliced if necessary for connection to new wall-mounted disconnect switches.

10. MCC-4 Replacement (Vacuum Filter Building)

The existing MCC-4 will be replaced by the new MCC-4. All existing loads and the externally mounted Washwater Pump Soft Start panels #1, #2, and #3 will be incorporated into the new MCC-4. Existing conduit, power conductors and network cables will be retained.

C. Factory Acceptance Test (FAT)

1. Provisions shall be made for the ENGINEER to conduct an FAT of the switchgear and MCC's. Shipment shall not be allowed until written approval by the ENGINEER has been provided.
2. The Contractor shall provide an approval of the proposed FAT plan with the Bid.
3. All components internal to the switchgear and MCC's including Power Monitors, Surge Protection Devices, Circuit Breaker configurations, VFD's, smart motor controller, etc. shall be fully configured and tested at the factory by the supplier and confirmed by the ENGINEER at the FAT prior to shipment.

D. Construction Staging

There will be limited planned downtime during construction. Therefore, the CONTRACTOR shall be required to follow a detailed construction staging plan to ensure the least amount of equipment downtime during the construction process. Generally, it is proposed that the new equipment be temporarily installed and powered while existing loads are gradually migrated over from the existing system until all of the existing loads have been removed from the existing electrical equipment. Refer to Section STS-01140 for the proposed Construction Staging Plan.

E. Services Provided by Others

1. Systems Integration

1. Systems integration of the SWITCHGEAR will be provided by others, to include
 - i. CP-SWGR Switchgear Control Panel PLC programming
 - ii. CP-SWGR Operator Interface Terminal programming
 - iii. Ethernet and Modbus communications network setup
 - iv. Intelligent MCC commissioning
 - v. Switchgear generator transfer commissioning
 - vi. SCADA HMI programming modifications

2. Engineering Analyses

1. Short Circuit Analysis
 2. Arc Flash Analysis
 3. Protective Device and Selective Coordination Analysis
 3. Factory Acceptance Testing
 4. All utility service entrance transformer connections and disconnections in the electrical vault, including all associated utility fees.
- D. The Work to be done under this Contract is shown on the Plans and specified in Contract Documents. The Work includes
1. Furnishing all labor, material, supervision, power, light, heat, fuel, water, tools, appliances, equipment, supplies, services and other means of construction necessary or proper for performing and completing the Work.
 2. Maintaining the Work area and site in a clean and acceptable manner.
 3. Maintaining existing facilities in service per the Construction Staging Plan.
 4. Protection of finished and unfinished Work.
 5. Repair and restoration of Work or existing facilities damaged during construction.
 6. Furnishing as necessary proper equipment and machinery to facilitate the Work and to handle all emergencies normally encountered in Work of this character.
 7. Furnishing, installing, and protecting all necessary appurtenances needed for the installation of the devices included in the equipment specified. Make anchor bolts of appropriate size, strength and material for the purpose intended. Furnish substantial templates and shop drawings for installation.
- E. Implied and Normally Required Work

It is the intent of these Specifications to provide the CITY with complete operable systems, subsystems and other items of Work. Any part or item of Work, which is reasonably implied or normally required to make each installation satisfactorily and completely operable, is deemed to be included in the Work and the Contract Amount. All miscellaneous appurtenances and other items of Work incidental to meeting the intent of these Specifications are included in the Work and the Contract Amount even though these appurtenances may not be specifically called for in these Specifications.

F. Quality of Work

Regard the apparent silence of the Contract Documents as to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished as meaning that only the best general practice is to prevail and

that only materials and workmanship of the best quality are to be used. Interpretation of these specifications will be made upon this basis.

G. CONTRACTOR's Use of Site

1. In addition to the requirements of the General Conditions, limit use of site and premises for work to allow for the following:
 - a. Coordination of the Work under this CONTRACT with the work of the other CONTRACTORS where Work under this CONTRACT encroaches on the Work of other CONTRACTORS.
 - b. The CONTRACTOR may utilize on-site storage for the new equipment, as needed.

H. Work Sequence

1. Prior to commencing construction that will impact any operations at the plant, the CONTRACTOR shall submit to the ENGINEER for review a Construction Staging Plan designed to ensure that existing plant operations are maintained to the maximum extent possible. This Construction Staging Plan must be approved by the ENGINEER before the CONTRACTOR begins construction.
2. Coordinate Work of all the SUBCONTRACTORS.

I. CITY Occupancy

1. OWNER will occupy premises during entire period of construction in order to maintain normal operations. Cooperate with OWNER's representative in all construction operations to minimize conflict and to facilitate OWNER usage.

1. CONTRACTOR'S USE OF SITE

J. In addition to the requirements of the Supplemental Terms and Conditions, limit use of site and premises for work and storage to allow for the following:

1. Coordination of the Work under this CONTRACT with the work of the other CONTRACTORS where Work under this CONTRACT encroaches on the Work of other CONTRACTORS.
2. CITY occupancy and access to operate existing facilities.
3. Coordination of site use with the OWNER.
4. Responsibility for protection and safekeeping of products under this CONTRACT.
5. Providing additional off-site storage at no additional cost to the CITY as needed.

K. Use of Premises

CONTRACTOR shall confine all construction equipment, the storage of materials and equipment and the operations of workers to the Project Site and land and areas identified in and permitted by the Contract Documents and other lands and areas permitted by law, rights of way, permits and easements, and shall not unreasonably encumber the Project site with construction equipment or other material or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or any land or areas contiguous thereto, resulting from the performance of the Work.

L. WORK SEQUENCE

The MCC replacement project will be initiated before the SWITCHGEAR replacement project. The SWITCHGEAR replacement project shall begin following completion of the MCC replacement project. Coordinate Work of all Sub-CONTRACTORS.

M. CITY OCCUPANCY

The CITY will occupy premises during entire period of construction in order to maintain normal operations. Cooperate with the CITY in all construction operations to minimize conflict, and to facilitate CITY usage.

N. PROTECTION OF EXISTING UTILITIES

In case of damage to existing utilities caused by construction activities, contact the owner of the utility or appropriate CITY department immediately. Repair any damage to existing utilities caused by construction activities in coordination with or as directed by the owner of the utility. CONTRACTOR shall locate all existing roadways, railways, drainage facilities and utility services above, upon, or under the Project site, said roadways, railways, drainage facilities and utilities being referred to in this Section as the "utilities". CONTRACTOR shall contact the owners of all Utilities to determine the necessity for relocating or temporarily interrupting any Utilities during the construction of the Project. CONTRACTOR shall schedule and coordinate its Work around any such relocation or temporary service interruption. CONTRACTOR shall be responsible for properly shoring, supporting and protecting all Utilities at all times during the course of the Work. The CONTRACTOR shall conduct his work at all times such that adequate drainage is provided and shall not interfere with or block existing drainage facilities such as gutters, ditches, storm drains, or other drainage appurtenances. Existing fire hydrants adjacent to the project shall be kept accessible for fire apparatus at all times and no material or equipment shall be placed within 25 feet of any hydrant.

PART 2 PRODUCTS

- A. See Section STS-01140 for acceptable equipment suppliers.

PART 3 EXECUTION

- A. Starting Work

Start Work within 10 days following the date stated in the Notice to Proceed and execute with such progress as may be required to prevent delay to other CONTRACTORS or to the general completion of the project. Execute Work at such items and in or on such parts of the project, and with such forces, material and equipment, as to complete the Work in the time established by the Contract. At all times, schedule and direct the Work so that it provides an orderly progression to completion within the specified time for completion. The CONTRACTOR shall obtain all necessary building permits prior to commencement of work. The CONTRACTOR shall become totally familiar with the requirements of all permits prior to start of work.

B. Intent of Contract Documents

It is the intent of the Contract Documents to describe a functionally complete project (or portion thereof) to be constructed in accordance with the Contract Documents. Any work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe work, materials or equipment, such works shall be interpreted in accordance with that meaning. Reference to standards specifications, manuals or codes of any technical society, organization or association or to the laws or regulations of any governmental authority having jurisdiction over the Project, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, law or regulation in affect at the time the Work is performed, except as may be otherwise specifically stated herein. If before or during the performance of the Work CONTRACTOR discovers a conflict, error or discrepancy in the Contract Documents, CONTRACTOR immediately shall report same to the ENGINEER in writing and before proceeding with the Work affected thereby shall obtain a written interpretation or clarification from the ENGINEER. CONTRACTOR shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to CONTRACTOR with the Contract Documents before commencing any portion of the Work. Drawings are intended to show general arrangements, design and extent of work and are not intended to serve as shop drawings. Specifications are separated into divisions for convenience of reference only and shall not be interpreted as establishing divisions for the Work, trades, subcontracts, or extent of any part of the Work. In the event of a discrepancy between or among the drawings, specifications or other Contract Document provisions, CONTRACTOR shall be required to comply with the provision which is the more restrictive or stringent requirement upon the CONTRACTOR, as determined by the ENGINEER. Unless otherwise specifically mentioned, all anchors, bolts, screws, fittings, fillers, hardware, accessories, trim and other parts required in connection with any portion of the Work to make a complete, serviceable, finished and first quality installation shall be furnished and installed as part of the Work, whether or not called for by the Contract Documents.

C. Investigation and Utilities

CONTRACTOR shall have the sole responsibility of satisfying itself concerning the nature and location of the Work and the general and local conditions, and particularly, but without limitation, with respect to the following: those affecting transportation, access, disposal, handling and storage of materials; availability and quality of labor; water and

electric power; availability and condition of roads; work area; living facilities; climatic conditions and seasons; physical conditions at the work-site and the project area as a whole; topography and ground surface conditions; nature and quantity of the surface materials to be encountered; subsurface conditions; equipment and facilities needed preliminary to and during performance of the Work; and all other costs associated with such performance. The failure of CONTRACTOR to acquaint itself with any applicable conditions shall not relieve CONTRACTOR from any of its responsibilities to perform under the Contract Documents, nor shall it be considered the basis for any claim for additional time or compensation.

D. SCHEDULE

The CONTRACTOR, within ten (10) days after receipt of the Notice of Award, shall prepare and submit to the ENGINEER for review and approval, a progress schedule for the project. The Progress Schedule shall relate to all Work required by the Contract Documents and shall provide for expeditious and practicable execution of the Work within the Contract Time. The Progress Schedule shall indicate the dates for starting and completing the various stages of the Work. The Progress Schedule shall be updated monthly by the CONTRACTOR. All monthly updates to the Progress Schedule shall be subject to the ENGINEER's review and approval. CONTRACTOR shall submit the updates to the Progress Schedule with its monthly Applications for Payment noted below. The ENGINEER's review and approval of the submitted Progress Schedule updates shall be a condition precedent to the CITY's obligation to pay the CONTRACTOR.

E. SUBMITTALS AND SHOP DRAWINGS

CONTRACTOR shall carefully examine the Contract Documents for all requirements for approval of materials to be submitted such as shop drawings, data, test results, schedules and samples. CONTRACTOR shall submit all such materials at its own expense and in such form as required by the Contract Documents in sufficient time to prevent any delay in the delivery of such materials and the installation thereof. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier, the naming of the item is intended to establish the type, function and quality required. Unless the name is followed by words indicating that no substitution is permitted, materials or equipment of other suppliers may be accepted by the ENGINEER if sufficient information is submitted by CONTRACTOR to allow the ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named. Requests for review of substitute items of material and equipment will not be accepted by the ENGINEER from anyone other than CONTRACTOR and all such request must be submitted by CONTRACTOR to the ENGINEER within thirty (30) calendar days after Notice of Award is received by CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall make application to the ENGINEER for acceptance thereof, certifying that the proposed substitute shall perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application shall state that the evaluation and acceptance of the proposed substitute will not prejudice CONTRACTOR's achievement of substantial completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the

Contract Documents (or in the provisions of any other direct contract with the CITY for the Project) to adapt the design to the proposed substitute and whether or not the incorporation or use by the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service shall be indicated. The application also shall contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs for redesign and claims of other CONTRACTORS affected by the resulting change, all of which shall be considered by the ENGINEER in evaluating the proposed substitute. The ENGINEER may require CONTRACTOR to furnish at CONTRACTOR's expense additional data about the proposed substitute. If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to the ENGINEER, if CONTRACTOR submits sufficient information to allow the ENGINEER to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents. The procedures for submission to and review by the ENGINEER shall be the same as those provided herein for substitute materials and equipment. The ENGINEER shall be allowed a reasonable time within which to evaluate each proposed substitute. The ENGINEER shall be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without the ENGINEER's and the CITY's prior written acceptance which shall be evidenced by either a Change Order or an approved Shop Drawing. The CITY may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

F. RECORDS

CONTRACTOR shall maintain in a safe place at the Project site one record copy of the Contract Documents, including all drawings, specifications, addenda, amendments, Change Orders, Work Directive Changes and Field Orders, as well as all written interpretations and clarifications issued by the ENGINEER, in good order and annotated to show all changes made during construction. The annotated drawings shall be continuously updated by the CONTRACTOR throughout the prosecution of the Work to accurately reflect all field changes that are made to adapt the Work to field conditions, changes resulting from Change Orders, Work Directive Changes and Field Orders, and all concealed and buried installations of piping, conduit and utility services. All buried and concealed items, both inside and outside the Project site, shall be accurately located on the annotated drawings as to depth and in relationship to not less than two (2) permanent features (e.g. interior or exterior wall faces). The annotated drawings shall be clean, and all changes, corrections and dimensions shall be given in a neat and legible manner in a contrasting color. The "As-Built" record documents, together with all approved samples and a counterpart of all approved shop drawings shall be available to the ENGINEER for reference. Upon completion of the Work and as a condition precedent to the CONTRACTOR's entitlement to final payment, these "As-Built" record documents, samples and shop drawings shall be delivered to the ENGINEER by CONTRACTOR. CONTRACTOR shall keep all records and supporting documentation which concern or relate to the Work hereunder for a minimum of five (5) years from the date of termination of this Agreement or the date the Project is completed, whichever is later. The CITY, or any duly authorized agents or representatives of the CITY, shall have the right to audit, inspect and copy all such records and documentation as often as they deem necessary

during the period of this Agreement and during the five (5) year period noted above; provided, however, such activity shall be conducted only during normal business hours.

G. Contract Time and Time Extensions

Should CONTRACTOR be obstructed or delayed as a result of unforeseeable causes beyond the control of the CONTRACTOR, CONTRACTOR shall notify the CITY in writing within forty-eight (48) hours after the commencement of such delay, stating the cause or causes thereof, or be deemed to have waived any right which CONTRACTOR may have had to request a time extension. No suspension or delay in the commencement or progress of the Work shall relieve the CONTRACTOR of the duty to perform or to any right to damages or additional compensation from the CITY. CONTRACTOR expressly acknowledges and agrees that it shall receive no damages for delay. CONTRACTOR's sole remedy, if any, against the CITY will be the right to seek an extension to the Contract Time, provided, however, the granting of any such time extension shall not be a condition precedent to the aforementioned "No Damage For Delay" provision. This paragraph shall expressly apply to claims for early completion, as well as to claims based on late completion.

H. Changes in Work

The CITY shall have the right at any time during the progress of the Work to increase or decrease the Work. Promptly after being notified of a change, CONTRACTOR shall submit an itemized estimate of any cost or time increases or savings it foresees as a result of the change. Except in an emergency endangering life or property, or as expressly set forth herein, no addition or changes to the Work shall be made except upon written order of the CITY, and the CITY shall not be liable to the CONTRACTOR for any increased compensation without such written order.

I. Claims and Disputes

A claim is a demand or assertion by one of the parties seeking an adjustment or interpretation of the terms of the Contract Documents, payment of money, extension of time or other relief with respect to the terms of the Contract Documents. The term "Claim" also includes other disputes and matters in question between the CITY and CONTRACTOR arising out of or relating to the Contract Documents. The responsibility to substantiate a Claim shall rest with the party making the Claim. Claims by the CONTRACTOR shall be made in writing to the CITY within forty-eight (48) hours after the first day of the event giving rise to such Claim or else the CONTRACTOR shall be deemed to have waived the Claim. Written supporting data shall be submitted to the CITY within fifteen (15) calendar days after the occurrence of the event, unless the CITY grants additional time in writing, or else the CONTRACTOR shall be deemed to have waived the Claim. The CONTRACTOR shall proceed diligently with its performance as directed by the CITY, regardless of any pending claim, action, suit or administrative proceeding, unless otherwise agreed to by the CITY in writing. The CITY shall continue to make payments in accordance with the Contract Documents during the pendency of any Claim. Other Work: The CITY may perform other work related to the Project at the site by the CITY's own forces, have other work performed by utility owners or let other direct contracts. If the fact that such other work is to be performed is not noted in the Contract Documents, written notice thereof will be given to CONTRACTOR prior to starting any

such other work. If CONTRACTOR believes that such performance will involve additional expense to CONTRACTOR or require additional time, CONTRACTOR shall send written notice of that fact to the CITY within forty-eight (48) hours of being notified of the other work. If the CONTRACTOR fails to send the above required forty-eight (48) hour notice, the CONTRACTOR will be deemed to have waived any rights it otherwise may have had to seek an extension to the Contract Time or adjustment to the Contract Amount. CONTRACTOR shall afford each utility owner and other CONTRACTOR who is a party to such a direct contract (or the CITY, if the CITY is performing the additional work with the CITY's employees) proper and safe access to the site and a reasonable opportunity for execution of such work and shall properly connect and coordinate its Work with theirs. CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of the ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other CONTRACTORS to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between the CITY and such utility owners and other CONTRACTORS. If any part of CONTRACTOR's Work depends for proper execution or results upon the work of any other CONTRACTOR or utility owner (or the CITY), CONTRACTOR shall inspect and promptly report to the ENGINEER in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution and results. CONTRACTOR's failure to report will constitute an acceptance of the other work as fit and proper for integration with CONTRACTOR's Work.

J. Compliance with Laws

CONTRACTOR agrees to comply, at its own expense, with all federal, state and local laws, codes, statutes, ordinances, rules, regulations and requirements applicable to the Project, including but not limited to those dealing with taxation, worker's compensation, equal employment and safety (including, but not limited to, the Trench Safety Act, Chapter 553, Florida Statutes). If CONTRACTOR observes that the Contract Documents are at variance therewith, it shall promptly notify the ENGINEER in writing.

K. Assignment

CONTRACTOR shall not assign this Agreement or any part thereof, without the prior consent in writing of the CITY. If CONTRACTOR does, with approval, assign this Agreement or any part thereof, it shall require that its assignee be bound to it and to assume toward CONTRACTOR all of the obligations and responsibilities that CONTRACTOR has assumed toward the CITY.

L. Permits, Licenses and Taxes

Pursuant to Section 218.80, F.S., the CITY will pay for all permits and fees, including license fees, permit fees, impact fees or inspection fees applicable to the work. CONTRACTOR is not responsible for paying for permits issued by The CITY of Naples but is responsible for acquiring all permits. All permits, fees and licenses

necessary for the prosecution of the Work which are not issued by the CITY shall be acquired and paid for by the CONTRACTOR unless otherwise noted.

M. Termination for Default

CONTRACTOR shall be considered in material default of the Agreement and such default shall be considered cause for the CITY to terminate the Agreement, in whole or in part, as further set forth in this Section, if CONTRACTOR:

- a. Fails to begin the Work under the Contract Documents within the time specified herein;
- b. Fails to properly and timely perform the Work as directed by the ENGINEER or as provided for in the approved Progress Schedule;
- c. Performs the Work unsuitably or neglects or refuses to remove material or to correct or replace such Work as may be rejected as unacceptable or unsuitable;
- d. Discontinues the prosecution of the Work;
- e. Fails to resume Work which has been suspended within a reasonable time after being notified to do so;
- f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy
- g. Allows any final judgment to stand against it unsatisfied for more than ten days
- h. Makes an assignment for the benefit of creditors
- i. Fails to obey any applicable codes, laws, ordinances, rules or regulations with respect to the Work;
- j. Materially breaches any other provision of the Contract Documents.
- k. The CITY shall notify CONTRACTOR in writing of CONTRACTOR's default(s). If the CITY determines that CONTRACTOR has not remedied and cured the default(s) within seven (7) calendar days following receipt by CONTRACTOR of said written notice, then the CITY, at its option, without releasing or waiving its rights and remedies against the CONTRACTOR's sureties and without prejudice to any other right or remedy it may be entitled to hereunder or by law, may terminate CONTRACTOR's right to proceed under the Agreement, in whole or in part, and take possession of all or any portion of the Work and any materials, tools, equipment, and appliances of CONTRACTOR, take assignments of any of CONTRACTOR's subcontracts and purchase orders, and complete all or any portion of CONTRACTOR's Work by whatever means, method or agency which the CITY, in its sole discretion, may choose. If the CITY deems any of the foregoing remedies necessary, CONTRACTOR agrees that it shall not be entitled to receive any

further payments hereunder until after the Project is completed. All monies expended and all of the costs, losses, damages and extra expenses (including ENGINEER and attorney's fees) or damages incurred by The CITY incident to such completion, shall be deducted from the Contract Amount, CONTRACTOR agrees to pay promptly to the CITY on demand the full amount (including appeals) and interest thereon at the maximum legal rate of interest until paid. If the unpaid balance of the Contract Amount exceeds all such costs, expenditures and damages incurred by the CITY to complete the Work, such excess shall be paid to the CONTRACTOR. The amount to be paid to the CONTRACTOR, shall be approved by the ENGINEER, upon application, and this obligation for payment shall survive termination of the Agreement. The liability of CONTRACTOR hereunder shall extend to and include the full amount of any and all sums paid, expenses and losses incurred, damages sustained, and obligations assumed by The CITY in good faith under the belief that such payments or assumptions were necessary or required, in completing the Work and providing labor, materials, equipment, supplies, and other items therefore or re-letting the Work, and in settlement, discharge or compromise of any claims, demands suits, and judgments pertaining to or arising out of the work hereunder. If, after notice of termination of CONTRACTOR's right to proceed pursuant to this Section, it is determined for any reason that CONTRACTOR was not in default, or that its default was excusable, or that the CITY is not entitled to the remedies against CONTRACTOR provided herein, then CONTRACTOR's remedies against the CITY shall be the same as and limited to those afforded CONTRACTOR under "Completion" section below.

N. Termination for Convenience and Right of Suspension

The CITY shall have the right to terminate this Agreement without cause upon seven (7) calendar days written notice to CONTRACTOR. In the event of such termination for convenience, CONTRACTOR's recovery against the CITY shall be limited to that portion of the Contract Amount earned through the date of termination, together with any retainage withheld and reasonable termination expenses incurred, but CONTRACTOR shall not be entitled to any other or further recovery against the CITY, including, but not limited to, damages or any anticipated profit on portions of the Work not performed. The CITY shall have the right to suspend all or any portions of the Work upon giving CONTRACTOR not less than two (2) calendar days' prior written notice of such suspension. If all or any portion of the Work is so suspended, CONTRACTOR's sole and exclusive remedy shall be to seek an extension of time to its schedule in accordance with the procedures set forth in the Contract Documents. In no event shall the CONTRACTOR be entitled to any additional compensation or damages. Provided, however, if the ordered suspension exceeds six (6) months, the CONTRACTOR shall have the right to terminate the Agreement with respect to that portion of the Work which is subject to the ordered suspension.

O. Completion

When the entire Work (or any portion thereof designated in writing by the CITY) is ready for its intended use, CONTRACTOR shall notify the ENGINEER in writing that the entire Work (or such designated portion) is substantially complete and request

that the ENGINEER issue a Certificate of Substantial completion (or Certificate of Partial Substantial Completion). Within a reasonable time thereafter, the CITY, CONTRACTOR and ENGINEER shall make an inspection of the Work (or designated portion thereof) to determine the status of completion. If the CITY and ENGINEER do not consider the Work (or designated portion) substantially complete, the ENGINEER shall notify CONTRACTOR in writing giving the reasons therefore. If the CITY and ENGINEER consider the Work (or designated portion) substantially complete, the ENGINEER shall prepare and deliver to CONTRACTOR a Certificate of Substantial Completion (or Certificate of Partial Substantial Completion) which shall fix the date of Substantial Completion for the entire Work (or designated portion thereof) and include a tentative punchlist of items to be completed or corrected by CONTRACTOR before final payment. The CITY shall have the right to exclude CONTRACTOR from the Work and Project site (or designated portion thereof) after the date of Substantial Completion, but the CITY shall allow CONTRACTOR reasonable access to complete or correct items on the tentative punchlist. Upon receipt of written certification by CONTRACTOR that the Work is completed in accordance with the Contract Documents and is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the ENGINEER will make such inspection and, if he finds the Work acceptable and fully performed under the Contract Documents, he shall promptly issue a final Certificate for Payment, recommending that, on the basis of his observations and inspection, and the CONTRACTOR's certification that the Work has been completed in accordance with the terms and conditions of the Contract Documents, that the entire balance found to be due CONTRACTOR is due and payable. Neither the final payment nor the retainage shall become due and payable until CONTRACTOR submits: all data establishing payment or satisfaction of all obligations, such as receipts, releases and waivers of liens, arising out of the Contract Documents, to the extent and in such form as may be designated by the CITY. The CITY reserves the right to inspect the Work and make an independent determination as to the Work's acceptability, even though the ENGINEER may have issued his recommendations. Unless and until the CITY is completely satisfied, neither the final payment nor the retainage shall become due and payable.

P. Warranty

CONTRACTOR shall obtain and assign to the CITY all express warranties given to CONTRACTOR or any SUBCONTRACTORS by any materialmen supplying materials, equipment or fixtures to be incorporated into the project. CONTRACTOR warrants to the CITY that any materials and equipment furnished under the Contract Documents shall be new unless otherwise specified, and that all Work shall be of good quality, free from all defects and in conformance with the Contract Documents. CONTRACTOR further warrants to the CITY that all materials and equipment furnished under the Contract Documents shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturers, fabricators, suppliers or processors except as otherwise provided for in the Contract Documents. If, within one (1) year after final completion, any Work is found to be defective or not in conformance with the Contract Documents, CONTRACTOR shall correct it promptly after receipt of written notice from the CITY. CONTRACTOR shall also be responsible for and pay for replacement or repair of adjacent materials or Work which may be damaged as a result of such replacement

or repair. These warranties are in addition to those implied warranties to which the CITY is entitled as a matter of law.

Q. Supervision

CONTRACTOR shall plan, organize, supervise, schedule, monitor, direct and control the work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the work in accordance with the contract documents. CONTRACTOR shall be responsible to see that the finished work complies accurately with the Contract Documents. CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without prior written notice to the ENGINEER except under extraordinary circumstances. The superintendent shall be CONTRACTOR's representative at the Project site and shall have authority to act on behalf of CONTRACTOR. All communications given to the superintendent shall be as binding as if given to the CONTRACTOR. The CITY shall have the right to direct CONTRACTOR to remove and replace its Project superintendent, with or without cause.

R. Protection of Work

CONTRACTOR shall fully protect the Work from loss or damage and shall bear the cost of any such loss or damage until final payment has been made. If CONTRACTOR or any one for whom CONTRACTOR is legally liable for is responsible for any loss or damage to the Work, or other work or materials of the CITY or the CITY's separate CONTRACTORS, CONTRACTOR shall be charged with the same, and any monies necessary to replace such loss or damage shall be deducted from any amounts due CONTRACTOR. CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it. CONTRACTOR shall not disturb any benchmark established by the ENGINEER with respect to the Project. If CONTRACTOR, or its SUBCONTRACTORS, agents or anyone for whom CONTRACTOR is legally liable, disturbs the ENGINEER's benchmark, CONTRACTOR shall immediately notify The CITY and ENGINEER. The ENGINEER shall re-establish the benchmark and CONTRACTOR shall be liable for all costs incurred by The CITY associated therewith.

S. Emergencies

In the event of an emergency affecting the safety or protection of persons or Work or property at the Project site or adjacent thereto, CONTRACTOR, without special instructions or authorization from the CITY or ENGINEER is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give ENGINEER written notice within forty-eight (48) hours after the occurrence of the emergency, if CONTRACTOR believes that after the occurrence of the emergency, if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If the ENGINEER determines that a change in the Contract Documents is required because of the action taken in

response to an emergency, a Change Order shall be issued to document the consequences of the changes or variations. If CONTRACTOR fails to provide the forty-eight (48) hour written notice noted above, the CONTRACTOR shall be deemed to have waived any right it otherwise may have had to seek an adjustment to the Contract Amount or an extension to the Contract Time.

T. Project Meetings

Prior to the commencement of Work, the CONTRACTOR shall attend a preconstruction conference with the ENGINEER and others as appropriate to discuss the Progress Schedule, procedures for handling shop drawings and other submittals, and for processing Applications for Payment, and to establish a working understanding among the parties as to the Work. During the prosecution of the Work, the CONTRACTOR shall attend any and all meetings convened by the ENGINEER or the CITY with respect to the Project, when directed to do so. CONTRACTOR shall have its SUBCONTRACTORS and suppliers attend all such meetings (including the preconstruction conference) as may be directed by the CITY or ENGINEER.

U. Hours of Work

Work within the travelled way of the project shall commence no earlier than 7:00 a.m. local time and be completed no later than 7:00 p.m. local time. Hours of work may be altered at any time at the discretion of the CITY.

V. Tax Exemption

The CITY of Naples is exempt from the payment of sales or use tax. The tax exemption certificate number is: 85-8012621645C-0.

PART 4 SAFETY

- A. CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:**
1. All employees on the Work and other persons and/or organizations who may be affected thereby;
 2. All the Work and materials and equipment to be incorporated therein, whether in storage on or off the Project site; and
 3. Other property on Project site or adjacent thereto, including trees, shrubs, walks, pavements, roadways, structures, utilities and any underground structures or improvements not designated for removal, relocation or replacement in the Contract Documents.
- B. CONTRACTOR shall comply with all applicable codes, laws, ordinances, rules and regulations of any public body having jurisdiction for the safety of persons or property**

or to protect them from damage, injury or loss. CONTRACTOR shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of underground structures and improvements and utility-owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation or replacement of their property. CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until such time as the Work is completed and final acceptance of same by The CITY has occurred.

- C. CONTRACTOR shall designate a responsible representative at the Project site whose duty shall be the prevention of accidents. This person shall be CONTRACTOR's superintendent unless otherwise designated in writing by CONTRACTOR to the CITY.

END OF SECTION

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STS-01011
PHASING OF WORK

PART 1 GENERAL

A. Construction Staging Plan

1. Due to the challenge associated with replacement of major equipment without unduly affecting plant operation, the project shall require a detailed Construction Staging Plan. FPL has agreed that the two existing 1000KVA utility transformer secondaries can be temporarily separated, allowing for 1000KVA utilized for the new system and 1000KVA utilized for the existing system to facilitate construction.

B. PRELIMINARY SCHEDULE

A preliminary construction schedule is provided for Bidding purposes.

A. NTP.....	06/01/2020
B. Place Order for Major Equipment.....	06/15/2020
C. Approve Shop Drawings.....	07/15/2020
D. Conduct FAT.....	11/01/2020
E. Start Construction.....	11/15/2020
F. Substantial Completion.....	02/28/2021
G. Final Completion.....	03/31/2021

C. CONSTRUCTION STAGING PLAN

- A. Since there will be limited planned downtime for construction, the Contractor must prepare and submit a detailed Construction Staging Plan for approval regarding the installation methods prior to the commencement of work in order to minimize planned downtime and accommodate plant operations.
- B. Suggested Construction Staging Plan
 1. Temporarily connect the new generators to the existing generator "Switchgear B" to ensure standby power is available. Generator startup assistance will be provided by Others.
 2. Demo all of the existing generator equipment.
 3. Construct the new Electrical Room.
 4. Install all of the new Electrical Room equipment.
 5. FPL to separate the two parallel 1000KVA transformers in the FPL vault (3-day planned utility shutdown). Contractor to connect one utility transformer to the new switchgear via a temporary wall penetration into the FPL vault. Planned downtime cannot exceed 3 days during construction. Some of the steps outlined can be concurrent. The Contractor will monitor electrical

capacity and coordinate with the Plant to avoid overloading the utility transformers during construction.

6. Contractor to install temporary power cables from the new switchgear to the utility transformer so that both the existing switchgear and new switchgear are energized.
7. Once the new equipment is temporarily energized, Contractor to gradually move all loads from the old equipment to the new equipment and all of the existing distribution equipment is abandoned.
8. Contractor to demo all of the old equipment, conduits, etc. no longer in use and install the proposed cable bus, cable tray, conduits etc.
9. Install MCC-3 in the Vacuum Filter Bldg.
10. FPL to restore the original parallel configuration of the two 1000KVA transformers in the FPL vault (3-day planned utility shutdown).
11. Contractor to seal the temporary wall penetration into the vault.
12. Contractor to demo all of the remaining obsolete equipment.

D. SUBSTANTIAL COMPLETION

- A. The following requirements and cleaning operations shall be completed before requesting inspection for Certification of Substantial Completion.
 1. Construction shall be complete. For this purpose, completion of construction is defined as completed construction and erection of the work in conformance with the Contract Drawings and Specifications.
 2. All shop drawings shall have final approval.
 3. Clean the site, including landscape development areas of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to smooth, even textured surfaces.
 4. Remove waste and surplus materials, rubbish, fencing equipment, temporary utilities and construction facilities from the site, unless otherwise required by the Engineer.
- B. Substantial Completion is defined in STS-01010 Summary of Work. The date of substantial completion will be certified by the Engineer. This date will not be certified until the following requirements have been satisfied by the Contractor:
- C. All Contract requirements are coordinated into a fully operational system

E. FINAL COMPLETION

A. Prior to final completion, the following tasks shall be completed:

- 1. All items in the punch list shall be completed.**
- 2. All Contract closeout documentation shall be submitted to and accepted by the Engineer.**

END OF SECTION

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STS-01026
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1. EXPLANATION AND DEFINITIONS

- A. The following explanation of the Measurement and Payment for the Bid Schedule items is made for information and guidance. The omission of reference to any item in this description shall not, however, alter the intent of the Bid Schedule or relieve the CONTRACTOR of the necessity of furnishing such as a part of the Contract. Measurement and payment for all Contract Items shall be made in accordance with this section or as modified by the Supplemental Terms and Conditions.
- B. The MCC Replacement project shall be completed prior to the start of construction of the Switchgear Replacement project, therefore each project shall have a separate Bid Schedule.

2. MEASUREMENT

- A. The quantities set forth in the Bid Schedule are approximate and are given to establish a uniform basis for the comparison of bids. The CITY reserves the right to increase or decrease the quantity of any class or portion of the work during the progress of construction in accord with the terms of the Contract.

3. PAYMENT

- A. Make payment for the items listed on the Bid Schedule on the basis of the work actually performed and completed, such work including but not limited to, the furnishing of all necessary labor, materials, equipment, transportation, clean up, restoration of disturbed areas, and all other appurtenances to complete the construction and installation of the work as shown on the drawings and described in the specifications.
- B. Unit prices are used as a means of computing the final figures for bid and Contract purposes, for periodic payments for work performed, for determining value of additions or deletions and wherever else reasonable.

4. SCHEDULE OF VALUES

- A. Approval of Schedule: Submit for approval a preliminary schedule of values, in duplicate, for all of the Work. Prepare preliminary schedule in accordance with the Supplemental Terms and Conditions. Submit preliminary schedule of values within 10 calendar days after the Effective Date of the Agreement. Submit final schedule of values in accordance with the Supplemental Terms and Conditions.
- B. Format: Utilize a format similar to the Table of Contents of the Project Specifications. Identify each line item with number and title of the major specification items. Identify site mobilization, bonds and insurance. Include within each line item, a direct proportional amount of CONTRACTOR's overhead profit.

- C. Revisions: With each Application for Payment, revise schedule to list approved Change Orders.

PART 2 PRODUCTS

- A. The Switchgear, Motor Control Centers (MCC), Panelboards, and Transformers shall be from the same manufacturer
1. Acceptable Switchgear Model/Manufacturer (SWGR):
 - A. Schneider Electric Power-Zone 4 switchgear
 2. Acceptable MCC Model/Manufacturer (MCC-1, MCC-2, MCC-3):
 - A. Schneider Electric Model 6 MCC
 3. Acceptable Power Panelboard Model/Manufacturer:
 - A. Schneider Electric I-Line series, 480V, 3PH (PNLBD-1)
 4. Acceptable Lighting Panelboard Model/Manufacturer:
 - A. Schneider Electric NQ series, 120/208V, 3PH (LP-6)
 5. Acceptable Lighting Transformer Model/Manufacturer:
 - A. Schneider Electric EX30T3HCU (T-6) Dry type Low Voltage Transformer
 6. Custom Control Panel fabrication:
 - A. BCI Technologies
6450 Corporate Park Circle, Ste 3
Ft. Myers, FL 33966
Attn: Dan Blocker (239) 707-0026
- B. The Owner reserves the right to direct-purchase any major equipment prior to Contract award at the Owner's discretion.

PART 3 EXECUTION

1. MEASUREMENT AND PAYMENT

- A. Make payment on the basis of work actually performed completing each item in the Bid, such work including, but not limited to, the furnishing of all necessary labor, materials, equipment, transportation, cleanup, and all other appurtenances to complete the construction and installation of the work to the configuration and extent as shown on the drawings and described in the specifications. Payment for each item includes compensation for cleanup and restorations. Cost of cleanup and surface restorations will be considered as the percentage retained in accordance with the Contract Documents, and complete payment will not be made until cleanup, restorations and as-builts are completed.

B. PROJECT

See Bid Schedule sheet.

1. **Mobilization / Demobilization**: Payment for mobilization and demobilization will be made for at the Contract lump sum price.
 2. **Construction Staging**: Payment for connection of the new generator and to the utility transformer shall be made at the Contract lump sum price.
 3. **New Electrical Room Installation and Demo**: Payment for demolition and construction of the new Electrical Room, labor and materials shall be made at the Contract price.
 4. **Electrical Equipment Installation**: Payment for construction and furnishing the major and miscellaneous equipment, labor and materials shall be made at the Contract price. The Owner shall be responsible for receiving and storage of the equipment.
 5. **Demolition**: Payment for demolition, labor and materials shall be made at the Contract price.
 6. **Final Completion**: Completion of the outstanding items punchlist and payment for providing training for the Owner's staff on operation and maintenance of the equipment shall be made at the Contract price.
- C. Prior to submitting first monthly Application for Payment, Contractor shall submit to Engineer, for review and approval, a schedule of values based upon the Contract Price, listing the major elements of the Work and the dollar value for each element. After its approval by the Engineer, this schedule of values shall be used as the basis for the Contractor's monthly Applications for Payment.
- D. Prior to submitting first monthly Application for Payment, Contractor shall submit to The City a complete list of all its proposed subcontractors showing the work and materials involved and the dollar amount of each proposed subcontract and purchase order. The first Application for Payment shall be submitted no earlier than thirty (30) days after the Commencement Date.
- E. If payment is requested on the basis of materials and equipment not incorporated into the Project, but delivered and suitably stored at the site or at another location agreed to by the City in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that the City has received the materials and equipment free and clear of all liens, charges, security interests and encumbrances, together with evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the City's interest therein, all of which shall be subject to the City's satisfaction.
- F. Contractor shall submit six (6) copies of its monthly Application for Payment to the Engineer on or before the 25th day of each month for work performed during the previous month. Invoices received after the 25th day of each month shall be

considered for payment as part of the next month's application. Within ten (10) calendar days after receipt of each Application for Payment, the Engineer shall either:

1. indicate approval of the requested payment;
2. indicate approval of only a portion of the requested payment, stating in writing his reasons therefore; or
3. return the Application for Payment to the Contractor indicating, in writing, the reason for refusing to approve payment.

In the event of a total denial and return of the Application for Payment by the Engineer, the Contractor may make the necessary corrections and resubmit the Application for Payment. The City shall, within thirty (30) calendar days after the Engineer's approval of an Application for Payment, pay the Contractor the amounts so approved. Provided, however, in no event shall the City be obligated to pay any amount greater than that portion of the Application for Payment approved by the Engineer.

- G. The City shall retain ten (10%) of the gross amount of each monthly payment request or ten percent (10%) of the portion thereof approved by the Engineer for payment, whichever is less. Such sum shall be accumulated and not released to the Contractor until final payment is due.
- H. Monthly payments to Contractor shall in no way imply approval or acceptance of Contractor's work.
- I. Contractor agrees and understands that funding limitations exist and that the expenditure of funds must be spread over the duration of the Project at regular intervals based on the Contract Amount and Progress Schedule. Accordingly, prior to submitting its first monthly Application for Payment, Contractor shall prepare and submit for the Engineers review and approval, a detailed Project Funding Schedule, which shall be updated as necessary and approved by the City to reflect approved adjustments to the Contract Amount and Contract Time. No voluntary acceleration or early completion of the Work shall modify the time of payments to Contractor as set forth in the approved Project Funding Schedule.

2. PAYMENTS WITHHELD

- A. The Engineer may decline to approve any Application for Payment, or portions thereof, because of subsequently discovered evidence or subsequent inspections. The Engineer may nullify the whole or any part of any approval for payment previously issued and the City may withhold any agreement between the City and Contractor, to such an extent as may be necessary in the City's opinion to protect it from loss because of:
 1. Defective Work not remedied;

2. Third party claims filed or reasonable evidence indicating probable filing of such claims
3. Failure of Contractor to make payment properly to subcontractors or for labor, materials or equipment;
4. Reasonable doubt that the Work can be completed for the unpaid balance of the Contract Amount;
5. Reasonable indication that the Work will not be completed within the Contract Time;
6. Unsatisfactory prosecution of the Work by the Contractor; or
7. Any other material breach of the Contract Documents.

B. If these conditions in Subsection 5.1 are not remedied or removed, the City may, after three (3) days written notice, rectify the same at Contractor's expense. The City also may offset against any sums due Contractor the amount of any liquidated or unliquidated obligations of Contractor whether relating to or arising out of this Agreement or any other agreement between Contractor and the Engineer.

3. FINAL PAYMENT

- A. The City shall make final payment to Contractor within thirty (30) calendar days after the Work is finally inspected and accepted by both the City and the Engineer in accordance with Section 20.1 herein provided that Contractor first, and as an explicit condition precedent to the accrual of Contractor's right to final payment, shall have furnished the City with any and all documentation that may be required by the Contract Documents and the City.
- B. Contractor's acceptance of final payment shall constitute a full waiver of any and all claims by Contractor against the City arising out of this Agreement or otherwise relating to the Project, except those previously made in writing and identified by Contractor as unsettled at the time of the final Application for Payment. Neither the acceptance of the Work nor payment by the City shall be deemed to be a waiver of the City's right to enforce any obligations of Contractor hereunder or to the recovery of damages for defective Work not discovered by the Engineer at the time of final inspection.

END OF SECTION

STS-01140
SPECIAL CONDITIONS

PART 1

A. CONTRACT TIME

1. OWNER desires the work to be completed under the following schedule:

1. Refer to STS-01011 Phasing of Work

B. SUBSTANTIAL COMPLETION

A. The following requirements and cleaning operations shall be completed before requesting inspection for Certification of Substantial Completion.

1. Construction shall be complete. For this purpose, completion of construction is defined as follows:

a. The CONTRACTOR has completed construction and erection of the work in conformance with the Contract Drawings and Specifications.

2. All shop drawings shall have final approval.

3. Clean the site of litter and other construction materials. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to smooth, even textured surfaces.

4. Remove waste and surplus materials, rubbish, fencing equipment, temporary utilities and construction facilities from the site, unless otherwise required by the ENGINEER.

5. CONTRACTOR shall be responsible for removal and disposal of all demoed equipment and materials.

B. Substantial Completion is officially defined in the General and Supplementary Conditions to the Construction Contract. The date of substantial completion will be certified by the ENGINEER. This date will not be certified until the following requirements have been satisfied by the CONTRACTOR.

1. All Contract requirements are coordinated into a fully operational system

C. FINAL COMPLETION

- A. Prior to final completion, the following tasks shall be completed:

1. All items in the punch list shall be completed.
2. All Contract closeout documentation shall be submitted to and accepted by the ENGINEER.

D. UTILITIES OPERATIONS MANUAL

- A. The City of Naples Utilities Specifications and Standards Manual (latest revision) shall be considered part of the Contract Documents, including all applicable detail drawings.

E. GENERAL INSURANCE REQUIREMENTS

- A. The City of Naples and Johnson Engineering, Inc, shall be named as additional insured on the insurance certificate.

PART 2 PRODUCTS

C. Major Equipment

1. All major equipment shall be from the same manufacturer.

- D. The Owner reserves the right to direct purchase the major equipment prior to Contract award at the Owner's discretion.

PART 3 QUALIFICATIONS

1. The CONTRACTOR shall be pre-qualified.

PART 4 EQUIPMENT UNAVAILABILITY AND LIMITATIONS

1. A detailed construction staging plan is outlined in the Plans to limit the duration of planned downtime events. The CONTRACTOR shall confirm the feasibility of the proposed Construction Staging Plan in the Bid.

END OF SECTION

STS-26 05 00
MATERIALS AND METHODS

PART 1 – GENERAL

1. SUMMARY

- A. **Section Includes:** General requirements for providing basic electrical materials and methods.
- B. **Related Work Specified in Other Sections Includes:**
 - 1. Certain items of equipment, and various control devices including conduit and wiring which are indicated on electrical drawings to be connected, but are specified in other sections pertaining to plumbing, heating, ventilating, air conditioning, temperature control systems, process equipment, process control systems, and instrumentation. Install and connect these items to the electrical system as indicated or required in accordance with the Contract Documents.
- C. **Overall Application of Specifications:** This Section applies to all sections of Division 26 and to other sections that include electrical equipment requirements except when in these individual sections requirements are otherwise specified to provide and install all materials necessary for a complete operational system.
- D. **Temporary Requirements:** This Section applies to any temporary circuits, overcurrent devices, conduit, wiring, and other equipment required during changeover from existing to a new electrical system. This Section also applies to temporary rewiring of lighting and power circuits, instruments and devices.

2. SYSTEM DESCRIPTION

- A. **Design Requirements:** Design requirements are specified in the applicable sections.
- B. **Performance Requirements:** Performance requirements are specified in the applicable sections.

3. SUBMITTALS

- A. **General:** Provide submittals for all electrical material and devices. Including the following:
 - 1. Submit Technical Information Brochures at start of construction or within 30 days after Award of the Contract. Each brochure shall consist of an adequately sized, hard-cover, 3-ring binder for 8-1/2" X 11" sheets. Provide correct designation on outside cover and on end of brochure. When, in the judgment of the Engineer, one binder is not enough to adequately catalog all data, an additional binder will be required and data split as directed by the Engineer. Specific shop drawing submittals may be

submitted separately after technical information brochures but before any equipment is purchased; provide index and schedule of shop drawings to be submitted within the technical information brochures.

2. First sheet in the brochure shall be a photocopy of the Electrical Index pages in these specifications. Second sheet shall be prepared by the Contractor, and shall list Project Addresses and phone numbers with key personnel for this project.
 3. Provide reinforced separation sheets tabbed with the appropriate specification reference number.
 4. The General Contractor shall review the brochures before submitting to the Engineer. No request for payment will be considered until the brochure has been submitted and reviewed completely.
 5. Submit cost breakdown "Schedule of Values" for electrical work in the Technical Information Brochures. Cost of material and labor for each major item shall be shown.
 6. Acceptance: When returned to Contractor, submittals will be marked with Engineer's stamp. If box marked "returned for correction resubmit" is checked, submittal is not approved and Contractor is to correct and resubmit as noted, otherwise submittal is approved and Contractor is to comply with notation making necessary corrections on submittal and resubmit for final record.
 7. Note that the approval of shop drawings, or other information submitted in accordance with the requirements hereinbefore specified, does not assure that the Engineer, or any other Owner's Representative, attests to the dimensional accuracy or dimensional suitability of the material or equipment involved, the ability of the material or equipment involved or the Mechanical/Electrical performance of equipment. Approval of shop drawings does not invalidate the plans and specifications if in conflict with the submittal. It is the contractor's responsibility to request in writing and seek written approval from the engineer for all deviations of the plans and specifications.
- B. Product Data and Information: Provide complete list of electrical equipment and materials to be furnished showing manufacturer, catalog number, size, type, voltage rating and other pertinent information.

1. Provide catalog data on manufacturer's standard equipment and materials. Clearly indicate on catalog cuts the equipment and devices being proposed.
2. Identification: Provide complete schedule and listing of system and equipment identification labels with legends.

3. Material shall not be ordered or shipped until the shop drawings have been approved.
 4. The Engineer's shop drawing review shall be for conformance with the design concept of the project and compliance with the Specifications and the Drawings. Errors and omissions on approved shop drawings shall not relieve the Contractor from the responsibility of providing materials and workmanship required by the Specifications and the Drawings.
 5. Shop drawings shall be stamped with the date checked by the contractor and a statement indicating that the shop drawings conform to the Specifications and the Drawings. This statement shall also list all exceptions to the Specifications and the Drawings. Shop drawings not so checked and noted shall be returned.
- C. CONTRACTOR's Shop Drawings: Provide shop drawings on items manufactured for the Contract.
1. Provide connection diagram and schematic for each piece of electrical equipment. A manufacturer's standard connection diagram or schematic showing more than one method of connection is not acceptable unless it is clearly marked to show the intended method of connection.
 2. Provide diagrams showing connections to field equipment. Clearly differentiate between manufacturer's wiring and field wiring.
 3. Provide raceway layout drawings showing conduits, boxes, and panels which contain the conductors to be provided. Include schedules listing conduit sizes and conductor content and identification.
 4. Where additions and modifications are made to existing equipment, provide drawings which include both retained existing equipment and new Work.
- D. Coordination Drawings: Prepare to scale coordination drawings (1/4"=1'-0"); detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including but not necessarily limited to the following:
1. Indicate the proposed locations of major raceway systems, equipment, and materials. All dimensions shall be field verified at the job site and coordinated with the work of all other trades. Include the following:
 - a. Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.
 - b. Exterior wall and foundation penetrations.
 - c. Fire-rated wall and floor penetrations.

- d. Equipment connections and support details.
 - e. Sizes and location of required concrete pads and bases.
- E. Record Documents: Prepare record documents, and in addition to the requirements specified in Division 1. As the work progresses, legibly record all field changes on a set of Project Contract Drawings, (the "Record Drawings"). indicate installed conditions for:
- 1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
 - 2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 - 3. Approved substitutions, and actual equipment and materials installed.
 - 4. Record Drawings shall accurately show the installed condition of the following items: Power Riser Diagram(s). Equipment elevations (front views). Raceways and pullboxes. Conductor sizes and conduit fills. Control Wiring Diagram(s). Underground raceway and duct bank routing. Plan view, sizes and locations of distribution transformers and outdoor electrical equipment enclosure.
 - 5. Submit a schedule of control wiring raceways and wire numbers, including the following information: Circuit origin, destination and wire numbers. Field wiring terminal strip names and numbers.
 - 6. In addition to the schedule, provide point to point connection diagrams showing the same information submitted in the schedule of control wiring raceways including all designations and wire numbers. Comply with PLC tag designation on all instrumentation and control cabling in and out of PLC racks.
 - 7. The schedule of control wiring raceways and wire numbers and the point to point connection diagrams shall be in electronic AutoCAD and Word format (i.e. no hand-written or drawn schedules, drawings, or diagrams will be accepted)
- F. Operation and Maintenance Manuals: Prepare operation and maintenance manuals, and in addition to the requirements specified in other Divisions, include the following information for equipment items:
- 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and catalog numbers of replacement parts. Complete parts list with stock numbers, including spare parts. A complete bill of material supplied, including serial numbers, ranges and pertinent data.

2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions. The operating instructions shall also incorporate a functional description of the entire system, with references to the systems schematic drawings and instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. A comprehensive index.
5. A complete "As Built" set of approved shop drawings.
6. A table listing of the settings for all timing relays and alarm and trip setpoints. A complete listing of programmable parameters for all drives, soft-starters and other microprocessor controlled equipment.
7. System schematic drawings "As Built", illustrating all components, piping and electric connections of the systems supplied under this Section.

4. QUALITY ASSURANCE

- A. Codes: Provide all electrical Work in accordance with applicable local codes, regulations and ordinances. If there is a conflict between the requirements specified in the Contract Documents and the codes, follow the more stringent requirements as determined and approved.
- B. Testing: As a minimum, provide standard factory and field tests for each type of equipment. Other tests may be specified in the applicable equipment section.
- C. Labeling: Provide all electrical equipment and materials listed and approved by Underwriters Laboratories with the UL label or other OSHA recognized testing laboratories attached to it.
- D. Standard Products: Unless otherwise indicated, provide electrical materials and equipment which are the standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturer's latest standard design that conforms to these Specifications. When two or more units of the same class of material and equipment are required, provide the products of the same manufacturer.

5. DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:

1. **Shipping and Packing:** Provide materials and equipment suitably boxed, crated or otherwise completely enclosed and protected during shipment, handling, and storage. Clearly label such boxes, crates or enclosures with manufacturer's name, and name of material or equipment enclosed.
2. **Acceptance at Site:** Conform to acceptance requirements as required in Division 1. Repair or replace all materials and equipment damaged by handling and storage as directed at no additional Contract cost.
3. **Storage and Protection:** Protect materials and equipment from exposure to the elements and keep them dry at all times. Handle and store to prevent damage and deterioration in accordance with manufacturer's recommendations.

6. PROJECT CONDITIONS

- A. **General:** The Drawings indicate the extent and general arrangement of the principal electrical elements, outlets and circuit layouts. Connect and install all electrical elements and devices to form a workable system as required by the Contract Documents whether the connections and installations are specifically stated in the Specifications or shown. Provide necessary materials and installation wherever required to conform to the specific requirements of the furnished equipment and for proper installation of the Work.
- B. **Schematics:** In general, the runs of feeders are shown schematically and are not intended to show exact routing and locations of raceways. Verify actual and final arrangement, equipment locations, and prepare circuit and raceway layouts before ordering materials and equipment. Equipment locations are approximate and are subject to modifications as determined by equipment dimensions.
- C. **Coordination of Work:** Coordinate the Work so that the electrical equipment may be installed without altering building components, other equipment or installations.
- D. **Coordinate arrangement, mounting, and support of electrical equipment to allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated. To provide for ease of disconnecting the equipment with minimum interference to other installations. To allow the right of way for piping and conduit installed at the required slope. To clear connecting raceways, cables, wireways, cable trays, and busways of obstructions and of the working and access space of other equipment. Coordinate the installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed. Coordinate electrical testing of electrical, mechanical, and architectural items, so that functionally interdependent equipment and systems demonstrate successful interoperability.**
- E. **Departure from Design:** If departures are deemed necessary due to structural conditions, obstructions or other problems, provide details of such departures and the reasons for requesting approval as soon as practicable but not later than the submittal of the raceway layout drawings. Do not make any departures without written approval.

PART 2 – PRODUCTS (NOT USED)**PART 3 – EXECUTION****1. ROUGH-IN**

- A. Final location: verify final locations for rough-ins with field measurements, vendor shop drawings and with the requirements of the actual equipment to be connected.
- B. The drawings are not intended to show exact locations of conduit runs. Coordinate the conduit installation with other trades and the actual supplied equipment.
- C. Install each 3 phase circuit in a separate conduit unless otherwise shown.
- D. Except where dimensions are shown, the locations of equipment, fixtures, outlets and similar devices shown on the drawings are approximate only. Exact locations shall be determined by the contractor and approved by the engineer during construction. Obtain information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the engineer and furnish all labor and materials necessary to complete the work in an approved manner.
- E. Surface mounted panel boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between wall and equipment.
- F. All floor mounted electrical equipment shall be placed on 3.5-inch high (3/4-inch, 45 degree chamfer at all exposed edges) concrete housekeeping pads, provide reinforcement, anchors, etc.

2. ELECTRICAL INSTALLATIONS

- A. Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate electrical systems, equipment, and materials installation with other building components.
 - 2. Verify all dimensions by field measurements. Investigate each space in the structure through which equipment must pass to reach its final location.
 - 3. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.
 - 4. The equipment shall be kept upright at all times during storage and handling. When equipment must be tilted for passage through restricted areas, brace the equipment to ensure that the tilting does not impair the functional integrity of the equipment.

5. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
6. Coordinate the installation of required supporting devices and sleeves to be set in cast-in-place concrete and other structural components, as they are constructed.
7. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
8. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
9. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
10. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the contract documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the engineer for resolution.
11. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
12. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
13. Install access panel or doors where units are concealed behind finished surfaces.
14. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3. CUTTING AND PATCHING

- A. Perform cutting and patching as specified in division 1. In addition to the requirements specified in division 1, the following requirements apply:
 1. Perform cutting, fitting, and patching of electrical equipment and materials required to:
 - a. Uncover work to provide for installation of ill-timed work.
 - b. Remove and replace defective work.

- c. Remove and replace work not conforming to requirements of the contract documents.
 - d. Remove samples of installed work as specified for testing.
 - e. Install equipment and materials in existing structures.
 - f. Locate existing structural reinforcing where core drilled penetrations are required so as not to cut the steel reinforcing.
2. Cut, remove, and properly dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new work. Deliver all the existing removed to the owner as directed.
 3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
 4. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
 5. Protection of installed work: during cutting and patching operations, protect adjacent installations.
 6. Patch finished surfaces and building components using new materials as specified for the original installation and experienced installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

END OF SECTION

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STS-26 05 11
ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1. SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install complete and make operational, electrical and process instrumentation systems for the Lee County Utilities Department as shown on the Drawings and as specified herein.
- B. The work shall include furnishing, installing and testing the equipment and materials specified in other Sections of the Specifications and shown on the Drawings.
- C. It is the intent of these Specifications that the electrical system shall be suitable in every way for the service required. All material and all work which may be reasonably implied as being incidental to the work of this Section shall be furnished at no extra cost. The work shall include but not be limited to furnishing and installing the following:
 - 1. Modify the service entrance.
 - 2. Conduit, wire and field connections for all motors, motor controllers, control devices, control panels and electrical equipment furnished under other Divisions of these specifications.
 - 3. Provide a complete grounding system and special grounds as required or noted.
 - 4. Provide Power and signal Surge Suppressors per the Plans.
 - 5. Provide Concrete work for pad mounted equipment.
 - 6. Provide Instrumentation and control conduit and wiring systems.
 - 7. Provide Electrical testing of equipment
 - 8. Provide Lightning protection, bonding and grounding systems.
- D. Each bidder or their authorized representatives shall, before preparing their proposal, visit all areas of the existing site and structures in which work under this Division is to be performed and inspect carefully the present installation. The submission of the proposal by this bidder shall be considered evidence that their representative has visited the site and structures and noted the locations and conditions under which the work will be performed and that the bidder takes full responsibility for a complete knowledge of all factors governing the work.
- E. Field verify all existing underground electrical and mechanical piping.
- F. The Contractor shall prepare and furnish electrical and instrumentation conduit layout shop drawings for yard electrical, within and under all roads, buildings and structures to the Engineer for approval prior to commencing work. Layouts shall include but not

be limited to equipment, pull boxes, conduit routing, dimensioning, methods and locations of supports, reinforcing, encasement, materials, conduit sizing, equipment access, potential conflicts, building and yard lighting, and all other pertinent technical specifications for all electrical and instrumentation conduits and equipment to be furnished. All layouts shall be drawn to scale on 22" x 34" sheets.

- G. The work shall include complete testing of all equipment and wiring at the completion of work and making any minor correction changes or adjustments necessary for the proper functioning of the system and equipment. All workmanship shall be of the highest quality; substandard work will be rejected.
- H. A single manufacturer shall provide panelboards, main breakers, transformers, disconnect switches, etc.
- I. Contractor shall provide their own temporary power for miscellaneous power (drills, pumps, etc.). No facility circuits shall be used unless approved by the engineer. Any temporary power added shall be removed at job completion.
- J. Complete coordination with other contractors. Contractor shall coordinate with all other contractors equipment submittals and obtain all relevant submittals.
- K. Mount transmitters, process instruments, operator's stations, etc. furnished under other Divisions of these specifications.
- L. Concrete electrical duct encasement, including but not limited to excavation, concrete, conduit, reinforcement, backfilling, grading and seeding is included. Excavation, bedding material, forms, concrete and backfill for underground raceways; forms and concrete for electrical equipment furnished herein is included in this Division.

2. QUALIFICATIONS

- A. The electrical contractor shall be Pre-Qualified.

3. RELATED WORK

- A. Excavation and backfilling, including gravel or sand bedding for underground electrical work is specified in other Divisions.
- B. Cast in place concrete work, including concrete encasements for electrical duct banks, equipment pads, and reinforcing steel, is specified in other Divisions.

4. REFERENCE STANDARDS

- A. Electric equipment, materials and installation shall comply with the latest edition of National Electrical Code (NEC) and with the latest edition of the following codes and standards:
 - 1. National Electrical Safety Code (NESC)

2. Occupational Safety and Health Administration (OSHA)
 3. National Fire Protection Association (NFPA)
 4. National Electrical Manufacturers Association (NEMA)
 5. American National Standards Institute (ANSI)
 6. Instrument Society of America (ISA)
 7. Underwriters Laboratories (UL)
 8. Factory Mutual (FM)
 9. International Electrical Testing Association (NETA)
 10. Institute of Electrical and Electronic Engineers (IEEE)
 11. American Society for Testing and Materials (ASTM)
 12. Electrical Safety in the Workplace (NFPA70E)
 13. State and Local Codes and Ordinances
- B. All electrical equipment and materials shall be listed or registered by Underwriter's Laboratories, if possible, and shall bear the appropriate UL mark or classification marking.
5. CODES, INSPECTION AND FEES
- A. Equipment, materials and installation shall comply with the requirements of the local authority having jurisdiction. Completed electrical installation shall be inspected and certified by all applicable agencies that it is in compliance with all codes.
 - B. Obtain all necessary permits and pay all fees required for permits and inspections.
6. TESTS AND SETTINGS
- A. Test systems and equipment furnished under Division 26 and other divisions supplying electrical equipment. Repair or replace all defective work and equipment. Refer to section 260800 and the individual equipment sections for additional specific testing requirements.
 - B. Make adjustments to the systems and instruct the Owner's personnel in the proper operation of the systems.
 - C. In addition to the specific testing requirements listed in section 260800 and the individual Sections, the following minimum tests and settings shall be performed. Submit test reports upon completion of testing in accordance with Section 260800.

1. Mechanical inspection, testing and settings of circuit breakers, disconnect switches, motor starters, overload relays, control circuits and equipment for proper operation.
2. Check the full load current draw of each motor. Where power factor correction capacitors are provided the capacitor shall be in the circuit at the time of the measurement. Check ampere rating of thermal overloads for motors and submit a typed record to the Engineer of the same, including driven load designation, motor service factor, horsepower, and Code letter. If incorrect thermal overloads are installed replace same with the correct size overload.
3. Check power and control power fuse ratings. Replace fuses if they are found to be of the incorrect size.
4. Check settings of the motor circuit protectors. Adjust settings to lowest setting that will allow the motor to be started when under load conditions.
5. Check motor nameplates for correct phase and voltage. Check bearings for proper lubrication.
6. Check rotation of motors prior to testing the driven load. Disconnect the driven equipment if damage could occur due to wrong rotation. If the rotation is incorrect for the driven equipment correct motor connections at the motor terminal box.
7. Check interlocking, control and instrument wiring for each system and/or part of a system to prove that the system will function properly as indicated by control schematic and wiring diagrams.
8. Inspect each piece of equipment in areas designated as hazardous to ensure that equipment of proper rating is installed.
9. Verify all terminations at transformers, equipment, panels and enclosures. Verify correct rotation of all motors.
10. Check all wire and cable terminations. Verify to the Engineer connections meet the equipment torque requirements.
11. Field set all transformer taps as required to obtain the proper secondary voltage.
12. Infra-red hot spot inspection shall be made of all electrical equipment including but not limited to switchgear, motor control centers, transformers, switches, power and control panels, etc. This shall be done under representative load conditions before the equipment is used by the Owner.

7. PHASE BALANCING

- A. The Drawings may not adequately balance the electrical loads across the phases. Circuits on panelboards shall be field connected to result in evenly balanced loads across all phases.

- B. Field balancing of circuits shall not alter the conductor color coding requirements as specified herein.

8. EQUIPMENT IDENTIFICATION

- A. Identify equipment (disconnect switches, control stations, etc.) furnished under Division 26 with the name of the equipment it serves. Control panels, panelboards, main breakers, junction or terminal boxes, etc., shall have nameplate designations as shown on the Drawings. Nameplates shall adequately describe the function of the particular equipment involved. Where nameplates are detailed on the drawings, inscription and size of letters shall be as shown and shop drawing submitted for approval. Nameplates for panelboards and switchboards shall include the panel designation, voltage and phase of the supply. For example, "Panel A, 277/480V, 3-phase, 4-wire". The name of the machine on the nameplates for a particular machine shall be the same as the one used on all motor starters, disconnect and P.B. station nameplates for that machine.
- B. Nameplates shall be engraved, laminated plastic, not less than 1/16-in thick by 3/4-in by 2-1/2-in with 3/16-in high white letters on a black background. Attach with stainless steel nuts and bolts.
- C. Electrical systems shall be identified at junction and pull boxes, terminal cabinets and equipment racks. Electrical contractor is responsible for nameplates on electrical equipment supplied by other divisions and installed and wired by electrical contractor including all instrumentation and controls equipment. A portion of existing equipment affected by this contract shall also receive nameplates as determined by the Engineer.
- D. Nameplates shall be screw mounted to NEMA 1 enclosures. Nameplates shall be bonded to all other enclosure types using an epoxy or similar permanent waterproof adhesive. Two sided foam adhesive tape is not acceptable. Where the equipment size does not have space for mounting a nameplate, the nameplate shall be permanently fastened to the adjacent mounting surface. Cemented nameplates shall not be drilled.
- E. All voltages (e.g. 480 volts, 240 volts, etc.) within pull boxes, junction boxes etc. shall be identified on the front exterior cover. Signs shall be red background with white engraved lettering, lettering shall be a minimum of 1" high.
- F. All receptacles, wall switches, lighting fixtures, photocells, emergency lights, exit lights, etc. shall be identified with the panel and circuit to which it is connected. Identification shall be with machine generated labels with 1/4" high letters.

9. SAFETY REQUIREMENTS

- A. The Contractor shall make every effort to keep all employees and/or subcontractors aware of the danger inherent in working in dangerous proximity to the existing power lines. The minimum recommended precautionary measures are as follows:
 - 1. Make sure that all persons responsible for operating cranes, draglines and other mobile equipment have a copy of, and are familiar with the State Department of

Commerce Regulations for Use of Cranes, Draglines and Similar Equipment Near Power Lines, as well as the U.S. Department of Labor OSHA Regulations, before commencing operation of said equipment.

2. Make sure that all cranes, draglines and other mobile equipment have attached to them the black and yellow Department of Commerce warning signs required by the said Regulations of State Department of Commerce.
3. Warn all employees on the ground, new and old employees alike, of the danger of holding on to or touching a cable or other piece of equipment or machinery that is located or working close to any overhead power line.
4. If, during the course of construction, it becomes necessary for the contractor, or subcontractor, and their employees, to operate cranes, draglines, or their mobile equipment, in dangerous proximity of any overhead power lines, or in such a manner that such equipment might come close to any overhead power lines, the Contractor shall give the Power Company or overhead power line owner prior notice of such proposed operation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

1. SLEEVES AND FORMS FOR OPENINGS

- A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured.
- B. Exact locations are required for stubbing-up and terminating concealed conduit. Obtain shop drawings and templates from equipment vendors or other subcontractors and locate the concealed conduit before the floor slab is poured.
- C. Where setting drawings are not available in time to avoid delay in scheduled floor slab pours, the Engineer may allow the installations of such conduit to be exposed. Requests for this deviation must be submitted in writing. No additional compensation for such change will be allowed.
- D. Seal all openings, sleeves, penetration and slots as specified in Section 260551.

2. INSTALLATION

- A. Any work not installed according to the Drawings and this Division or without approval by the Engineer shall be subject to change as directed by the Engineer. No extra compensation will be allowed for making these changes.
- B. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored out-of-doors. Electrical equipment shall be stored in dry permanent shelters. If an apparatus has been damaged, such damage shall be repaired at no additional cost.

Any repair must be pre-approved by owner and engineer. If any apparatus has been subject to possible injury by water, it shall be replaced at no additional cost to the Owner, the damaged unit(s) or systems shall remain on site and returned to the manufacturer after the replacement unit(s) or systems have been delivered to the site. Under no circumstances will electrical equipment damaged by water be rehabilitated or repaired, new equipment shall be supplied and all cost associated with replacement shall be borne by the Contractor.

- C. Equipment that has been damaged shall be replaced or repaired by the equipment manufacturer, at the Engineer's discretion.
- D. Repaint any damage to factory applied paint finish using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted at no additional cost to the Owner.

3. MANUFACTURERS SERVICE

- A. Provide manufacturer's services for testing and start-up of all major electrical equipment: VFDs, ATS, Gensets, MCCs, Switchboards, Switchgear, Etc.
- B. Testing and startup shall not be combined with training. Testing and start-up time shall not be used for manufacturer's warranty repairs.
- C. The manufacturers of the above listed equipment shall provide experienced Field Service Engineer to accomplish the following tasks:
 - 1. The equipment shall be visually inspected upon completion of installation and prior to energization to assure that wiring is correct, interconnection complete and the installation is in compliance with the manufacturer's criteria. Documentation shall be reviewed to assure that all Drawings, operation and maintenance manuals, parts list and other data required to check out and sustain equipment operation is available on-site. Documentation shall be red-lined to reflect any changes or modifications made during the installation so that the "as-built" equipment configuration will be correctly defined. Spare parts shall be inventoried to assure correct type and quantity.
 - 2. The Field Service Engineers shall provide engineering support during the energization and check-out of each major equipment assembly. They shall perform any calibration or adjustment required for the equipment to meet the manufacturer's performance specifications.
 - 3. Upon satisfactory completion of equipment test, they shall provide engineering support of system tests to be performed in accordance with manufacturer's test specifications.
 - 4. A final report shall be written and submitted to the Contractor within fourteen days from completion of final system testing. The report shall document the inspection and test activity, define any open problems and recommend remedial action. The reports after review by the Contractor shall be submitted to the Engineer.

4. TRAINING

- A. The cost of training programs to be conducted with Owner's personnel shall be included in the Contract Price. The training and instruction, insofar as practicable, shall be directly related to the system being supplied.
- B. Provide detailed O&M manuals to supplement the training courses. The manuals shall include specific details of equipment supplied and operations specific to the project.
- C. The training program shall represent a comprehensive program covering all aspects of the operation and maintenance including trouble-shooting of each system.
- D. All training schedules shall be coordinated with and at the convenience of the Owner. Shift training may be required to correspond to the Owner's working schedule. The training shall be conducted with record "as-built" drawings sufficient for each class member.
- E. The Contractor shall submit an overview of the proposed training plan. This overview shall include, for each course proposed:
 - 1. An overview of the training plan.
 - 2. Course title and objectives.
 - 3. Recommended types of attendees.
 - 4. Course Content - A topical outline.
 - 5. Course Format - Lecture, laboratory demonstration, etc.
 - 6. Schedule of training courses including dates, duration and locations of each class.

5. WARRANTY

- A. The work under this Division shall include a two-year warranty. This warranty shall be by the Contractor to the Owner for any defective workmanship or material that has been furnished under this Contract at no cost to the Owner for a period of two years from the date of final completion of the System. This guarantee shall not include light bulbs or batteries in service after six months from date of final Completion of the System.

END OF SECTION

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LOW VOLTAGE CONDUCTORS

PART 1 – GENERAL

1. REFERENCED STANDARDS

- A. Institute of Electrical and Electronics Engineers, Inc./American National Standards Institute (IEEE/ANSI).
- B. Standard for Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies.
- B. National Electrical Manufacturers Association (NEMA): ICS 4, Industrial Control and Systems: Terminal Blocks.
- C. National Electrical Manufacturers Association/Insulated Cable Engineers Association (NEMA/ICEA): WC 57/S-73-532, Standard for Control Cables: WC 70/S-95-658, Non-Shielded Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
- D. National Fire Protection Association NFPA-70, National Electrical Code (NEC).
- E. Underwriters Laboratories, Inc. (UL44): Standard for Safety Thermoset-Insulated Wires and Cables; (UL83): Standard for Safety Thermoplastic-Insulated Wires and Cables; UL467 Standard for Safety Grounding and Bonding Equipment. UL486A Standard for Safety Wire Connectors and Soldering Lugs for use with Copper Conductors; UL 486C, Standard for Safety Splicing Wire Connections. UL510, Standard for Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.

2. DEFINITIONS

- A. Building Wire: Copper single conductor, cross link polyethylene insulated; type XHHW-2 or thermoplastic insulated THHN and THWN.
- B. Cable: Multi-conductor, insulated, with outer sheath containing either building wire or instrumentation wire.
- C. Instrumentation Cable (Analog signal cable): Multiple conductor, insulated, twisted Pair/Triad, with individual Pair/Triad shield and outer overall shield and outer sheath. Used for the transmission of low current (e.g., 4-20mA DC) using No. 18 AWG conductors. Common Types, TSP: Twisted shielded pair, TST: Twisted shielded triad.
- D. Control Cable: Multi-conductor, insulated, with outer sheath containing building wires, No. 16, AWG. With overall shield where specified. Type SIS and MTW approved for use in the wiring of control equipment within control panels and field wiring of control equipment within switchgear, switchboards, motor control centers; otherwise type XHHW-2.

- E. Power Cable: Multi-conductor, insulated, with outer sheath containing building wire, No. 8 AWG and larger, Rated XHHW-2. No. 12-6 AWG, Rated THHN or THWN.
- F. Digital signal cable: Used for the transmission of digital signals between computers, PLC's, RTU's, etc. Common Types: Ethernet UTP-unshielded twisted pair.

3. SUBMITTALS:

- A. Submit cut sheets on all major types of wires and cables including splicing tape, and terminating/splicing lugs, conductor identification systems and connectors and cable sleeves. Submit sample of all instrumentation and control cable. Sample shall be a minimum of 24" with exterior sheath clearly marked.
- B. Submit sample of all cable identification systems products.

PART 2 – PRODUCTS

1. POWER CONDUCTORS:

- A. Branch circuits and feeder conductors for all three phase electric power shall be stranded copper type XHHW-2 cross-link polyethylene (XLP) insulation and de-rated to 75 degC for #8 AWG and larger. No. 12-6 AWG, shall be type THHN or THWN, thermoplastic insulation and de-rated to 75 degC. No aluminum wiring shall be permitted. Wire shall be in accordance to NEC and minimum No. 12, except that branch "homeruns" over 50 ft. in length shall be minimum No. 10 for 120/208V circuits. All branch lighting circuits serving HID and Fluorescent fixtures shall be minimum #10 with each circuit provided with a separate neutral.
- B. Taps and Splices:
 - 1. All power wiring taps and splices in No. 8 or smaller wire shall be fastened together by means of terminal strips except within lighting fixtures and wiring devices where conformance to NEC practices will be acceptable (Twist/screw on type connectors). All taps and splices in wire larger than No. 8 shall be made with compression type connectors and taped to provide insulation equal to wire. Tape shall be heavy duty, flame retardant and weather resistant vinyl electrical tape, minimum 7 mil premium grade with an operating temperature of 0 degree F. to 220 degree F. Provide tape meeting UL 510 and CSA standard C22.2.
 - 2. All taps and splices in manholes or in ground pull boxes, etc. shall be approved by the engineer on a case by case basis; be made with high press long barrel double crimp compression type connectors and covered with Raychem heavy wall cable sleeves (type CTE or WCS) with type "S" sealant coating. Install sleeve kits as per manufacturer's installation instructions.

C. Color Coding:

1. All power feeders and branch circuits No. 6 and smaller shall be wired with color-coded wire with the same color used for a system throughout the building. Power feeders above No. 6 shall either be fully color-coded or shall have black insulation and be similarly color-coded with tape or paint in all junction boxes and panels. Tape or paint shall completely cover the full length of conductor insulation within the box or panel except for the wire markings.
2. Unless otherwise approved, color-code shall be as follows: Neutrals to be white for 120/208V system, natural grey for 277/480V system; ground wire green, bare or green with yellow strips. Nominal Voltage: 120/208V, Phase A -black; Phase B - red; Phase C - blue. 480/277V, Phase A brown; Phase B - orange; Phase C -yellow. All switch legs, other voltage system wiring, control and interlock wiring shall be color-coded other than those above. In exiting or expansion projects, comply with existing color coding established within the facility.

2. INSTRUMENTATION AND CONTROL CABLE:

- A. Multiconductor and Multi pair Process instrumentation cable shall be #18 AWG stranded, twisted pair, 600 V, (XLP) cross link polyethylene insulated, aluminum tape pair shielding, cross link polyethylene or chlorinated polyethylene (CPE) overall sheathed and shielded, type TC instrument cable as manufactured by the American Insulated Wire Co., Belden Wire Co. or equal.
- B. Multiconductor control cable shall be #16 AWG stranded, 600V, (XLP) cross link polyethylene insulated or polyolefin, with cross link polyethylene or chlorinated polyethylene (CPE or Hypalon) overall sheathed type TC control cable except for control cable into and out of VFD cabinets. Multiconductor control cable into and out of VFD cabinets shall be as indicated above and in addition include an aluminum polyester tape overall shield and drain wire. As a contractor alternate to shielded control cable into and out of VFD cabinets, provide twisted shielded instrument cable as specified above. Contractor to provide increased conduit size as required if instrument cable alternate is used into and out of VFD cabinets.

C. Connections:

1. All conductor connections shall be on terminal strips including all spare conductors. Provide terminal strips in all cabinets; motor control centers; etc.
2. All connections of stranded wire to screw terminals shall be by insulated spade lugs, crimp fastened to wire. Provide stranded wire crimp ferrules for all stranded wire connections not requiring spade lugs for screw type terminal blocks. The stranded wire ferrule is to be crimped to all stranded wire using a crimping tool specifically approved for crimping the size and type of ferrule.
3. All conductors shall be marked with mylar wrap type "Brady" labels. Identification labels shall be permanent type, properly shrunk, and be

machine printed. All terminal block terminations shall be labeled. The inside portion of the terminal cabinet doors shall display a protected terminal cabinet drawing with all connections shown and described as to color code, number assigned to connection function of conductor and destination.

4. Wire shall be guided within terminal cabinets by cable supports. All conductors shall be neatly led to terminations.
 5. Instrumentation and control field cables on the unprotected side of SPD devices within the cabinet shall not run in parallel to the cables on the protected side of the SPD device. Separate cable supports (duct) will be provided.
 6. Cabinets: All cabinets shall be labeled with an engraved plastic laminate label riveted to the door.
 7. No splices shall be made within a conduit run or in manholes.
- D. All plant control system field wiring shall be labeled per the instrumentation and control contractor loop drawings from the field device, through the intermediate cabinets, to the PLC cabinet. The labeling system shall be consistent throughout the loop and follow the standard tag designation: PLC#-Rack#-Slot#-Point# (example PLC1-R2-S3-P4).
- E. Provide for separation of instrumentation, control and power conductors. Provide a minimum of 24" inch separation for parallel run of power conduit and instrumentation or control conduit. This separation can be reduced to 8" if metallic grounded separation is provided.

3. ETHERNET MEDIA CABLE

- A. Multiconductor and Multi pair Data Signal cable shall be TIA 5638B Cat 5e, #22 AWG solid, twisted pair, 600V, PVC insulated, aluminum tape pair shielding, thermoplastic elastomer (TPE) overall sheathed and shielded, industrial Ethernet cable as manufactured by the Allen Bradley 1585-C8HB or equal. Option to provide molded RJ45 patch cords Allen Bradley 1585D and 1585J is acceptable at contractor's option.
- B. Connections:
 1. All conductor connections shall be to RJ45 and M12 compatible jacks.
 2. All conductors shall be marked with mylar wrap type "Brady" labels. Identification labels shall be permanent type and be machine printed. All terminal block terminations shall be labeled. The inside portion of the terminal cabinet doors shall display a protected terminal cabinet drawing with all connections shown and described as to color code, number assigned to connection function of conductor and destination.

3. Wire shall be guided within terminal cabinets by cable supports. All conductors shall be neatly led to terminations.
4. Instrumentation and control field cables on the unprotected side of SPD devices within the cabinet shall not run in parallel to the cables on the protected side of the SPD device. Separate cable supports (duct) will be provided.
5. No splices shall be made within a conduit run or in manholes.

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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STS-26 05 26
GROUNDING AND BONDING SYSTEMS

PART 1 - GENERAL

1. Description; the terms “connect”, “ground” and “bond” are used interchangeably in this specification and have the same meaning.
 - A. This section specifies general grounding and bonding requirements of electrical equipment operations and to provide a low impedance path for possible ground fault currents.
 - B. “Grounding electrode system” refers to all electrodes required by NEC, as well as including made, supplementary, perimeter counterpoise ground, lightning protection system grounding electrodes.
2. Submittals
 - A. Submit in accordance with Section 26 05 00
 - B. Shop Drawings:
 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 2. Include the location of system grounding electrode connections and the routing of aboveground and underground grounding electrode conductors.
 - C. Test Reports: Provide certified test reports of ground resistance.
 - D. Certifications: Two weeks prior to final inspection, submit four copies of the following to the Project Engineer:
 1. Certification, by the Contractor, that the complete installation has been properly installed and tested.
3. Applicable Publications- Latest Edition
 - A. American Society for Testing and Materials (ASTM):
 - B. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
 - C. National Fire Protection Association (NFPA):
National Electrical Code (NEC)
 - D. Underwriters Laboratories, Inc. (UL):
Thermoset-Insulated Wires and Cables

Thermoplastic-Insulated Wires and Cables
Grounding and Bonding Equipment
Wire Connectors

PART 2 – PRODUCTS

1. Grounding and Bonding Conductors
 - A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes 2 AWG and smaller may be solid copper unless otherwise noted on the drawings. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes 4 AWG and larger shall be permitted to be identified per NEC.
 - B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes 2 AWG and smaller may be ASTM B1 solid bare copper wire.
 - C. Electrical System Grounding: Conductor sizes shall not be less than what is shown on the drawings and not less than required by the NEC, whichever is greater.
2. Splices and Termination Components
 - A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).
3. Ground Connections
 - A. Above Grade:
 1. Bonding Jumpers: compression type connectors, using zinc-plated fasteners and external tooth lock washers.
 2. Ground Busbars: Two-hole compression type lugs using tin-plated copper or copper alloy bolts and nuts.

PART 3 – EXECUTION

1. General
 - A. Ground in accordance with the NEC, as shown on drawings, and as hereinafter specified.
 - B. System Grounding:
 1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.
 2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.

- C. Equipment Grounding: Metallic structures (including ductwork and building steel), enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be bonded and grounded.
 - D. The cable tray system shall be utilized as an Equipment Grounding Conductor (EGC).
2. Grounding Connections
- A. Make grounding connections that are below grade by exothermic weld. Make grounding connections that are above grade but are otherwise normally inaccessible (poured columns, within walls) with exothermic weld.
3. Secondary Equipment and Connections
- A. Transformers:
 - 1. Exterior: Exterior transformers supplying interior service equipment shall have the neutral grounded at the transformer secondary. Provide a grounding electrode at the transformer.
 - 2. Separately derived systems (transformers downstream from service equipment): Ground the secondary neutral at the transformer. Provide a grounding electrode conductor from the transformer to the ground bar at the service equipment.
 - B. Conduit Systems:
 - 1. Ground all metallic conduit systems. All conduit systems shall contain an equipment grounding conductor (except service entrance with grounded neutral). Ground conductor shall be bonded to metallic conduit systems at the entrance and exit from the conduit.
 - C. Boxes, Cabinets, Enclosures, and Panelboards:
 - 1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes.
 - 2. Provide lugs in each box and enclosure for equipment grounding conductor termination.
 - 3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.
 - E. Motors and Starters: Provide lugs in motor terminal box and starter housing or motor control center compartment to terminate equipment grounding conductors.

- F. Receptacles shall not be grounded through their mounting screws. Ground with a jumper from the receptacle green ground terminal to the device box ground screw and the branch circuit equipment grounding conductor.
4. Corrosion Inhibitors
- A. When making ground and ground bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.
5. Conductive Piping
- A. Bond all conductive piping systems, interior and exterior, to the building to the grounding electrode system.
6. Ground Resistance
- A. Grounding system resistance to ground shall not exceed 2 ohms. Make necessary modifications or additions to the grounding electrode system for compliance without additional cost to the owner. Final tests shall assure that this requirement is met.
 - B. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided. Document with test results for approval and include approved test results in the O&M manual.
 - C. Below-grade connections shall be visually inspected by the Project Engineer prior to backfilling. Provide ground inspection wells at all ground rod locations.
7. Ground Rod Installation
- A. Drive each rod vertically in the earth, not less than 20 feet in depth.
 - B. Where permanently concealed ground connections are required, make the connections by the exothermic process to form solid metal joints. Make above grade accessible ground connections with mechanical pressure type ground connectors.
 - C. Where rock prevents the driving of vertical ground rods, drill rock then install rod. Backfill with flowable fill or concrete mix. Obtain the necessary permits if required for drilling.

END OF SECTION

STS-26 05 29
HANGERS AND SUPPORTS

PART 1 - GENERAL

1. SCOPE

- A. The work under this section includes conduit and equipment supports, straps, clamps, steel channel, etc., and fastening hardware for supporting electrical work. Furnish and install all supports, hangers and inserts required to mount fixtures, conduit, cables, pull boxes and other equipment furnished under this Division. All supporting devices and hardware exterior of buildings or interior of structures except in air conditioned spaces shall be stainless steel. Aluminum and nonmetallic supports (fiberglass) and hardware will be reviewed by the Engineer on a case-by-case basis.
 - B. All items shall be supported from the structural portion of the building. Supports and hangers shall be of a type approved by Underwriters' Laboratories. Wire shall not be used as a support. Boxes and conduit shall not be supported or fastened to ceiling suspension wires or to ceiling channels.
 - C. The Contractor shall furnish and install all sleeves that may be required for openings through floors, wall etc. Where plans call for conduit to be run exposed, the Contractor shall furnish and install all inserts and clamps for the supporting of conduit. If the Contractor does not properly install all sleeves and inserts required, contractor to provide cutting and patching to the satisfaction of the Engineer.
2. SUBMITTALS: Product Data: Provide data for support channel.
3. QUALITY ASSURANCE: Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

1. MATERIAL

- A. Support Channel: Stainless steel throughout except galvanized steel in conditioned interior areas.
- B. Hardware: Stainless steel throughout
- C. Minimum sized threaded rod for supports shall be 3/8".
- D. Conduit clamps, straps, supports, etc., shall be stainless steel or malleable iron. One-hole straps shall be heavy duty type.

PART 3 - EXECUTION

1. INSTALLATION

- A. All steel conduits shall be securely fastened in place on maximum of 6 foot intervals; all PVC conduits shall be securely fastened in place on maximum of 3 foot intervals vertically and 2 foot intervals horizontally. Hangers, supports or fastenings shall be provided at each elbow and at the end of each straight run terminating at a box or cabinet. The required strength of the supporting equipment and size and type of anchors shall be based on the combined weight of conduit, hanger and cables. Horizontal and vertical conduit runs may be supported by two-hole malleable straps, clamp-backs, or other approved devices with suitable bolts, expansion shields (where needed) or beam-clamps for mounting to building structure or special brackets.
- B. On concrete or masonry construction, use "Tapcon" type fasteners. For brick construction, insert anchors shall be installed with round head machine screws. In wood construction, round head screws shall be used. An electric or hand drill shall be used for drilling holes for all inserts in brick, concrete or similar construction. Steel members shall be drilled and tapped, and round head machine screws shall be used. All screws, bolts, washers, etc., used for supporting conduit or outlets shall be fabricated from stainless steel, or approved substitution.
- C. Fasten hanger rods, conduit clamps, outlet, junction and pull boxes to building structure using preset inserts, beam clamps, expansion anchors, or spring steel clips (interior metal stud walls only). Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchors on concrete surfaces; sheet metal screws in sheet metal studs and wood screws in wood construction.
- D. File and de-bur cut ends of support channel and spray paint with cold galvanized paint to prevent rusting. Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or conduit. Do not drill structural steel members unless approved by the engineer.
- E. Fabricate supports from 316 stainless steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch (25 mm) off wall.
- F. Furnish and install all supports as required to fasten all electrical components required for the project, including free standing supports required for those items remotely mounted from the building structure, catwalks, walkways etc.

END OF SECTION

STS-26 05 36
CABLE TRAY

PART 1 GENERAL

A. SUMMARY

1. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, tests and services to install complete cable tray systems as shown on the drawings.
2. Cable tray systems are defined to include, but are not limited to straight sections of ladder type cable trays, bends, tees, elbows, drop-outs, supports and accessories.

B. DRAWINGS

1. The drawings, which constitute a part of these specifications, indicate the general route of the cable runway systems. Data presented on these drawings is as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification of all dimensions, routing, etc., is required.
2. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.

C. QUALITY ASSURANCE

1. NEMA Compliance: NEMA Standards Publication Number VE1, "Cable Tray Systems".
2. NEC Compliance: NEC Article 392
3. UL Compliance: UL File No. E341872

D. DELIVERY, STORAGE AND HANDLING

1. Deliver cable tray systems and components carefully to avoid breakage, denting and scoring finishes. Do not install damaged equipment.
2. Store cable trays and accessories in original cartons and in clean dry space; protect from weather and construction traffic. Wet materials should be unpacked and dried before storage.

E. SUBMITTALS

1. Section 01 33 00 - Submittal Procedures: Submittal procedures.

2. **Shop Drawings:** Indicate tray type, dimensions, support points, and finishes.
3. **Product Data:** Submit fittings and accessories.
4. **Manufacturer's Installation Instructions:** Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

F. CLOSEOUT SUBMITTALS

1. **Section 01 70 00 - Execution and Closeout Requirements:** Closeout procedures.
2. **Project Record Documents:** Record actual routing of cable tray and locations of supports.

PART 2 PRODUCTS

A. ACCEPTABLE MANUFACTURERS/MODEL

1. Subject to compliance with these specifications, cable tray systems shall be as manufactured by the following:
 - a. HPHusky (Doug Adams PH: 864.234.4833)
 - b. United Structural Products, LLC
560-E Wharton Cir., Atlanta, Ga., 30336, USA. Phone:(404) 696-8585 or USTray.com
Model: Cable Tray System No. A520A
 - c. Engineer approved equivalent

B. CABLE TRAY SECTIONS AND COMPONENTS

1. General

1. Except as otherwise indicated, provide metal cable trays, of types, classes and sizes indicated; with splice plates, bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.

C. TYPE OF TRAY SYSTEM

1. **Material:** Extruded Aluminum Alloy 6063-T6
2. **Finish:** Plain

3. Type: Ladder, Two Rails
4. Load Rating (NEMA): 57 lbs/ft, 20' span. Class 20A, Safety Factor = 1.5
5. Side Rail Height: 5" nominal (or as shown on Plans)
6. Inside Load Depth: 4" nominal (or as shown on Plans)
7. Rung Spacing: 9" nominal (or as shown on Plans)
8. Bottom: 1.13" Wide rungs (tubular with open slot)
9. Construction: Arc-welded on both sides of rungs
10. Min. Cross-Sectional Area Per NEC 392: 1.5 in²
11. Amperage Rating Per NEC 392: 1600 Amperes
12. Flanges: 2" Wide
13. Fastener Finish: 316 Stainless Steel
14. The Cable Tray system shall support a 200 pound concentrated static load applied at the center of any rung in addition to the full safe cable load without failure of the rung or side rails.
15. Splice plates shall be furnished with straight sections and fittings.
16. Cable Tray Supports: Shall be placed so that the support spans do not exceed maximum span indicated on drawings. Supports shall be constructed from 12 gauge steel formed shape channel members 1-5/8 inch by 1-5/8 inch with necessary hardware. Cable trays installed adjacent to walls shall be supported on wall mounted brackets.
17. Center hung supports shall be manufactured of 12 gauge, 1-5/8 inch by 1-5/8 inch stainless steel strut
18. Trapeze hangers and center-hung supports shall be supported by 1/2 inch (minimum) diameter rods.
19. Barrier Strips: Shall be placed as specified on drawings and be fastened into the tray with self-drilling screws. 4/0 AWG and larger cables shall be installed in a single layer and segregated from smaller cables with a cable tray divider.
20. Accessories - special accessories shall be furnished as required to protect, support, and install a cable tray system. Accessories shall consist of but are not limited to; section splice plates, expansion plates, blind-end plates, specially designed ladder dropouts, barriers, etc.

PART 3 EXECUTION

A. INSTALLATION

1. Install cable trays as indicated on the Plans. Installation shall be in accordance with equipment manufacturer's instructions, and with recognized industry practices to ensure that cable tray equipment comply with requirements of NEC and applicable portions of NFPA 70B. Reference NEMA-VE2 for general cable tray installation guidelines.
2. Coordinate cable tray with other electrical work as necessary to properly integrate installation of cable tray work with other work.
3. Provide sufficient space encompassing cable trays to permit access for installing and maintaining cables.
4. Cable tray fitting supports shall be located such that they meet the strength requirements of straight sections. Install fitting supports per NEMA VE-2 guidelines, or in accordance with manufacturer's instructions.
5. Cable tray should be free of burrs and sharp edges.
6. Cable tray shall be grounded according to manufacturer's specifications.
7. The cable tray shall be utilized as an Equipment Ground Conductor as defined by the NEC.

B. TESTING

1. Test cable trays to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance. See NFPA 70B, Chapter 18, for testing and test methods.

END OF SECTION

STS-26 05 37
CABLE BUS

1.0 General

1.1 A complete metal enclosed bus system shall be provided; including all necessary fittings, tap boxes, enclosure connectors, entrance fittings, insulated conductors, electrical connectors, terminating kits, and other accessories as required.

1.2 The bus system shall be suitable for indoor or outdoor use with conductor spacing and ventilation maintained throughout the system.

1.3 All elements of the bus enclosure shall be so designed to eliminate any sharp edges or projections that may injure personnel or conductor insulations.

1.4 The bus system shall be manufactured by MPHusky or approved equal.

(Doug Adams PH: 864.234.4833)

2.0 Construction

2.1 All load carrying members of the bus system shall be fabricated from extrusions of aluminum alloy 6063-T6. The maximum allowable stress used in design shall be 10,000 PSI.

2.2 Bus enclosure fittings shall have a radius of 24 inches, unless the minimum bending radius of the conductor requires a larger fitting radius.

2.3 The top and bottom enclosure sections shall be corrugated to provide mechanical strength and slotted for ventilation. The top cover shall be fastened to the enclosure with self-tapping screws spaced approximately 2 feet on centers and shall be removed for inspection. The bottom section shall be factory installed by welding.

2.4 Splice joints between sections of the bus enclosure shall be the high pressure splined bolted type of a design, which avoids any structural weakness at the connection and does not exceed the manufacturer's specified electrical resistance.

2.5 Conductor support blocks shall be designed in segments to maintain a minimum of one conductor diameter in both the horizontal and vertical planes as required for free air conductor rating. Horizontal runs will have blocks spaced every 36 inches and vertical runs every 18 inches.

2.5 Conductors shall be copper.

3.0 Electrical

3.1 All current carrying conductors shall have insulation rated for 90degree Celsius operating temperature in accordance with the NEC for the ampacity and voltage specified.

3.2 The conductors shall be phased and supported to maintain low impedance and assure the mechanical strength necessary to prevent cable movement or damage under short circuit currents up to 100,000 RMS symmetrical amps.

3.3 Conductors shall be of continuous length and be pulled in after the bus enclosure is in place. Electrical connectors shall be used only at the termination of conductor runs, or, if necessary, at tap points. All electrical connectors shall be provided by MPHusky.

3.4 The bus enclosure shall have a continuous current rating of not less than 1,000 amperes (50 degree Celsius rise) and the resistance across the enclosure section splice shall not exceed 50 microhms.

3.5 The bus enclosure shall be grounded at sufficient intervals for the purpose of preventing a potential above ground on the bus enclosure in the event of fault.

3.6 The conductors shall be arranged in a phasing pattern which exhibits minimal interphase and intra-phase imbalance.

3.7 Conductor temperature rise calculations and current balance calculations shall be available in support of Section 3.6 of this specification.

3.8 All transposing of cables shall occur at termination points. Transposing of cables will not be done in the bus housing.

STS-26 05 51
CONDUIT

PART 1 - GENERAL**1. DESCRIPTION**

- A. Description of System: This Section includes requirements for raceways, fittings, boxes, enclosures, and cabinets for electrical, instrumentation and control system wiring.
- B. Heavy wall PVC (Schedule 80) shall be used for all raceways trapped underground without concrete encasement protection. Conduits in concrete encasement use Schedule 40-PVC. Use rigid aluminum conduit above grade on exterior of buildings and in above grade interior wet locations. Where PVC conduit penetrates a floor from underground or in a slab; a black mastic coated rigid aluminum conduit elbow shall be used for all conduits. EMT and rigid steel are permitted within air conditioned spaces only.
- C. Minimum conduit size for all systems shall be 3/4". All conduits shall be U.L. listed and labeled. Conduit sizes shown on the drawings are to aid the contractor in bidding only; the contractor is responsible for conduit sizes as required by NEC fill tables but do not provide smaller conduits than indicated. The contractor is responsible to coordinate the required conduit sizes and conductor quantities for all control and instrumentation system conduit and wiring with the controls subcontractor prior to installation.
- D. Provide stainless steel or non-metallic conduit supports and 316 stainless steel hardware in all areas except air conditioned spaces.

2. SUBMITTALS

- A. Product Data:
 - 1. Product data shall be submitted on:
 - a. Conduit, raceways, wireways.
 - b. Conduit fittings, boxes, enclosures and cabinets.
 - c. Surface metal raceway

PART 2 - PRODUCTS**1. FLEXIBLE STEEL CONDUIT**

- A. Continuous length, spirally wound steel strip, zinc-coated, each convolution interlocked with following convolution. Federal Specification WW-C-566. Liquid-tight Flexible Steel Conduit: Plastic (PVC) jacketed flexible steel conduit with copper bonding conductor (UL 1660). Flexible conduit fittings: UL 514B.

2. PVC CONDUIT

A. PVC conduit shall be composed of High Impact Virgin homopolymer, PVC (polyvinyl chloride C-200 Compound), and shall conform to industry standards, and be UL 651 listed in accordance with Article 347 of National Electrical Code for underground and exposed use and NEMA standard TC-2. Materials must have tensile strength of 55 PSI, at 70°F, flexural strength of 11,000 PSI, compression strength of 8,600 PSI. Manufacturer shall have five years' extruding PVC experience. Consistent with requirements provide PVC conduit products by one of the following manufacturers:

1. Carlon
2. Cantex
3. J.M. Plastics
4. Queen City Plastics

3. RIGID ALUMINUM CONDUIT

- A. Provide Rigid Aluminum Conduit of 6063 alloy in temper designation T-1. The fittings are of the same alloy. Provide threaded Rigid Aluminum Conduit to Underwriters Laboratories U.L. 6A, "Standard for Electrical Rigid Metal Conduit and manufactured to ANSI C80.5.
- B. Provide threaded aluminum conduit fittings, of 6063 alloy, cast aluminum with integral insulated throat as manufactured by Allied, OZ Gedney, T&B, Crouse-Hinds, Killark or Appleton.
- C. Provide supplementary corrosion protection for aluminum conduit imbedded in concrete or in contact with soil. Where aluminum conduits are in contact with or penetrate concrete, coat conduit with asphaltic or bitumastic type coating.

4. CONDUIT FITTINGS

- A. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
- B. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
- C. Fittings, surface boxes and conduit bodies for Rigid Aluminum Conduit shall be heavy cast aluminum with external raised hubs and mounting lugs; Appleton, Crouse Hinds or approved substitution. Cover plates cast aluminum. Zinc die cast not acceptable.
- D. Conduit locknuts shall be aluminum throughout.

- E. Conduit expansion fittings shall be malleable iron, and shall be hot dipped galvanized inside and outside. These fittings shall have a four-inch expansion chamber to allow approximately two-inch movement parallel to conduit run in either direction from normal. They shall have factory-installed packing and internal tinned copper braid packing to serve as an emergency bonding jumper. Unless the fitting used is listed by Underwriters' Laboratories for use "without external bonding jumpers", an external copper bonding jumper shall be installed with each expansion fitting with one end clamped on each conduit entering fitting.

PART 3 - EXECUTION

1. INSTALLATION

- A. All raceways shall be run in neat and workmanlike manner and shall be properly supported in accordance with latest edition of NEC with approved conduit clamps, hanger rods and structural fasteners except for PVC conduit installed in exterior locations. PVC conduit installed in exterior locations shall be supported at two foot intervals. Supporting conduit and boxes with wire is not approved. All raceways except those from surface-mounted switches, outlet boxes or panels shall be run concealed from view. Exposed raceways shall be supported with clamp fasteners with toggle bolt on hollow walls, and with lead expansion shields on masonry. Rigid steel box connections shall be made with double locknuts and bushings. Where PVC penetrates a floor from underground or in slab, a black mastic coated aluminum conduit elbow shall be used on all conduits. All individual bare copper ground conductors (i.e. service, transformer, or lightning protection grounds) shall be installed in PVC conduit, not metal conduit. This does not apply to bare copper ground conductors run with feeders (as specified in this section). Conduits shall be run parallel to building walls wherever possible, exposed or concealed, and shall be grouped in workmanlike fashion. Crisscrossing of conduits shall be minimized.
- B. All raceways runs, whether terminated in boxes or not, shall be capped during the course of construction and until wires are pulled in, and covers are in place. No conductors shall be pulled into raceways until construction work which might damage the raceways has been completed.
- C. All raceways shall be kept clear of plumbing fixtures to facilitate future repair or replacement of said fixtures without disturbing wiring. Except where it is necessary for control purposes, all raceways shall be kept away from items producing heat.
- D. All raceway runs in masonry shall be installed at the same time as the masonry so that no face cutting is required, except to accommodate boxes.
- E. All raceways shall be run from outlet to outlet exactly as shown on the drawings, unless permission is granted to alter arrangement shown. If permission is granted arrangement shall be marked on field set of drawings as previously specified.
- F. All underground raceways (with exception of raceways installed under floor slab) shall be installed in accordance with Section 300-5 of the NEC except that the

minimum cover for any conduit shall be two feet. Included under this Section shall be the responsibility for verifying finished lines in areas where raceways will be installed underground before the grading is complete.

- G. All raceways shall have an insulated copper system ground conductor throughout the entire length of circuit installed within conduit in strict accordance with NEC. Grounding conductor shall be included in total conduit fill determining conduit sizes, even though not included or shown on drawings. Grounding conductors run with feeders shall be bonded to portions of conduit that are metal by approved ground bushings.
- H. Insulated bushings shall be used on all rigid steel conduits terminating in panels, wire gutters, or cabinets, and shall be impact resistant plastic molded in an irregular shape at the top to provide smooth insulating surface at top and inner edge. Material in these bushings must not melt or support flame.
- I. Spare conduit stubs shall be capped and location and use marked with concrete marker set flush with finish grade or terminated in a manhole. Marker shall be 6" round X 6" deep with appropriate symbol embedded into top to indicate use. Also, tag conduits in panels where originating.
- J. All conduit stubbed above floor shall be separated with plastic interlocking spacers manufactured specifically for this purpose, or shall be strapped to channel supported by conduit driven into ground or tied to steel.
- K. Raceways which do not have conductors furnished under this Division of the specifications shall be left with an approved nylon pullcord in raceway.
- L. Rigid Metallic Conduit, electrical metallic tubing, flexible steel conduit and PVC conduit shall be manufactured within the United States.
- M. All connections to motors or other vibrating equipment (except dry type transformers) or at other locations where required shall be made with not less than 12" nor more than 20" of flexible liquid-tight steel conduit, using special type of connectors with strain relief fittings at both terminations of conduit. Flex connectors shall have insulated throat and shall be T & B 3100 Series or approved substitution. Use angle connectors wherever necessary to relieve angle strain on flex conduit. Connections to dry type transformers shall be made with flexible conduit. Typical length of flex conduit shall be limited to 20" unless specifically approved by the engineer.
- N. PVC joints shall be solvent welded. Threads will not be permitted on PVC conduit and fittings, except for aluminum to PVC couplings. Installation of PVC conduit shall be in accordance with manufacturer's recommendations. PVC conduit shall not be used to support fixture or equipment. Field bends shall be made with approved hotbox.

- O. Expansion fittings shall be installed in the following cases: In each conduit run wherever it crosses an expansion joint in the concrete structure; on one side of joint with its sliding sleeve end flush with joint, and with a length of bonding jumper in expansion equal to at least three times the normal width of joints; in each conduit run which mechanically attached to separate structures to relieve strain caused by shift on one structure in relation to the other; in straight conduit run above ground which is more than fifty feet long and interval between expansion fittings in such a runs shall not be greater than 100 feet for aluminum conduit and 50 feet for PVC conduit.
- P. Underground cable identification: bury a continuous, pre-printed, bright colored metalized plastic (electronically traceable) ribbon cable marker with each underground conduit (or group of conduits), regardless of whether conduits are in duct banks. Locate directly over conduits, 6" to 8" below finished grade. Delete this requirement under building slabs.
- Q. Provide for separation of instrumentation, control and power conductors. Provide a minimum of 24" inch separation for parallel runs of power conduit to instrumentation or control conduit with either conduit being PVC or Aluminum. This separation can be reduced to 8" if metallic grounded separation is provided (steel conduit).

END OF SECTION

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STS-26 08 00
ELECTRICAL RELIABILITY VERIFICATION

PART 1 - GENERAL

1. GENERAL SCOPE

- A. The Contractor shall engage the services of a recognized corporately and financially independent testing firm for the purpose of performing inspections and tests on all new electrical equipment supplied in this contract and on existing modified equipment as herein specified. All tests shall be documented. It is the intent of these specifications that the testing firm work in direct communication with the engineer of record with frequent testing data updates as the work progresses.
- B. The testing firm shall provide all material, equipment, labor and technical supervision to perform such tests and inspections. Testing shall be supervised by qualified professional engineering staff.
- C. It is the purpose of these tests to assure that all tested electrical equipment, is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications. Tests shall be performed with and in cooperation with certification tests performed by switchgear and generator manufacturer. The testing contractor shall be an integral part in assuring the coordinated testing and startup of the power system. The tests and inspections shall determine suitability for energization.
- D. An itemized description of existing equipment to be inspected and tested is as follows:
 - i) Provide testing of existing feeders that are relocated, extended or disturbed in any way.
 - ii) Provide testing of existing breakers that are re-fed, relocated, re-cabled or disturbed in any way.
- E. The above electrical testing shall be used in the development of the final testing report encompassing all new and existing electrical equipment; submitted with the operation and maintenance manuals prior to substantial completion of the project. The testing report shall be submitted on 8.5" X 11" paper bound with all field test data in appendix form plus an electronic copy in Adobe PDF format. All tested breakers shall be fitted with a sticker indicating the testing firm, date and technician performing the test.

2. APPLICABLE CODES, STANDARDS, AND REFERENCES

- A. All inspections and test shall be in accordance with the following codes and standards except as provided otherwise herein:
 - 1. National Electrical Manufacturer's Association – NEMA
 - 2. American Society for Testing and Materials – ASTM

3. Institute of Electrical and Electronic Engineers – IEEE
4. International Electrical Testing Association - NETA Acceptance Testing Specifications - ATS-1991
5. American National Standards Institute - ANSI C2: National Electrical Safety Code.
6. State and local codes and ordinances
7. Insulated Cable Engineers Association – ICEA
8. Occupational Safety and Health Administration – OSHA
9. National Fire Protection Association – NFPA
 - a. ANSI/NFPA 70: National Electrical Code
 - b. ANSI/NFPA 70B: Electrical Equipment Maintenance
 - c. NFPA 70E: Standard for Electrical Safety in the Workplace

B. All inspections and test shall utilize the following references:

1. Project design specifications
2. Project design drawings
3. Manufacturer's instruction manuals applicable to each particular apparatus

3. QUALIFICATIONS OF TESTING FIRM

- A. The testing firm shall be an independent testing organization which can function as an unbiased testing authority, professionally independent of the manufacturers, supplier, and installers of equipment or systems evaluated by the testing firm.
- B. The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.
- C. The testing firm shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or be a Full Member company of the International Electrical Testing Association (NETA).
- D. The lead, on-site, technical person shall be currently certified by the International Electrical Testing Association (NETA) or National Institute for Certification in Engineering Technologies (NICET) in electrical power distribution system testing or be an electrical professional engineer in the state of Florida.

- E. The testing firm shall utilize engineers and technicians who are regularly employed by the firm for testing services. The testing firm shall provide in house electrical studies and reports as specified. The testing firm shall have a Florida registered professional electrical engineer on staff.
- F. The testing firm shall submit proof of the above qualifications when requested. Pre-qualified testing firms for this project are:

- 1. Emerson Electrical Reliability Services, Inc.
- 2. Industrial Electrical Testing, Inc.
- 3. Electric Power Systems

Other firms will be considered by the engineer on submittal of qualifications on or before 20 days prior to bid.

4. DIVISION OF RESPONSIBILITY

- A. The contractor shall perform routine insulation-resistance, continuity, and rotation test for all distribution and utilization equipment prior to and in addition to tests performed by the testing firm specified herein.
- B. The contractor shall supply a suitable and stable source of electrical power to each test site.
- C. The contractor shall notify the testing firm when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling. However the testing firm shall visit the job a minimum of once a week to perform coordination duties required and make reports to the engineer of the installation progress.
- D. The testing firm shall notify the engineer prior to commencement of any testing.
- E. Any system, material, or workmanship which is found defective on the basis of acceptance tests shall be reported to the engineer.
- F. The testing firm shall maintain a written record of all tests and, upon completion of project, shall assemble and certify a final test report.
- G. Safety and Precautions
 - 1. Safety practices shall include, but are not limited to, the following requirements:
 - a. Occupational Safety and Health Act.
 - b. Accident Prevention Manual for Industrial Operations, National Safety council

- c. Applicable state and local safety operating procedures.
 - d. Owner's safety practices.
 - e. National Fire Protection Association - NFPA 70E
 - f. American National Standards for Personnel Protection
2. All test shall be performed with apparatus de-energized. Exceptions must be thoroughly reviewed to identify safety hazards and devise adequate safeguards.
 3. The testing firm shall have a designated safety representative on the project to supervise the testing operations with respect to safety.

5. SUITABILITY OF TEST EQUIPMENT

- A. All test equipment shall be in good mechanical and electrical condition.
- B. Digital multimeters used shall be RMS sensing when the variable being measured contains harmonics or dc offset or any deviation from a pure sine wave. Accuracy of metering in test equipment shall be appropriate for the test being performed but not in excess of 2 percent of the scale used.
- C. Equipment calibration and certification is required to be up to date per equipment manufacturers recommendations and in accordance with NETA standards.

PART 2 - INSPECTION AND TEST PROCEDURES

1. Cables - Low Voltage – 600V maximum (all cables except 20 and 30amp lighting and receptacle circuits).

A. Visual And Mechanical Inspection

1. Inspect cables for physical damage and proper connection in accordance with drawings.
2. Test cable mechanical connections to manufacturer's recommended values or NETA Standards using a calibrated torque wrench.
3. Check cable color coding with applicable engineer's specifications and National Electrical Code standards.

B. Electrical Tests

1. Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 1000 volts dc for 3 minutes.

2. Perform continuity test to insure proper cable connection.
 3. Test Values; Evaluate results by comparison with cables of same length and type. Minimum acceptable value shall be no less than 50 megohms for new feeders; 5megohms for existing reused, renovated, rerouted or extended feeders.
2. CIRCUIT BREAKERS (all breakers except 20 and 30amp breakers; test all GFCI breakers)
- A. Circuit Breakers - Low Voltage Insulated Case/Molded Case
1. Visual and Mechanical Inspection
 - a. Check circuit breaker for proper mounting and compare nameplate data to drawings and specifications.
 - b. Operate circuit breaker to ensure smooth operation.
 - c. Inspect case for cracks or other defects.
 - d. Check tightness of connections using calibrated torque wrench. Refer to manufacturer's instructions or NETA standards for proper torque levels.
 2. Electrical Tests
 - a. Perform a contact-resistance test.
 - b. Perform an insulation-resistance test at 1000 volts dc from pole to pole and from each pole to ground with breaker closed and across open contacts of each phase.
 - c. Determine long-time minimum pickup current by primary current injection where practical.
 - d. Perform long-time delay time-current characteristic tests by passing three hundred percent (300%) rated current through each pole separately. Record trip time.
 - e. Determine short-time pickup and delay by primary current injection, if applicable.
 - f. Determine ground-fault pickup and time delay by primary current injection, if applicable.
 - g. Determine instantaneous pickup current by primary injection using run-up or pulse method.
 3. Test Values

- a. Compare contact resistance or millivolt drop values to adjacent poles and similar breakers. Investigate deviations of more than fifty percent (50%). Investigate any value exceeding manufacturer's recommendations.
- b. Insulation resistance shall not be less than 100 megohms.
- c. Trip characteristic of breakers shall fall within manufacturer's published time-current characteristic tolerance band, including adjustment factors.
- d. All trip times shall fall within NETA Standards. Circuit breakers exceeding specified trip time at three hundred percent (300%) of pickup shall be tagged defective.
- e. Instantaneous pickup values shall be within NETA standards.

3. METERING AND INSTRUMENTATION

A. Visual And Mechanical Inspection

1. Examine all devices for broken parts, shipping damage and tightness of connections.
2. Verify that meter types, scales and connections are in accordance with drawings and specifications.

B. Electrical Tests

1. Determine accuracy of meters at 25/50/75/100% of full scale.
2. Calibrate watt-hour meters to one-half percent (0.5%).
3. Verify all instrument multipliers.
4. Verify calibration of all instrumentation is accurate to the operator interface terminals

4. GROUNDING SYSTEMS: (provide for new and upgraded grounding systems)

A. Visual And Mechanical Inspection

B. Inspect ground systems for compliance with drawings and specifications.

C. Perform ground-impedance measurements utilizing the fall-of-potential method per ANSI/IEEE standard 81 "IEEE guide for measuring earth resistivity, ground impedance, and earth surface potentials of a ground system." instrumentation utilized shall be as approved by NETA standards and shall be specifically designed for ground impedance testing.

D. Equipment grounds: utilize two-point method of IEEE std. 81. Measure between equipment

ground being tested and known low-impedance grounding electrode of system:

- E. Lightning protection ground system test values within the ground system should be 5 ohms or less tested with a clamp on ground test instrument. Down conductor tests at grade level should be 2 ohms or less. Investigate high resistance connections and correct readings above these limits.
- F. The main ground electrode system impedance-to-ground should be no greater than one (1) ohms. Equipment grounds, depending on size and length of grounding conductor, should be only fractionally higher than system ground.

- 1. Gnd. fault systems

- A. Visual and Mechanical Inspection

- 1. Inspect for physical damage and compliance with drawings and specifications.
- 2. Inspect neutral main bonding connection to assure:
 - a. Zero-sequence sensing system is grounded.
 - b. Ground-strap sensing systems are grounded through sensing device.
 - c. Ground connection is made ahead of neutral disconnect link on zero-sequence sensing systems.
 - d. Grounded conductor (neutral) is solidly grounded.
- 3. Inspect control power transformer to ensure adequate capacity for system.
- 4. Manually operate monitor panels (if present) for: Trip test; No trip test; Non-automatic reset.
- 5. Record proper operation and test sequence.
- 6. Set pick-up and time-delay settings in accordance with the settings provided by the manufacturer.

- B. Electrical Tests

- 1. Measure system neutral insulation resistance to ensure no shunt ground paths exist. Remove neutral-ground disconnect link. Measure neutral insulation resistance and replace link.
- 2. Determine the relay pickup current by current injection at the sensor and operate the circuit interrupting device.

3. Test the relay timing by injecting three hundred percent (300%) of pickup current, or as specified by manufacturer.
4. Test the system operation at fifty-seven percent (57%) rated control voltage, if applicable.
5. Test zone interlock systems by simultaneous sensor current injection and monitoring zone blocking function.
6. On multiple source, tie breaker, etc., systems, devise a simulation scheme that fully proves correct operation.

C. TEST PARAMETERS

1. System neutral insulation shall be a minimum of one hundred (100) ohms, preferable one (1) megohm or greater.
2. Relay timing shall be in accordance with manufacturer's published time-current characteristic curves but in no case longer than one (1) second for fault currents equal to or greater than 3,000 amperes.
3. Relay pickup value shall be within 10% of setting and in no case greater than 1200A.

2. MOTORS (5hp and greater)

A. VISUAL AND MECHANICAL INSPECTION

1. Inspect for physical damage.
2. Inspect for proper anchorage, mounting, grounding, connection and lubrication.
3. When applicable, perform special tests as air gap spacing and pedestal alignment.

B. ELECTRICAL TESTS - INDUCTION MOTORS

1. Perform insulation resistance tests in accordance with ANSI/IEEE Std. 43.
2. Motors 200Hp and Less - Test duration shall be for one minute with resistances tabulated at 30 and 60 seconds and calculate the dielectric absorption ratio. Motors larger than 200 horsepower perform tests for ten minutes and calculate polarization index. Minimum acceptable polarization index for Class B or F insulated motors shall be 2.0.
3. Perform insulation resistance test on pedestal per manufacturer instructions.
4. Perform insulation resistance test on surge protection device in accordance with this

specification.

5. Check that the motor space heater circuit is in proper operating condition.
6. Check all protective devices in accordance with other sections of these specifications.
7. Perform a rotation test to ensure proper shaft direction if the motor has been disconnected.
8. Measure running current and evaluate relative to load conditions and nameplate full load amperes. Verify proper overload relays.

3. MOTOR CONTROL (all motors)

A. VISUAL AND MECHANICAL INSPECTION

1. Inspect for physical damage, proper anchorage, and grounding.
2. Inspect equipment for compliance with drawings and specifications.
Motor-running protection

- a. Compare overload heater rating with motor full-load current rating to verify proper sizing.
- b. If motor-running protection is provided by fuses, verify proper rating considering motor characteristics and power-factor correction capacitors if applicable. Check tightness of bolted connections using calibrated torque wrench.

B. ELECTRICAL TESTS

1. Insulation tests:
 - a. Measure insulation resistance of each bus section phase-to-phase and phase-to-ground for three (3) minutes. Test voltage shall be in accordance with NETA Standards.
 - b. Measure insulation resistance of each starter section phase-to-phase and phase-to-ground with the starter contacts closed and the protective device open. Test voltage shall be in accordance with NETA Standards.
 - c. Measure insulation resistance of each control circuit with respect to ground.
2. Test motor overload units by injecting current through overload unit and monitoring trip time at three hundred percent (300%) of motor full-load current.

3. Three phase power unbalance: Run motor at full load steady state conditions and take current readings on all three leads. Roll the motor leads maintaining the proper rotation and take motor current readings on all three possible hook-ups. Choose the least unbalance hookup for each motor. The maximum acceptable unbalance is 10 percent at full load. If the unbalance cannot be corrected by rolling leads, the source of the unbalance must be located and corrected. If on the three possible hook ups, the leg of "greatest unbalance" (furthest from the average) stays on the same power lead then most of the unbalance is being caused by the power source. However, if the leg of greatest unbalance moves on each of the hookups with a particular motor lead, the primary source of unbalance is on the motor side of the starter. Check for damaged cable, leaking splices, poor connections, or faulty motor winding.
8. TRANSFORMERS - dry type transformers - small dry type, air-cooled (600 volt and below)
 - A. Inspect for physical damage, broken insulation, tightness of connections, defective wiring, and general condition.
 - B. Thoroughly clean unit prior to making any tests.
 - C. Perform insulation-resistance test. Perform test verification for impedance.
 - D. Energize primary winding with system voltage. Measure secondary voltage with the secondary load disconnected. Record results.
9. THERMOGRAPHIC SURVEY (provide for all new or modified switchgear, bus ducts, transformers, points of power connection equal to or greater than 30amps, mcc's and distribution centers)
 - A. Visual and Mechanical
 1. Remove all necessary covers prior to scanning.
 2. Inspect for physical, electrical, and mechanical condition.
 - B. Equipment to be Scanned
 1. All new and existing equipment with ratings of 30amps or more.
 - C. Provide report indicating the following:
 1. Problem area (location of "hot spot")
 2. Temperature rise between "hot spot" and normal or reference area.
 3. Cause of heat rise

4. Phase unbalance, if present

5. Areas scanned

D. Test Parameters

1. Scanning distribution system with ability to detect 1°C between subject area and reference at 30°C.
2. Equipment shall detect emitted radiation and convert detected radiation to visual signal.
3. Infrared surveys should be performed during periods of maximum possible loading but not less than twenty percent (20%) of rated load of the electrical equipment being inspected.
4. Provide photographs and/or the thermogram of the deficient area as seen on the imaging system.

10. LOW VOLTAGE SURGE SUPPRESSORS

A. Visual and mechanical inspection

1. Verify suppressors are installed with minimum length leads to the protected equipment. Verify connections to bus.
2. Verify ground connections to ground bus.

B. Electrical Tests

1. Test clamping voltage and verify meets specified ratings; test in accordance with ANSI C62.33 section 4.4 and 4.7

11. LOW VOLTAGE AIR SWITCHES (disconnect switches, manual & automatic transfer switches)

A. Visual and Mechanical Inspection

1. Compare equipment nameplate data with drawings and specs.
2. Inspection for mechanical and physical damage. Cleaning of interior, insulators, arc chutes.
3. Testing of mechanical operator. Cleaning and lubrication of contacts and mechanism, as applicable.

4. Verification of contact alignment and wipe. Verify phase barrier insulation.
5. Inspect anchorage, alignment, grounding, and required clearances.
6. Documentation of fuse and types are in accordance with drawings, short circuit studies and coordination study.
7. Verification of tightness of accessible bolted electrical connections by calibrated torque-wrench method.
8. Verification of presence of expulsion-limiting devices on all holders having expulsion-type elements.
9. Verification of interlocking systems for proper operation and sequencing.
10. Verify proper lubrication on current carrying and moving sliding parts.

B. Electrical Tests

1. Contact resistance testing across each switch blade and fuse holder.
2. Measurement of fuse resistance.
3. Insulation resistance testing on each pole, phase-to-phase and phase-to-ground with switch closed and across each open pole for one minute.
4. AC or DC overpotential testing phase-to-phase and phase-to-ground.
5. Verification of proper space heater operation.

END OF SECTION

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LOW VOLTAGE SWITCHGEAR

Part 1 GENERAL

A. REFERENCES

1. The LV metal-enclosed SWITCHGEAR assembly and all components shall be designed, manufactured and tested in accordance with the following latest applicable standards:
 - a. ANSI C37.13- Low Voltage AC Power Circuit Breakers
 - b. ANSI C37.20 – Metal Enclosed Low Voltage SWITCHGEAR
 - c. UL 1558 – Low Voltage SWITCHGEAR Assemblies
 - d. UL 1066 – Low Voltage Power Circuit Breakers

B. COUNTRY of ORIGIN

1. The Switchgear shall be assembled in the U.S. or Canada.

C. SUBMITTALS – for Review/Approval

1. THE FOLLOWING INFORMATION SHALL BE SUBMITTED TO THE ENGINEER:
 - a. Master drawing index
 - b. Front view and plan view of the assembly
 - c. Three-line diagram
 - d. Schematic diagram
 - e. Nameplate schedule
 - f. Component list
 - g. Conduit space locations within the assembly
 - h. Assembly ratings including:
 1. Short-circuit rating
 2. Voltage
 3. Continuous current rating

- i. Major component ratings including:
 - 1. Voltage
 - 2. Continuous current rating
 - 3. Interrupting ratings
 - j. Cable terminal sizes
 - k. Product data sheets
 - 2. Where applicable, the following additional information shall be submitted to the Engineer:
 - a. Composite front view and plan view of close-coupled assemblies
 - b. Electrical hard-wired interlock schematic drawing
- D. Submittals – for Construction
- 1. The following information shall be submitted for record purposes:
 - a. Shop drawings
 - b. Final as-built drawings and information for items listed above, and shall incorporate all changes made during the manufacturing process
 - c. Wiring diagrams
 - d. Certified production test reports
 - e. Installation information
 - 2. Submit sufficient information to determine compliance with the Contract Documents. Identify submittal data with the specific equipment tags and/or service descriptions to which they pertain. Submittal data shall be clearly marked to identify the specific model numbers, options, and features of equipment and Work proposed.
 - 3. All deviations from the Contract Documents shall be indicated within a submittal. Each deviation shall reference the corresponding drawing or specification number, show the contract document requirement text and/or illustration, and shall be accompanied by a detailed written justification for the deviation.
 - 4. Product data specific to each type and rating of SWITCHGEAR proposed to include the following
 - a. Manufacturer, supplier, and proposal specific contact information.

- b. Manufacturer's catalog data indicating equipment specifications and construction features including all furnished options, and accessories.
 - c. Switchboard assembly rated operating characteristics, and electrical characteristics.
 - d. Enclosure type, NEMA rating, material and finishes.
 - e. Certification of UL conformity
 - f. As-Built drawings in PDF and CAD DWG format
 - g. Shop drawings for each product and accessory required. Include information not fully detailed in manufacturer's standard product data. Shop drawings shall include, but not be limited to the following:
 - h. Equipment assembly indicating dimensions, shipping section dimensions, weights, foundation requirements, required clearances, location and size of each field connection, and mounting and installation instructions.
 - i. Include elementary and interconnection diagrams for power, signal, control, and communications wiring. Diagrams shall provide the minimum detail as shown for drawings in the appendix of NFPA 79. All field terminals shall be identified and updated later within the O&M data to include actual field connection information. Drawings shall not be typical, but be provided for each SWITCHGEAR and Breaker furnished.
 - j. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - k. Detailed description of equipment anchorage devices on which the certification is based, and their installation requirements.]
 - l. Required working clearances and required area above and around SWITCHGEAR.
 - m. SWITCHGEAR layout and relationships between electrical components and adjacent structural and mechanical elements.
 - n. Support locations, type of support, and weight on each support.
- E. Operation & Maintenance (O&M) Manuals: Submit installation, operation and maintenance data to be included within operation and maintenance manuals. O&M data shall include but not be limited to the following:
- 1. O&M manuals shall be submitted 2 weeks prior to arrival of equipment on site.
 - 2. Manufacturer, supplier, support, and repair center specific contact information.

3. Manufacturer's standard operation and maintenance data assembled for each size and type of equipment furnished.
4. All construction, installation, schematic, and wiring diagrams updated to an as-installed and commissioned state. [All submittal information updated to an as-installed and commissioned state.]
5. All configured settings/parameters for adjustable components updated to an as-installed and commissioned state if different from the factory default. Electronic copies of configuration files shall be provided, on media acceptable to the Owner (e.g. CD, USB stick, etc.), where these configurations can be saved as an electronic file for future upload into replaced or repaired components.
6. List of furnished and recommended spare parts.
7. Statement of standard Warranty.

F. QUALITY ASSURANCE

1. The ENGINEER shall conduct a Factory Acceptance Test prior to shipment. The written approval of the ENGINEER shall be required prior to shipment.
2. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of SWITCHGEAR of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of fifteen (15) years.
3. Commissioning and Training: SWITCHGEAR shall be inspected and commissioned by a factory trained representative of the SWITCHGEAR manufacturer. SWITCHGEAR operation and maintenance training shall be conducted by a factory trained representative of the SWITCHGEAR manufacturer trained in the installation, operation, and maintenance of the SWITCHGEAR and Breakers.

G. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

H. Without limiting the generality of other requirements of this Section, all work specified herein shall conform to or exceed the applicable requirements of the following standards, provided that wherever the provisions of said publications are in conflict with the requirements specified herein, the more stringent requirements shall apply:

1. ANSI/NFPA 70: National Electrical Code

I. Single Source Responsibility: Obtain SWITCHGEAR, Breakers and required accessories from a single source with resources to produce products of consistent quality in appearance and physical properties without delaying the work. Any materials which are not produced by the manufacturer shall be acceptable to and approved by the manufacturer.

J. SPECIAL TOOLS AND SPARE PARTS

1. Provide the minimum spare parts recommended by the manufacturer. At a minimum the following shall be provided:
2. Any manufacturer specific special tool, not normally found in an electrician's toolbox, required to remove and install recommended or furnished spare parts shall be furnished.
3. Electronic configuration files in a USB stick media format updated to an as-installed and commissioned state.

K. DELIVERY, STORAGE, AND HANDLING

1. Prior to delivery to the Project site, ensure that suitable storage space is available to store materials in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres. Materials shall be protected during delivery and storage and shall not exceed the manufacturer stated storage requirements.
2. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.
3. Inspect and report any concealed damage or violation of delivery storage and handling requirements to the Owner.
4. The lineup shall be divided into shipping splits as indicated on the Plans, and shall be capable of being lifted overhead or by a forklift.
5. Each shipping split shall be provided with removable lifting angles for crane installations purposes.
6. Removable base channels shall be provided with prying slots for ease of final positioning at the job site

Part 2 PRODUCTS

A. MANUFACTURERS

1. Acceptable manufacturer is Schneider Electric "Pow-R-Zone 4" Low Voltage Metal Enclosed SWITCHGEAR utilizing Masterpact MTZ series power circuit breakers.
2. SWITCHGEAR specified herein shall be the product of a single manufacturer. Products and manufacturers specified are to establish a standard of quality for design, function, materials, and appearance. Products shall be modified as necessary by the manufacturer for compliance with requirements.

3. The SWITCHGEAR manufacturer shall provide for repair and service of the equipment with worldwide support. The manufacture shall provide for expedited 48-hour delivery of repair parts.

B. RATINGS

1. System ampacity, voltage, and frequency shall be as indicated by the Plans.
2. All horizontal bus shall be rated to the full ampacity of the system.
3. The vertical bus shall be rated to the total ampacity of the feeder breakers and prepared spaces within the given vertical structure per ANSI C37.20.1
4. All circuit interruption shall be accomplished by the circuit breaker and without the aid of limiter fuses. The Short time rating shall also be a function on the desired selectivity of the electrical system. Short time ratings shall be per the Plans.
5. Short Circuit RMS symmetrical amperes and corresponding Short Time ratings shall be per the Plans.
6. The equipment bus system shall be braced according to ANSI/IEEE C37.20.1 with a short-circuit withstand rating per the Plans.
7. Storage Temperature: 0°C to 40°C,
8. Operating Temperature: 0°C to 40°C
9. Relative Humidity: ≤95% relative humidity without condensation for indoor enclosures.
10. Any items not specifically mentioned but which are obviously necessary for proper operation are implied in this specification.
11. Equipment shall be suitable for use as service entrance equipment and labeled according to UL requirements.

C. STRUCTURE

1. Paint shall be manufacturer's standard color.
2. Each shipping split shall weigh less than 4,000 pounds. Circuit breakers shall be shipped separately to reduce the weight of shipping splits.
3. Each vertical section shall have a hinged rear door with padlockable latches.
4. Bus Bars shall be tin-plated copper along their entire length.
5. Bus Bars shall be braced to withstand the instantaneous interrupting rating as indicated on the Plans (RMS symmetrical).

6. Each steel section shall contain one or more individual circuit breakers, or instrumentation compartments, and a rear compartment for the buses and outgoing cable connections.
7. Rigid removable steel base channel shall be provided at the front and rear of each section.

D. INTERNAL WIRING

1. All externally provided control circuit power shall be protected by miniature circuit breakers located in the customer wiring auxiliary cabinet.
2. DC common and AC neutral shall be tied to ground and wired in the Switchgear without overcurrent protection.
3. 24VDC externally provided control power shall be protected by a 20A/1P miniature circuit breaker.
4. 120VAC externally provided control power shall be protected with a 10A/1P miniature circuit breaker.
5. All customer control and networking terminations shall be routed to a single auxiliary cabinet as shown on the Plans.

E. DIMENSIONS

1. All section widths shall be 22".
2. All section depths shall be 60"
3. Adequate cable-bending space shall be provided for main and feeder breakers for conductor sizes as indicated on the Plans.

F. CIRCUIT BREAKER COMPARTMENT

1. Component compartments shall be rear-accessible.
2. All customer secondary control and communications connections shall be made from the front of the SWITCHGEAR lineup.
3. A dedicated wiring area accessible from the front shall allow easy access to all control or communications terminations.
4. Control Connections shall be cage clamp terminals. All control wire shall be 16 AWG, type SIS.
5. Customer control wiring shall be provided at the top and bottom of each structure conduit area, capable of landing up to a quantity of (3) 1 ½" conduits and accessible from the front.

6. All interconnections between structures at shipping splits shall use locking-pull apart terminal blocks.
7. All secondary and communication wiring shall be securely fastened to the SWITCHGEAR without the use of adhesive backed wire anchors.
8. Where additional space is required for instrumentation, CPTs, metering, etc., a barriered instrumentation compartment shall be used. The instrumentation compartment shall not inhibit the routing of control or communication wires.
9. Individual component mounting surfaces shall be painted white as standard.

G. POWER CIRCUIT BREAKERS

1. Circuit breakers shall be draw-out type.
2. Shunt Trip and Shunt Close operating control voltage shall be 24VDC.
3. Spring Charging motors operating voltage shall be 120VAC.
4. All breakers shall be listed for application in their intended enclosures for 100% of their continuous ampere rating.
5. Breakers shall be manually operated (MO) unless electrically operated (EO) is indicated on the drawings, and have shunt trip, shunt close, and auxiliary contacts as indicated on the Plans.
6. All circuit breaker operating mechanisms are to be two-step, fully-stored energy devices for quick-make, quick-break operation with a maximum of a five-cycle closing time. Open-close-open (O-C-O) cycle shall be possible without recharging. Motor operator shall automatically charge when circuit breaker is closed. Actuation of the operating handle or an operation cycle of the circuit breaker motor is to charge the closing springs (step one) and operation of a local "close" button is to close the circuit breaker contact (step two). Closing the circuit breaker contacts shall automatically charge the opening springs.
7. Circuit breakers shall be suitable for the required instantaneous rating without the use of current limiting fuses.
8. All circuit breakers shall have provisions for field interchangeable electrical accessories including shunt trip, spring release, electrical operator, auxiliary contacts, and Trip Unit.
9. Each Circuit breaker shall have built in contact temperature and contact wear sensors.
10. Current-carrying components shall be completely isolated from the accessory mounting area and double insulated from the operator with accessory cover in place.
11. Circuit breakers shall have interrupting, close and latch, and 30-cycle withstand ratings that meet the application requirements.

12. Each circuit breaker shall be mounted in its own Barrired compartment.
13. Operational buttons on the circuit breaker as well as the trip unit and the display shall be accessible without opening the breaker compartment door.
14. Prepared spaces shall be completely assembled with provisions for Circuit Breakers.
15. Circuit Breaker and prepared space compartments shall be keyed such that a breaker cannot be incorrectly installed with respect to Interrupting Rating, Frame Size, or secondary connections
16. Padlocking provisions shall be furnished on the cradle when the circuit breaker is in the connected, test or disconnected position.
17. Key locking provisions shall be furnished allowing locking the cradle in the connected, test or disconnected position.
18. Located on the face of the circuit breaker shall be an open and close button for operating the circuit breaker. There shall be an indication on the cradle showing the current position and status of the breakers and status of the closing springs.
19. The circuit breaker racking system must have positive stops at the connected, test, disconnected and withdrawn positions. Mounting hardware shall be installed on the cradle for remote racking. An existing Remote Racking device shall be provided by the Owner.
20. Circuit breaker must be equipped with an interlock to discharge the stored energy spring before the circuit breaker can be withdrawn from its cell.
21. Circuit breaker must provide a positive ground contact check between the circuit breaker and cell when the accessory cover is removed while the circuit breaker is in the connected, test or disconnected positions.
22. 3200 A circuit breaker frame sizes and those of lower ratings must be certified to perform a minimum of 10,000 operations without maintenance.
23. Circuit breakers shall be equipped with accessories as shown on the Plans. All accessories shall be UL Listed as field-installable and be interchangeable between frame sizes.
24. Circuit breakers shall provide isolation from primary power when accessory cover is removed.
25. Connection between protective relays and other devices shall be hard-wired.
26. For each Main, Tie and Generator circuit breaker, provide a Maintenance OFF/ON selector switch on the compartment door to switch the circuit breaker instantaneous tripping characteristics to an alternate setting temporarily during maintenance activity.

H. CIRCUIT BREAKER TRIP UNITS (Harmonic Type)

1. All trip units shall be removable to allow for field upgrades.
2. Trip Units shall incorporate true RMS sensing and have LED long-time pickup indications.
3. Solid state electronic trip unit functions shall consist of adjustable settings for:
 - A. Short-time pickup and delay
 - B. Long-time pickup and delay
 - C. Instantaneous
 - D. Optional ground-fault alarm without trip pickup and delay per the Plans
 - E. All trip units shall have the capability for the adjustments to be set and read locally by rotating a switch.
 - F. Trip unit shall provide local trip indication
 - G. Trip units shall be available to provide real time metering. Metering functions include current, voltage, power and frequency.
 - H. Trip Units shall have the following functions available:
 - I. True RMS Sensing
 - J. Display Panel
 - K. Selectable L-S-I settings
 - L. Selectable Ground Fault Alarm settings (as indicated on the Plans)
 - M. Adjustable rating plugs
 - N. Digital Ammeter
 - O. Protective Relay Functions
 - P. Neutral Protection
 - Q. Contact Wear Indication
 - R. Current, Voltage, and Power Measurement
 - S. Serial Modbus communication with a master Modbus ethernet gateway device
 - T. Locally Programmable

U. Power monitoring

V. Remote Status Dry Contacts. Provide (2) OPENED/CLOSED status and (2) TRIPPED/OK Form-C status each on the following circuit breakers

1. MAIN C/B
2. TIE C/B
3. GEN C/B

I. Manufacturers

1. Square D Masterpact MTZ Low Voltage Power Circuit Breaker listed to UL 1066 with a Micrologic electronic trip unit.

J. Metering and Instrumentation

1. Manufacturer:

A. Schneider Power Logic PM5563 power meter, consisting of:

1. Schneider P/N METSEPM5663 din-mtd base
2. Schneider P/N METSEPM5663RD remote display meter

2. All customer connections shall be wired to terminal blocks in the specified auxiliary compartment per the Plans.
3. The power meter remote display shall be mounted in the location shown on the Plans. The power meter base shall be located in the auxiliary cabinet, din-rail mounted. The power meters shall communicate via Ethernet/IP, and shall have dual ports to daisy chain the ethernet network.
4. Four digital inputs and two configurable digital outputs.
5. Program one digital output to be closed (TRUE) when voltage is greater than 80% for one second.
6. Power supply shall be 120VAC, externally supplied.
7. Measurement accuracy per IEC 61557-12
8. Direct reading of the operating voltage

K. ACCESSORIES

A. Overhead breaker lifter with rails

- B. CT test blocks
- C. All breakers to be fitted with mounting brackets for customer-provided remote racking device
- D. Optional means to reduce arc flash events during diagnostics of energized breakers > 800A rating.
- E. Neutral bus shall be 100% rated, solidly grounded.
- F. Neutral current transformers shall be provided.
- G. Modified differential ground fault system shall be provided.
- H. CT's shall be appropriately sized for use on the main per the Plans
- I. I/O and Ethernet communications card shall be provided as necessary, per the Plans
- J. MAIN C/B, TIE C/B, GEN breakers shall be electrically interlocked per the plans.
- K. Communications

Switchgear lineup shall include an ethernet/serial Modbus gateway for connection to user's Ethernet/IP network for power monitoring, equipment status and alarm information.

- 1. The network communication system shall be pre-configured and tested at the factory with drawings of the network and device addresses per the Plans. Device addressing shall be configurable by the end user.
- 2. The network inter-wiring shall consist of shielded cables with pluggable connectors to facilitate ease of connection across shipping splits.
- 3. The Switchgear communication system shall consist of the following:
 - A. Ethernet/IP connection via daisy-chain architecture to Power Meters and the Modbus ethernet gateway.
 - B. Power Meters shall be connected to the network via Ethernet/IP.
- L. Surge Protection Devices (SPD's)
 - 1. The SPD operator interface is to be mounted in the location shown on the Plans.
 - 2. Peak surge capacity per phase shall be as indicated by the Plans.
 - 3. Type shall be modular parallel transient voltage type surge suppressors
 - 4. An operator interface shall be provided

5. The Service voltage rating shall be 480/277, 3-phase, 4-wire + ground
6. A circuit breaker shall be provided to electrically isolate the SPD's
7. Features
 - A. EMI/RFI noise attenuation
 - B. Visual fault status per phase
 - C. Individually fused suppression modes
 - D. On-line diagnostic display
 - E. Audible Alarm with Acknowledge switch
 - F. Form C type dry contacts
 - G. Optional surge counter

2. Nameplates

1. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the drawings. Nameplates shall be laminated plastic, black characters on white background, and secured with screws. Characters shall be 3/16-inch high, minimum.
 - a. Furnish master nameplate giving SWITCHGEAR designation, voltage ampere rating, short-circuit rating, and manufacturer's name.
 - b. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's drawings.

PART 3 EXECUTION

1. FACTORY ACCEPTANCE TESTING (FAT)
 - A. Provisions shall be made for the ENGINEER to conduct an FAT of the switchgear and MCC's. Shipment shall not be allowed until written approval by the ENGINEER has been provided.
 - B. The Contractor shall provide an approval of the proposed FAT plan with the Bid.
 - C. All components internal to the switchgear including Power Monitors, Surge Protection Devices, Circuit Breaker configurations, etc. shall be fully configured and tested at the factory by the supplier and confirmed by the ENGINEER at the FAT prior to shipment.

2. **Manufacturer's responsibilities**

- A. The manufacturer will provide shop drawings for approval per the Plans. The manufacturer will be must make the equipment available and have a trained technician to assist and provide power, miscellaneous hardware, wiring, and cables to needed to perform the factory acceptance testing.
- B. The manufacturer shall notify the owner two weeks prior to the date manufacturer internal tests are to be performed and shall notify the Engineer when the subsequent Factory Acceptance Test can be performed.
- C. The manufacturer will not be authorized to ship the equipment until the conclusion of the FAT and approval by the Engineer.

3. **ENGINEER'S responsibilities**

- A. The Engineer will be responsible for preparation of testing procedures and implementation of tests.
- B. The Engineer will provide all equipment external to the SWITCHGEAR needed to complete the testing, e.g. PLC with program
- C. The Engineer will approve the equipment at the factory. Approval shall be required prior to shipment of the SWITCHGEAR.

4. **INSPECTION**

- A. Examine area to receive SWITCHGEAR to provide adequate clearance for SWITCHGEAR installation.
- B. Start work only after unsatisfactory conditions are corrected.

5. **INSTALLATION**

- A. Install SWITCHGEAR in accordance with manufacturer's written guidelines, the NEC, and local codes.
- B. Read Instruction Bulletin on energizing SWITCHGEAR, pre-energizing checkout.

6. **FIELD QUALITY CONTROL**

- A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.
- B. Megohm the insulation resistance of each bus structure phase-to-phase and phase-to-ground for one minute each. Minimum acceptable value for insulation resistance is 1 megohms. Refer to manufacturer's literature for specific testing procedures.

- C. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer's recommended torque values.
- D. Test electrical interlock systems to check for proper functionality prior to energizing.
- E. Test ground fault systems by operating push-to-test button.
- F. Adjust all operating mechanisms for free mechanical movement per manufacturer's specifications.
- G. Tighten bolted bus connections in accordance with manufacturer's instructions.
- H. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

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LOW VOLTAGE MOTOR CONTROL CENTERS

PART 1 GENERAL

1. SUMMARY

- A. This section includes requirements for an Intelligent Motor Control Center (MCC) and required control devices as shown on the Plans and specified to be part of the MCC equipment. The MCC shall be 480 Volt, 3-phase, 3-wire, 60 hertz.

2. REFERENCES

- A. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

1. NEMA
2. ANSI
3. UL 845 Motor Control Centers

3. SUBMITTALS

A. General

1. Submit the following for Review and Approval

B. Product Data

1. Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications.

C. Shop Drawings

1. Submit shop drawings for each product and accessory required. Include information not fully detailed in manufacturer's standard product data.

- a. Master drawing index
- b. Front view elevation
- c. Floor plan
- d. Top view
- e. Unit wiring diagrams
- f. Nameplate schedule

- g. Starter and component schedule
- h. Conduit entry/exit locations
- i. Assembly ratings including
- j. Short-circuit rating
- k. Voltage
- l. Continuous current
- m. Major component ratings including:
- n. Voltage
- o. Continuous current
- p. Interrupting ratings
- q. Cable terminal sizes
- r. Product data sheets

D. Where applicable the following information shall be submitted to the Engineer:

- 1. Busway connection
- 2. Connection details between close-coupled assemblies
- 3. Electrical interlock scheme drawing and sequence of operations

E. Submittals for construction

- 1. The following information shall be submitted for record purposes
 - a. Final as-built drawings and information for items listed in Paragraph 1.04, and shall incorporate all changes made during the manufacturing process
 - b. Unit wiring diagrams
 - c. Certified production test reports
 - d. Installation information
 - e. Equipment anchorage details as specified

F. Operation and Maintenance Manual

Submit with the delivery of the MCC (1) hard copy operation and maintenance manual and manufacturer's drawings and (1) digital copy with the equipment. Send a PDF version to the Engineer.

4. QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer shall be engaged in the manufacture of low voltage industrial MCCs of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of five years.

B. Regulatory Requirements

1. Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

D. Single Source Responsibility

1. Obtain MCCs and required accessories from a single source or with materials acceptable to and approved by the manufacturer.

5. DELIVERY, STORAGE, AND HANDLING

- A. The MCC shall be separated into shipping with a weight of less than 4,000 pounds each, not exceeding 3 vertical sections. Shipping blocks shall be shipped on their sides to permit easier handling at the job site. Each shipping block shall include, but shall not be limited to, a removable lifting angle, which shall allow an easy means of attaching an overhead crane or other suitable lifting equipment.
- B. If the MCC cannot be placed into service reasonably soon after its receipt, store it in a clean, dry, and ventilated building free from temperature extremes. Acceptable storage temperatures are from 32 degF-104 degF.

6. WARRANTY

- A. The MCC shall be warranted to be free from defects in materials and workmanship for a period of 18 months from date of invoice from manufacturer or authorized sales channel.
- B. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents

PART 2 PRODUCTS

1. MANUFACTURERS

- A. Acceptable manufacturer shall be Square D Model 6.

2. MATERIALS

- A. Enclosure shall be fabricated from steel and comply with UL 845 requirements.
- B. Each MCC shall consist of one or more vertical sections of heavy gage steel bolted together to form a rigid, freestanding assembly. A removable structural steel lifting angle shall be mounted full width of the MCC shipping block at the top. Removable bottom channel sills shall be mounted underneath front and rear of the vertical sections extending the full width of the shipping block. Vertical sections shall be made of a welded side-frame assembly.

3. MCC ENCLOSURE FINISH

- A. The paint type and process shall meet UL 1332 for electrical equipment steel enclosures.
- B. The paint shall be applied using an electro-deposition process to ensure a uniform paint coat with high adhesion.
- C. Paint color shall be gray gloss on all surfaces unless specified otherwise. Control station plates and escutcheon plates shall be painted a contrasting gray. Unit interior shall be painted white for better visibility inside the unit.

4. STRUCTURES

- A. Structures shall be totally enclosed, dead front, freestanding assemblies. Structures shall be capable of being bolted together to form a single assembly.
- B. The overall height of the MCC shall not exceed 90 inches, excluding base channel or lifting angle.
- C. Structures shall be NEMA Type 1 front-mounted enclosures, unless noted.
- D. Each standard section shall have all the necessary hardware and bussing for modular plug-on units to be added and relocated. Unused spaces shall be covered by hinged blank doors or cover plates and equipped to accept future units. Vertical bus openings shall be covered by manual bus shutters.

5. WIREWAYS

- A. Structures shall contain a minimum 9-inch high horizontal wireway at the top and bottom of each section. These wireways shall run the full length of the MCC to allow space for power and control cable to connect between units in different sections.

6. BUSSING

- A. Bussing and connectors shall be tin-plated copper.
- B. The main horizontal bus shall be rated per the Plans and shall extend the full length of the MCC. Bus ratings shall be based on 65 degC maximum temperature rise in a 40 degC

ambient. Provisions shall be provided for splicing additional sections onto either end of the MCC.

- C. The horizontal bus splice bars shall be pre-assembled into a captive bus stack. This bus stack shall be installed into the end of the MCC power bus to allow the installation of additional sections.
- D. Each section that accepts plug-in units shall be provided with a vertical bus for distributing power from the main bus to the individual plug-in starter units. This bus shall be of the same material and plating as the main bus. The vertical bus shall be connected directly to the horizontal bus stack without the use of risers or other intervening connectors.
- E. A tin-plated copper ground bus shall be provided that shall run the entire length of the MCC. The ground bus shall be 0.25 inch by 1 inch and shall be rated per the Plans. The ground bus shall be provided with holes for each vertical section to accept user-supplied ground lugs for any loads requiring a ground conductor.
- F. Each vertical section shall have a copper vertical ground bus that shall be connected to the horizontal ground bus. This vertical ground bus shall be installed so that the plug-in units engage the ground bus prior to engagement of the power stabs and shall disengage only after the power stabs are disconnected upon removal of the plug-in unit.
- G. The system shall be rated for an available short circuit capacity per the Plans.

7. TYPICAL UNIT CONSTRUCTION

- A. Units with circuit breaker disconnects through 400 ampere frame size shall utilize electronic trip Motor Circuit Protectors (MCP) and shall connect to the vertical bus through a spring reinforced stab-on connector. Units with larger disconnects shall be connected directly to the main horizontal bus with appropriately sized cable or riser bus.
- B. Circuit Breaker compartments shall be 6" in height, where possible.

All compartments other than circuit breaker compartments shall be 12" minimum height.
- C. Unit mounting shelves shall include hanger brackets to support the unit weight during installation and removal. Plug-on units shall use a twin-handle camming lever located at the top of the bucket to rack in and out the plug-on unit. The cam lever shall work in conjunction with the hanger brackets to ensure positive stab alignment.
- D. A lever handle operator shall be provided on each disconnect. With the unit stabs engaged onto the vertical phase bus and the unit door closed, the handle mechanism shall allow complete on/off control of the unit. Circuit breaker operators shall include a separate tripped position to clearly indicate a circuit breaker trip condition. It shall be possible to reset a tripped circuit breaker without opening the control unit door. Clear indication of disconnect status shall be provided by adhering to the following operator handle positions:

1. Handle on position shall be up or to the left and within 45 degrees of being parallel to the face of the equipment.
 2. Handle off position shall be down or to the right and within 45 degrees of being parallel to the face of the equipment.
 3. The minimum separation between the on and off positions shall be 90 degrees.
 4. On circuit breaker disconnects, the handle tripped position shall be perpendicular to the face of the equipment ± 30 degrees. Minimum separation between on and tripped shall be 30 degrees. Minimum separation between tripped and off shall be 45 degrees.
- E. A mechanical interlock shall prevent the operator from opening the unit door when the disconnect is in the on position. Another mechanical interlock shall prevent the operator from placing the disconnect in the on position while the unit door is open. It shall be possible for authorized personnel to defeat these interlocks.
- F. A non-defeatable interlock shall be provided to prevent installing or removing a plug-on unit unless the disconnect is in the off position.
- G. The plug-in unit shall have a grounded stab-on connector which shall engage the vertical ground bus prior to, and shall release after, the power bus stab-on connectors.
- H. Provisions shall be provided for locking disconnects in the off position with up to three padlocks.
- I. Handle mechanisms shall be located on the left side to encourage operators to stand to the left of the unit being switched.
- J. Unit construction shall combine with the vertical wireway isolation barrier to provide a fully compartmentalized design.
- 8. COMPONENTS FOR TYPICAL UNITS**
- A. FVNR Combination Motor Starters
1. FVNR combination starters shall use a unit disconnect. Magnetic FVNR motor starters shall be furnished in combination motor starter units. FVNR motor starters shall utilize NEMA-rated contactors.
 2. Motor controller overload relay units shall utilize EtherNet/IP communications protocol.
 3. See the plans for a typical wiring schematic and required I/O.

4. Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed operation.
5. NEMA size 1-4 starters shall be mounted directly adjacent to the wireway so that power wiring motor leads shall connect directly to the starter terminals without the use of interposing terminals. Larger starters shall be arranged so that power wiring may exit through the bottom of the starter cubical without entering the vertical wireway.
6. FVNR motor starters shall be capable of measuring current and voltage, and shall be provided with a motor controller overload relay unit, Schneider Model TeSys T with Control Operator Unit.

B. VFD Combination Motor Starters

1. VFD combination starters shall use a unit disconnect.
2. MCC-mounted VFD's shall be sized one nominal HP rating size greater than the actual HP rating of the motor.
3. MCC-mounted VFD's shall be rated for high overload, with capability for 150% overload for one minute.
4. VFD's shall be equipped with a 5% line reactor. VFD's shall be equipped with 5% load reactors only per the Plans.
5. VFD's shall be 6-pulse type.
6. VFD's shall utilize EtherNet/IP communications protocol.
7. Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed operation.
8. VFD buckets shall be equipped with fans.
9. VFD's shall be equipped with a graphic display terminal.
10. See the plans for a typical wiring schematic and required I/O.
11. Manufacturer:

A. Schneider Electric Altivar Model ATV630

B. Terminal Blocks

1. MCC compartments shall be configured with Type B wiring is specified such that all starter units are provided with unit control terminal blocks.
2. Terminal blocks shall be the pull-apart type with a minimum rating of 250 volts and 10 amperes. Current carrying parts shall be tin-plated. Terminals shall be accessible from inside the unit when the unit door is opened. Terminal blocks shall be DIN rail-mounted with the stationary portion of the block secured to the unit bottom plate. The stationary portion shall be used for factory connections and shall remain attached to the unit when removed. The terminals used for field connections shall face forward so they can be wired without removing the unit or any of its components.

C. Nameplates

1. Provide engraved phenolic nameplates for each MCC and unit compartment. Provide white background with black letters inscribed per the Plans. The nameplate shall measure a minimum of 1" high by 3" wide with 3/16" lettering.

D. Pilot Devices

1. Pilot Lights shall be Square D Harmony 9001, 30mm, with glass color cap
2. FVNR starter unit shall be provided with an Operator Control Unit (OCU) and 30 mm pilot devices per the Plans.
 - a. Operator Control Unit (OCU)
 - b. FAULT pilot light, LED-Yellow, Push-To-Test
3. VFD starter unit shall be provided with a Human Interface Module (HIM) and 30 mm pilot devices per the Plans.
 - a. HIM
 - b. FAULT pilot light, LED-Yellow, Push-To-Test
 - c. RUNNING pilot light, LED-Green, Push-To-Test
 - d. STOPPED pilot light, LED-Red, Push-To-Test
 - e. H-O-A Selector Switch, HAND-OFF-AUTO, Black, non-illuminated, 3-position, maintained, standard knob

L. Metering and Instrumentation

1. Manufacturer:
 - A. Schneider Power Logic PM5563 power meter, consisting of:

1. Schneider P/N METSEPM5663 din-mtd base
 2. Schneider P/N METSEPM5663RD remote display meter
2. All customer connections shall be wired to terminal blocks in the specified auxiliary compartment per the Plans.
 3. The power meter remote display shall be mounted in the location shown on the Plans. The power meter base shall be located in the auxiliary cabinet, din-rail mounted. The power meters shall communicate via Ethernet/IP, and shall have dual ports to daisy chain the ethernet network.
 4. Four digital inputs and two configurable digital outputs.
 5. Program one digital output to be closed (TRUE) when voltage is greater than 80% for one second.
 6. Power supply shall be 480VAC.
 7. Measurement accuracy per IEC 61557-12
 8. Direct reading of the operating voltage
4. GENERAL COMMUNICATION CABLING
- A. The MCC shall employ a pre-engineered communication cabling system to interconnect units within the MCC.
 - B. Network cabling shall be routed through the lower horizontal wireway to isolate the network from the horizontal bussing routed through the top.
 - C. The full-depth vertical wireway shall serve to separate communications from power cabling to prevent noise interference on the network cable.
 - D. The communication cabling installation shall meet Class 2 wiring practices under the provisions of NEC Articles 725 and 800.
 - E. Provisions for appropriate terminators and grounding shall be provided.
 - F. Addition, removal, or rearrangement of units shall not interrupt the communications network.
15. ETHERNET/IP COMMUNICATION CABLING
- A. The Ethernet/IP communications network shall be configured in a star topology from each device in the MCC to an internal ethernet switch.
 - B. The cabling system shall consist of multiple Ethernet patch cables that directly connect each network device to an Ethernet switch internal to the MCC. All Ethernet patch cables

shall be 600V Cat 5 rated with direct home-run connections to an Ethernet patch panel per the Plans.

- C. All Ethernet devices mounted in the MCC shall be configured at the factory with IP addresses per the Plans.

16. FACTORY ACCEPTANCE TESTING (FAT)

- A. The manufacturer shall make provisions for a FAT witnessed by the Engineer.
- B. The Contractor shall notify the Engineer two weeks prior to the FAT so that the Engineer can make arrangements to conduct witnessed factory acceptance testing at the manufacturer's facility. The Engineer shall provide related external hardware, as practical, to facilitate the FAT for the most complete testing.
- C. The equipment shall not be allowed to ship until the Engineer has witnessed the FAT, approved the FAT, and authorized the shipment of the equipment from the factory.

17. QUALITY CONTROL

- A. The entire MCC shall go through a quality inspection before shipment. This inspection shall include
 - 1. Physical Inspection of the following:
 - a. Structure.
 - b. Electrical conductors, including:
 - 1. Bussing.
 - 2. General wiring.
 - 3. Units.
 - 2. Electrical Tests:
 - a. General electrical tests shall include:
 - 1. Power circuit phasing.
 - 2. Control circuit wiring.
 - 3. Instrument transformers.
 - 4. Meters.
 - 5. Ground fault system.
 - 6. Device electrical operation.

- b. AC dielectric tests shall be performed on the power circuit.
- 3. Markings/labels include:
 - a. Nameplates per the Plans.
 - b. UL listing.
 - c. Inspector's stamps.
- 4. Each device shall be configured and addressed to correspond with software settings.
- 5. A read/write test shall be performed prior to shipment on all network devices.
- 6. Testing shall be designed to verify system operation and shall include as a minimum:
 - a. Drawings and bill of materials.
 - b. I/O addressing.
 - c. Correct device operation by I/O address.
 - d. Host communications.
 - e. Control network interface.

PART 3 EXECUTION

1. EXAMINATION

A. Verification of Conditions

Examine areas and conditions under which the work is to be installed and notify the Owner and Engineer of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

2. INSTALLATION

- A.** Install low voltage industrial MCCs in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations and as indicated on the Plans.
- B.** Protection shall be provided to prevent moisture from entering the enclosure.
- C.** MCCs shall be located in an area with a minimum of 3 feet of free space in front of standard front access construction. 3 feet shall also be allowed in the rear of back-to-back construction. This free space shall give adequate room to remove and install units. A

minimum of 1/2 inch space shall be provided between the back of standard front access MCCs and a wall or 6 inches for damp locations.

- D. The MCCs shall be assembled at the factory on a smooth level surface so that sections are properly aligned. A similar smooth and level surface shall be provided for installation. The surface under a MCC shall be of a non-combustible material.

3. SITE ACCEPTANCE TESTING

- A. Provide the services of a factory-authorized service representative to provide start-up service and to demonstrate and train the Owner's personnel.

- 1. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

The Contractor shall perform field adjustments of the short circuit and overload devices as required to place the equipment in final operating condition. The settings shall be in accordance with the approved short-circuit study, protective device evaluation study, protective device coordination study, manufacturer's instruction leaflets, and the contract documents.

- 2. Train the Owner's maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, and preventive maintenance.
- 3. Review data in operation and maintenance manuals with the Owner's personnel.
- 4. Schedule training with the Owner.

4. PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to the Installer that shall ensure that the equipment shall be without damage at time of Substantial Completion.

END OF SECTION

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LOW VOLTAGE PANELBOARDS

2.02 GENERAL

a. SUMMARY

- (1) Scope: Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, configuration and installation for lighting and appliance panelboards (also identified as panelboard, PP) as required for the complete performance of the Work, as shown on the Drawings, as specified herein, and as specified elsewhere for the assemblies or systems comprised of the components specified herein.
- (2) Related Sections: Related sections include, but shall not be limited to, the following:
 - (a) Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - (b) Applicable general requirements for electrical Work specified within Division 26 Specification Sections apply to this Section.

b. REFERENCES

- (1) General, Publications: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.
 - (a) National Electrical Manufacturers Association (NEMA):
 - 1) NEMA AB 1, "Molded Case Circuit Breakers and Molded Case Switches."
 - 2) NEMA PB 1, "Panelboards."
 - 3) NEMA PB 1.1, "General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less."
 - (b) National Fire Protection Agency (NFPA)
 - 1) NFPA 70, "National Electrical Code," hereinafter referred to as NEC.
 - 2) NFPA 5000, "Building Construction and Safety Code."
 - (c) Underwriter Laboratories (UL):

- 1) UL 50, "Enclosures for Electrical Equipment, Non-Environmental Considerations."
- 2) UL 67, "Standard for Panelboards."
- 3) UL 489, "Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures."

c. DEFINITIONS

- (1) Unless specifically defined within the Contract Documents, the words or acronyms contained within this specification shall be as defined within, or by the references listed within this specification, the Contract Documents, or, if not listed by either, by common industry practice.

- (a) GF: Ground fault
- (b) PP: Power Panelboard
- (c) LP: Lighting Panelboard
- (d) MCB: Main circuit breaker
- (e) MLO: Main Lugs Only
- (f) SPD: Surge Protective Device

d. SUBMITTALS

(1) General

- (a) Submit sufficient information to determine compliance with the Contract Documents. Identify submittal data with the specific equipment tags and/or service descriptions to which they pertain. Submittal data shall be clearly marked to identify the specific model numbers, options, and features of equipment and work proposed.
- (b) Deviations from the Contract Documents shall be indicated within the submittal. Each deviation shall reference the corresponding drawing or specification number, show the Contract Document requirement text and/or illustration, and shall be accompanied by a detailed written justification for the deviation.
- (c) Product Data: For each type of panelboard:
 - 1) Bus Materials, devices, and accessories indicated.
 - 2) Dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
 - 3) Installation instructions complying with NEMA PB 1.1.

- (d) Shop Drawings: Submit the following additional shop drawing information for each product and accessory required. Include information not fully detailed in manufacturer's standard product data.
 - 1) Drawings shall include, but shall not be limited to environmental protection, interior mounting dimensions, and wiring gutter dimensions.
 - 2) The location of the main shall be clearly shown.
 - 3) The location of the branches and solid neutral shall be clearly shown.
 - 4) Shop drawings shall illustrate one-line diagrams with applicable voltage systems.
 - 5) Evidence of NRTL listing for series rating on OCPDs.
- (2) Operation & Maintenance (O&M) manuals shall be provided.
 - (a) Submit required Operations & Maintenance data specific to each product and accessory proposed. In addition, include the following information:
 - 1) Installation instructions and NEMA Standards Publication PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- e. QUALITY ASSURANCE
 - (1) Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 50 years.
 - (a) The manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system that is regularly reviewed and audited by a third-party registrar. Manufacturing, inspection, and testing procedures shall be developed and controlled under the guidelines of the quality assurance system.
 - (b) The manufacturer or their representative shall have service, repair, and technical support services available 24 hours 7 days a week basis.
 - (2) All work performed and all materials used shall be in accordance with the National Electrical Code, and with applicable local regulations and ordinances. Process controllers, assemblies, materials, and equipment shall be listed and labeled by Underwriter's Laboratories or by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- f. DELIVERY, STORAGE AND HANDLING
 - (1) Prior to delivery to the Project site, ensure that suitable storage space is available to store materials in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres. Materials shall be

protected during delivery and storage and shall not exceed the manufacturer stated storage requirements. As a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. In addition, protect electronics from all forms of electrical and magnetic energy that could reasonably cause damage.

- (2) Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified within the Contract Documents.
- (3) Inspect and report any concealed damage or violation of delivery storage, and handling requirements to the Engineer.

g. WARRANTY

- (1) Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

2.03 PRODUCTS

a. MANUFACTURERS

- (1) Acceptable Products: Panelboards specified herein shall be the product of a single manufacturer. Products and manufacturers specified are to establish a standard of quality for design, function, materials, and appearance. Products shall be modified as necessary by the manufacturer for compliance with requirements. Provide the following specified product and manufacturer without exception, unless approved as a substitute by addendum to the Contract Documents prior to the bid date:

- (a) Power Panelboards (480V, 3PH) shall be Schneider Electric "I-Line" Series
- (b) Lighting Panelboards (120->240V) shall be Schneider Electric "NQ" Series

b. GENERAL REQUIREMENTS

- (1) Panelboards shall be manufactured in accordance with standards listed within the Article 1.2 REFERENCES.

c. PANELBOARD Interior

- (1) Shall be rated per the Plans.
- (2) The panelboard interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.

- (3) The bussing shall be fully rated with sequentially phased branch distribution. Panelboard bussing shall be plated copper. Bus bar plating shall run the entire length of the bus bar. The entire interleaved assembly shall be contained between two (2) U-shaped steel channels, permanently secured to a galvanized steel-mounting pan by fasteners.
- (4) Interior trim shall be of dead-front construction to shield user from all energized parts. Main circuit breaker and main lug interiors shall be field convertible for top or bottom incoming feed.
- (5) A solidly bonded copper equipment ground bar shall be provided.
- (6) Solid neutral shall be equipped with a full capacity bonding strap for service entrance applications.
- (7) Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label, and Short Circuit Current Rating shall be displayed on the interior or in a booklet format. Leveling provisions shall be provided for flush mounted applications.
- (8) Group mounted circuit breakers through 1200A
 - (a) Circuit breaker(s) shall be group mounted with plug-on electrical connection, bolted to common pan or rail assembly.
 - (b) The interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
 - (c) Circuit breakers equipped with line terminal jaws shall not require additional external mounting hardware. Circuit breakers shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breakers of different frame sizes shall be capable of being mounted across from each other.
 - (d) Line-side circuit breaker connections are to be jaw type.
 - (e) All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate breaker connectors and mounting hardware.
- (9) Molded Case Circuit Breaker Characteristics - General
 - (a) Power Panel circuit breakers shall be "I-LINE" type.
 - (b) Lighting Panel circuit breakers shall be "QO" type.
 - (c) Circuit breaker/circuit breaker combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations.

- (d) All circuit breakers with permanent trip units shall be UL Listed for reverse connection without restrictive line and load markings and be suitable for mounting in any position.

d. Panelboard Enclosures

(1) Type 1 Boxes

- (a) Boxes shall be hot zinc dipped galvanized steel constructed in accordance with UL 50 requirements. Unpainted galvanized steel is not acceptable.
- (b) Boxes shall have removable blank end walls and interior mounting studs. Interior support bracket shall be provided for ease of interior installation.

(2) Type 1 Trim Fronts

- (a) Trim front steel shall meet strength and rigidity requirements per UL 50 standards. Shall have an ANSI 49 medium gray enamel electrodeposited over cleaned phosphatized steel.
- (b) Trim front shall be 4-piece with door surface mount. Trim front door shall have rounded corners and edges free of burrs. A clear plastic directory cardholder shall be mounted on the inside of the door.
- (c) Locks shall be cylindrical tumbler type with larger enclosures requiring sliding vault locks with 3-point latching. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock.

(3) Type 3R, 5, and 12

- (a) Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.

2.04 EXECUTION

a. GENERAL

- (1) Examine equipment exterior and interior prior to installation. Report any damage and do not install any equipment that is structurally, moisture, or mildew damaged.
- (2) Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
- (3) Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

- (4) Install equipment in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings.
- (5) Functional testing, commissioning, and first parameter adjusting shall be carried out by a factory trained manufacturer's representative field service engineer. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment. Report to the Engineer any discrepancies or issues with the installation.
- (6) Provide final protection and maintain conditions in a manner acceptable to the manufacturer that shall help ensure that the equipment is without damage at time of Substantial Completion.

b. **INSTALLATION**

- (1) Install panelboards in accordance with manufacture's written instructions, NEMA PB 1.1 and NEC Standards.
- (2) Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.
- (3) Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads within 20% of each other. Maintain proper phasing for multi-wire branch circuits.
- (4) Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

END OF SECTION

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STS-26 29 13
CONTROL PANELS

PART 1 - GENERAL

1.02 WORK INCLUDED

- A. Furnish all labor, equipment, and materials for control panels as indicated on the drawings and specified herein. The panel supplier shall be a UL listed panel shop and all panels shall be UL-508 certified and labeled.
- B. Control panel equipment shall be coordinated to provide all the specified control as indicate in the elementary diagrams or specified herein.
- C. The Contractor shall be responsible for coordinating and interfacing with equipment and instrumentation supplied under other sections of the Contract Documents that are an integral part of the plant control systems. This interfacing shall be incorporated in the detailed systems drawings and data sections to be submitted by the contractor prior to rough-in work.

2. SUBMITTALS

- A. The contractor shall submit to the Engineer for approval complete shop drawings, wiring diagrams, data, and operation and maintenance manuals of all equipment to be furnished under this section.
- B. Coordination and Shop Drawings

Prepare and submit coordination drawings for installation of products and materials fabricated. Coordination and shop drawings shall be prepared using a computer aided drafting system compatible with Autocad. Coordination and shop drawings shall be submitted on hard copy (PDF) and electronically (DWG).

- 1. Submit component interconnect drawings showing the interconnecting wiring between each component including equipment supplied under other sections requiring interfacing with the control system. Diagrams shall show all component and panel terminal board identification numbers, and external wire and cable numbers. Note, this diagram shall include all intermediate terminations between field elements and panels (e.g., terminal junction boxes, pull boxes, etc.). Diagrams' device designations, and symbols shall be in accordance with NEMA ICS 1-101.
- 2. Panel Wiring Diagrams: Elementary diagrams shall be similar to those diagrams shown in the drawings, but with the addition of all auxiliary devices such as additional relays, alarms, fuses, lights, fans, heaters, etc.
- 3. Panel wiring diagrams shall identify wire numbers and types, terminal numbers, tag numbers and PLC I/O identification (address) numbers. Wiring diagrams shall show all circuits individually; no common

diagrams shall be allowed.

4. Submit arrangement and construction drawings for consoles, control panels, and for other special enclosed assemblies for field installation. Include dimensions, identification of all components, preparation and finish data, nameplates, enough other details to define the style and overall appearance of the assembly and a finish treatment. Drawings shall show the location of all front panel mounted devices to scale and shall include a panel legend and a bill of materials. The panel legend shall list and identify all front of panel devices by their assigned tag numbers, all nameplate inscriptions, service legends and annunciator inscriptions. The bill of materials shall list all devices mounted within the panel that are not listed in the panel legend, and shall include the tag number, description, manufacturer and complete model number for each device.
 5. Submit installation, mounting, and anchoring details for all components.
- C. Operation, Maintenance and Repair Manuals
1. Submit operation and maintenance manuals.
- D. Panel Record Drawings
1. Provide one set of laminated approved panel record drawings inside each control panel.
3. CODES AND STANDARDS:
- A. Equipment, materials, and workmanship shall comply with the latest revisions of the following codes and standards
1. Instrumentation: Instrument Society of America (ISA).
 2. National Electrical Code (NEC).
 3. Wiring: ISA S5.3 and S5.4, latest issue.
 4. Control Panels and equipment: NEMA, UL and ANSI.
 5. Control Logic: Joint Industrial Council (JIC).
 6. UL508A and UL508A-SB

PART 2 - PRODUCTS

1. GENERAL

- A. Control panels shall be UL508A compliant. Control panels with resident voltages greater than 120V shall be marked with a short circuit current rating (SCCR). The SCCR shall be equal to or more than the short circuit current available at the panel line terminals and in no case be less than 10,000A SCCR. The panel designer shall verify the available short circuit required.
- B. The electrical control equipment shall be mounted within a pad-lockable enclosure equipped with a 3-point latch with all hardware and exterior components construction of 300 series stainless steel (except control panels in air-conditioned spaces and electrical room may be NEMA 1 painted steel). Back panel shall be secured to enclosure with collar studs. All hardware shall be stainless steel. Provide safety hardware to hold the door in an open position.
- C. Components: All motor branch circuit breakers, motor starters and control relays shall be of highest industrial quality, securely fastened to the removable back panels with screws and lock washers. Back panels shall be tapped to accept all mounting screws.
- D. If voltages exceeding 120V are present, a circuit breaker shall be provided on each control panel as a means of disconnecting power to the control panel. The circuit breaker operating handle shall be installed on the right side of the cabinet not in the door. The door shall be interlocked from opening when the circuit breaker is in the on position. The circuit breaker operating handle shall have an interlock defeat mechanism for qualified personnel to gain access to the panel without shutting off power.
- E. Control transformers shall be installed where shown to provide control power. Transformers shall be fused on the primary and secondary circuits. The transformer secondary shall be grounded on one leg.
- F. All control panel wiring shall be identified at both ends with type written heat shrinkable wire markers with the numbering system shown on the control submittal drawings.
 - 1. Control wiring shall be stranded tinned copper, minimum size #16 AWG (except for shielded instrumentation cable may be #18 AWG), with 600volt, 90DegC, flame retardant, Type MTW thermoplastic insulation.
 - 2. Wire shall be guided within control and terminal cabinets by cable supports (duct). Instrumentation and control field cables on the unprotected side of SPD devices within the cabinet shall not run in parallel to the cables on the protected side of the SPD device. Separate cable supports (duct) will be provided.
 - 3. All conductors shall be neatly led to terminations. All connections of stranded wire to screw type terminal blocks shall be by insulated spade

lugs, crimp fastened to wire. Provide stranded wire crimp ferrules for all stranded wire connections not requiring spade lugs for screw type terminal blocks.

- G. The control panel shall be provided with nameplates identifying each component, selector switches, pilot lights, etc. Nameplates shall be permanently affixed using an epoxy process. Nameplates shall be laminated plastic, engraved white letters with a black background.
- H. Corrosion Inhibitor Emitter: Provide an industrial corrosion inhibitor emitter on all exterior mounted control panels that will protect internal components of the control panel from corrosion one year. Provide a year supply of spare emitters, for each control panel.
- I. Terminal strips shall be provided for all signals as indicated on the drawings plus all spare conductors as specified. Terminal strips shall be switch type with integral fuses equal to Allen Bradley 1492-H6. Wiring from the control panel to the terminal strips shall be factory installed. All spare conductors shall be terminated and identified. All terminals over 200V phase to phase shall be covered with approved plastic shields.
- J. Relays
 - 1. Relays for interfacing and control applications shall be the miniature general purpose plug-in type having low coil inrush and holding current characteristics. An LED status-indicating light shall be provided with each relay. Coil voltage shall be as noted or shown. Non-latching relays shall have a single coil. Relays shall have plain plastic dust covers, test buttons, and mounting sockets with screw terminals and hold-down springs. Relays shall be UL recognized.
 - 2. All relays shall have a screw terminal interface with the wiring. Terminals shall have a permanent, legible identification. Relays shall be mounted such that the terminal identifications are clearly visible and the terminals are readily accessible.
- K. PANEL OPERATING CONTROLS AND INSTRUMENTS
 - 1. All operating controls and instruments shall be securely mounted on the control compartment door or interior deadfront as detailed on panel enclosure drawings. All controls and instruments shall be clearly labeled to indicate function.
 - 2. Indicator lamps shall be 30mm LED full voltage push to test type and mounted in NEMA 4X (800H) modules, as manufactured by Allen Bradley or SKPI as manufactured by Square D. Lamp modules shall be equipped to operate at 24 or 120 volt input. Lamps shall be easily replaceable from the front of the control compartment door without removing lamp module from its mounted position. Units shall be heavy-duty, oiltight, push to test industrial type with screwed on prismatic glass lenses in colors as shown,

and shall have factory engraved legend plates.

3. Selector switches shall be 30mm heavy-duty, oiltight, industrial type selector switches with contacts rated for 120V ac service at 10 amperes continuous. Units shall have standard size, black field, legend plates with white markings, as indicated. Operators shall be black knob type. Units shall have the number of positions and contact arrangements and spring return function (if any) as shown.

PART 3 - EXECUTION

1. MOUNTING OF EQUIPMENT AND ACCESSORIES

- A. Install and mount equipment in accordance with the Contract Documents, and installation detailed shop drawings. Mount equipment so that they are rigidly supported, level and plumb, and in such a manner as to provide accessibility; protection from damage; isolation from heat, shock and vibration; and freedom from interference with other equipment, piping, and electrical work.
- B. Mount local equipment in cabinets or existing panels as specified. Mount associated terminals on a common panel or rack; all terminals over 200V phase to phase shall be covered with plastic shields.
- C. Provide services of panel manufacturer to test the completed system after installation to assure that all components are operating within the specified range and all interlocks are functioning properly. Panel manufacturer shall certify functional operation and calibration in written startup report. Perform field tests on all completed control assemblies to demonstrate conformance to specifications and functional compatibility.

END OF SECTION

EXHIBIT B

BASIS OF COMPENSATION

As consideration for providing the Services as set forth in the Agreement, the CITY agrees to pay, and the CONTRACTOR agrees to accept payment on a time and reimbursement cost basis as indicated in Attachment B-1 which is attached and made a part of this Agreement.

Retainage of (10%) ten percent will be a part of said agreement and future payments.

END OF EXHIBIT B

BID TABULATION
RFP 20-030
WTP Switchgear and MCC Replacement Projects

NEW ELECTRICAL ROOM, SWITCHGEAR AND MCC'S REPLACEMENT					
SECTION 1: GENERAL					
ITEM NO.	DESCRIPTION	QTY.	UNIT	UNIT PRICE	EXTENDED PRICE
1	Mobilization/De-mobilization	1	LS	130,000	130,000
2	Construction Staging				
a.	Provide all labor and material for temporary generators connection and all construction staging activities	1	LS	30,000	30,000
SECTION 1 SUBTOTAL:					
SECTION 2: INSTALLATION and DEMO					
ITEM NO.	DESCRIPTION	QTY.	UNIT	UNIT PRICE	EXTENDED PRICE
3	New Electrical Room Installation and Demo				
a.	Provide all labor and material connection and demo of all existing generator equipment	1	LS	50,000	50,000
b.	Provide all labor and material for construction of new Electrical Room, including lighting, cooling, ceiling, walls, window, sliding door, and floor	1	LS	165,000	165,000
4	All Labor and Materials to Furnish and Install				
a.	Switchgear, MCC-1, MCC-2, MCC-3, VFD-9, VFD-10, VFD-11, VFD-12, PNLBD-1, LP-6, XFMR-6, and Disconnects	1	LS	1,450,000	1,450,000
b.	Control Panel CP-SWGR, CP-GEN subplate, MCC-RIO 1/2/3	1	LS	152,000	152,000
c.	Cable Busses, Cable Trays, conduits, and all other equipment per the Plans & Specs	1	LS	700,000	700,000
5	All Labor and Materials to Demo				
a.	Switchgear A, Switchgear B, MCC-1, MCC-2, MCC-3, MCC-4, MCC-5, MCC-6, JB-500, and all obsolete equipment and raceways	1	LS	30,000	30,000
SECTION 2 SUBTOTAL:					
SECTION 3: CLOSEOUT					
ITEM NO.	DESCRIPTION	QTY.	UNIT	UNIT PRICE	EXTENDED PRICE
6	Final Completion				
a.	Provide all labor, materials and training per Final Completion requirements, per approval by the Engineer.	1	LS	10,000.00	10,000
SECTION 3 SUBTOTAL:					
SUMMARY					
SECTION 1: GENERAL					160,000
SECTION 2: INSTALLATION and DEMO					2,547,000
SECTION 3: CLOSEOUT					10,000
PROJECT TOTAL					2,717,000

This solicitation has potential for P-Card Payment. Does your company accept credit card payment? YES ___ NO X

If "yes" please indicate payment options on the below chart.

Payment Options	YES	NO	PERCENT AND/OR TERMS FOR EARLY PAYMENT
Is there a discount for a credit card payment?			
Is there an additional charge for credit card payment?			
Discount for early payment?			
Prompt payment terms: _____ % _____ Days; Net 30 Days			

Company Name: Eau Gallie Electric, Inc

EIN: 59-2694842

Email: chughes@eg-electric.com

Name and Title of individual completing this schedule:

Christopher Hughes President
 (Printed Name) (Title)

x  4-15-20
 (Signature) (Date)

EXHIBIT C

GENERAL INSURANCE REQUIREMENTS

The Contractor shall not commence work until he has obtained all the insurance required under this heading, and until such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work until all similar insurance required of the subcontractor has also been obtained and approved by the Owner.

Certificates of insurance must be issued by an authorized representative of the insurance company at the request and direction of the policyholder and must include sufficient information so as to identify the coverage and the contract for Owner's improvements for which they are issued. Certificates of insurance must be issued by a nationally recognized insurance company with a Best's Rating of no less than B+VII, satisfactory to the Owner, and duly authorized to do business in the state of said Contract.

The Contractor shall procure and maintain, during the life of this Contract, Workmen's Compensation Insurance for all of his employees to be engaged in work under this Contract, and he shall require any subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees to be engaged in such work, unless such employees are covered by the protection afforded by the Contractor's insurance. In case any employees are to be engaged in hazardous work under this Contract, and are not protected under this Workmen's Compensation statute, the Contractor shall provide, and shall cause each subcontractor to provide, adequate coverage for the protection of such employees. It is acceptable to use a State-approved Workmen's Compensation Self-Insurance fund.

The Contractor shall take out and maintain during the life of this Contract, Public Liability and Property Damage and shall include Contractual Liability, Personal Injury, Libel, Slander, False Arrest, Malicious Prosecution, Wrongful Entry or Eviction, Broad Form Property Damage, Products, Completed Operations and XCU Coverage to be included on an occurrence basis, and to the full extent of the Contract to protect him, the Owner, and any subcontractor performing work covered by this Contract from damages for personal injury, including accidental death, as well as from claims for property damage, which may arise from operations under this contract, whether such operations be by himself or by a subcontractor, or by anyone directly or indirectly employed by either of them. The Contractor shall also maintain automobile liability insurance including "non-owned and hired" coverage. The entire cost of this insurance shall be borne by the Contractor.

The amount of such insurance shall be no less than \$1,000,000 annual aggregate for bodily injury and property damage combined per occurrence and with Umbrella Liability insurance limits of \$5,000,000 aggregate.

The City of Naples must be named as Additional Insured on the insurance certificate and the following must also be stated on the certificate. "These coverage's are primary to all other coverage's the City possesses for this contract only." The City of Naples shall be named as the Certificate Holder. The Certificate Holder shall read as follows:

The City of Naples
735 Eighth Street South
Naples, Florida 34102

No City Division, Department, or individual name should appear on the Certificate.
No other format will be acceptable.

The Certificate must state the bid number and title.

When using the ACORD 25 – Certificate of Insurance only the most current version will be accepted.

The City of Naples requires a copy of a cancellation notice in the event the policy is cancelled. The City of Naples shall be expressly endorsed onto the policy as a cancellation notice recipient.

[If other insurance or insurance requirements or any waivers, attach as Exhibit C-1 through C-__]





CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

5/5/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Sihle Insurance Group, Inc. 5545 N. Wickham Road Suite 101 Melbourne FL 32940	CONTACT NAME: Ann Watters PHONE (A/C, No, Ext): 321-422-7890 FAX (A/C, No): 321-724-2063 E-MAIL ADDRESS: awatters@sihle.com														
INSURED Eau Gallie Electric, Inc. 2012 Aurora Road Melbourne FL 32935	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">INSURER(S) AFFORDING COVERAGE</th> <th style="text-align: center;">NAIC #</th> </tr> </thead> <tbody> <tr> <td>INSURER A : Westfield Insurance Group</td> <td style="text-align: center;">24112</td> </tr> <tr> <td>INSURER B : Western World Insurance Co Inc</td> <td style="text-align: center;">13196</td> </tr> <tr> <td>INSURER C : North River Insurance Company</td> <td></td> </tr> <tr> <td>INSURER D :</td> <td></td> </tr> <tr> <td>INSURER E :</td> <td></td> </tr> <tr> <td>INSURER F :</td> <td></td> </tr> </tbody> </table>	INSURER(S) AFFORDING COVERAGE	NAIC #	INSURER A : Westfield Insurance Group	24112	INSURER B : Western World Insurance Co Inc	13196	INSURER C : North River Insurance Company		INSURER D :		INSURER E :		INSURER F :	
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INSURER F :															

COVERAGES

CERTIFICATE NUMBER: 581881290

REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL SUBR INSD WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC OTHER:	Y	TRA7877068	10/1/2019	10/1/2020	EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 150,000 MED EXP (Any one person) \$ 5,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000 \$
A	<input checked="" type="checkbox"/> AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO <input type="checkbox"/> OWNED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS ONLY <input checked="" type="checkbox"/> NON-OWNED AUTOS ONLY		TRA7877068	10/1/2019	10/1/2020	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ PIP \$ 10,000
C	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> DED <input checked="" type="checkbox"/> RETENTIONS \$		5811109299	10/1/2019	10/1/2020	EACH OCCURRENCE \$ 5,000,000 AGGREGATE \$ 5,000,000 \$
WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below		Y/N				<input type="checkbox"/> PER STATUTE <input type="checkbox"/> OTH-ER E.L. EACH ACCIDENT \$ E.L. DISEASE - EA EMPLOYEE \$ E.L. DISEASE - POLICY LIMIT \$
A B	Inland Marine Pollution Liability & Professional Liability		TRA7877068 EVP1002001-01	10/1/2019 10/1/2019	10/1/2020 10/1/2020	Leased/Rented Equip \$100,000 Installation Floater \$35,000 Aggregate (Prof & Pol) \$1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
 Re: #20-030 - Naples WTP Switchgear & MCC Replacement Project

Certificate holder is named as additional insured with respects to general liability on a primary and non contributory basis as required by written contract.

CERTIFICATE HOLDER**CANCELLATION**

City of Naples 735 Eighth Street South Naples FL 34102	<p>SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.</p> <p>AUTHORIZED REPRESENTATIVE</p> <p style="text-align: center;"><i>A.V.V.</i></p>
--	---

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CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

05/06/20

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Aon Risk Services, Inc of Florida 1001 Brickell Bay Drive, Suite #1100 Miami, FL 33131-4937	CONTACT NAME: Aon Risk Services, Inc of Florida	
	PHONE (A/C, No, Ext): 800-743-8130	FAX (A/C, No): 800-522-7514
EMAIL ADDRESS: ADP.COI.Center@Aon.com		
INSURER(S) AFFORDING COVERAGE		NAIC #
INSURER A : Illinois National Insurance Co		23817
INSURER B :		
INSURER C :		
INSURER D :		
INSURER E :		
INSURER F :		

INSURED
 ADP TotalSource CO XXI, Inc.
 10200 Sunset Drive
 Miami, FL 33173
ALTERNATE EMPLOYER
 Eau Gallie Electric Inc
 2012 Aurora Rd
 Melbourne, FL 32935

COVERAGES **CERTIFICATE NUMBER:** 2694652 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS. **LIMITS SHOWN ARE AS REQUESTED.**

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PROJECT <input type="checkbox"/> LOC <input type="checkbox"/> OTHER						EACH OCCURRENCE \$ DAMAGE TO RENTED PREMISES (Ea occurrence) \$ MED EXP (Any one person) \$ PERSONAL & ADV INJURY \$ GENERAL AGGREGATE \$ PRODUCTS - COMP/OP AGG \$ \$	
	AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO OWNED AUTOS ONLY <input type="checkbox"/> HIRED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> NON-OWNED AUTOS ONLY						COMBINED SINGLE LIMIT (Ea accident) \$ BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$	
	UMBRELLA LIAB <input type="checkbox"/> OCCUR EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE DEC RETENTION \$						EACH OCCURRENCE \$ AGGREGATE \$	
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? <input type="checkbox"/> Y/N (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below		N/A	WC 080371933 FL	07/01/19	07/01/20	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTH-ER	E.L. EACH ACCIDENT \$ 2,000,000 E.L. DISEASE - EA EMPLOYEE \$ 2,000,000 E.L. DISEASE - POLICY LIMIT \$ 2,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
 All worksite employees working for EAU GALLIE ELECTRIC INC, paid under ADP TOTALSOURCE, INC.'s payroll, are covered under the above stated policy. EAU GALLIE ELECTRIC INC is an alternate employer under this policy.
 RE: Naples WTP Switchgear & MCC Replacement, Bid #20-030

CERTIFICATE HOLDER

CANCELLATION

The City of Naples 735 Eighth Street South Naples, FL 34102	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE <i>Aon Risk Services, Inc of Florida</i>
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EXHIBIT D

CERTIFICATION OF COMPLIANCE WITH IMMIGRATION LAWS

The undersigned is the President of the Eau Gallie Electric, Inc., company ("the CONTRACTOR"), and hereby certifies to the following:

1. The CONTRACTOR is in full compliance with all provisions of the Immigration Reform and Control Act of 1986 ("IRCA"), as well as all related immigration laws, rules, regulations pertaining to proper employee work authorization in the United States.

2. The undersigned has verified that the CONTRACTOR has obtained and maintains on file, and will continue to obtain and maintain on file, all documentation required by law, including but not limited to, Form I-9, Employment Eligibility Verification, for all persons employed by or working for the CONTRACTOR in any capacity on any project for the City of Naples (CITY). All such persons have provided evidence of identity and eligibility to work to the CONTRACTOR in accordance with the IRCA and related law. The undersigned hereby affirms that no person has been or will be employed by the CONTRACTOR to work on projects for the CITY who is not authorized to work under law. The undersigned further affirms that the CONTRACTOR's files will be updated by written notice any time that additional employees work on projects for the CITY.

3. The CONTRACTOR will have its contractors, subcontractors, suppliers and vendors who are involved in projects for the CITY to sign a written acknowledgment that they too are in compliance with immigration law. It is understood that failure to do so could result in the CONTRACTOR being liable for any violation of the law by such third parties.

4. The CONTRACTOR will fully cooperate with and have its contractors, subcontractors, suppliers and vendors to fully cooperate with, all inquiries and investigations conducted by any governmental agency in connection with proper compliance with the laws pertaining to appropriate work authorization in the United States.

5. The undersigned, on behalf of the CONTRACTOR, acknowledges that this Certification may be relied upon by the CITY, its officers, directors, employees, and affiliates or related persons and entities.

6. If it is found that the CONTRACTOR has not complied with the laws pertaining to proper employment authorization, and any legal and administrative action ensues against the CITY, the CONTRACTOR will indemnify, defend and hold the CITY harmless along with their officers, directors, employees, and affiliated or related persons and entities.

7. The CONTRACTOR acknowledges that the CITY by their authorized representatives shall have the right, at any time, upon 24 hours' notice, to examine the CONTRACTOR's books and records to confirm that the CONTRACTOR is in compliance with the terms of this certification.

Executed this 25 day of May, 2020.

By: Chris M. Pasich
Eau Gallie Electric, Inc

Handwritten mark