



**AGENDA ITEM EXECUTIVE SUMMARY**

Agenda Item:	Consider Resolution Awarding Bid to Haugland Energy LLC for the procurement of equipment and devices and the construction of the Kautz Rd Substation		
Presenter & Title:	Aaron Holton – Superintendent of Electric Services		
Date:	June 19, 2023		
<b>Please Check Appropriate Box:</b>			
<input checked="" type="checkbox"/>	Committee of the Whole Meeting	<input type="checkbox"/>	Special Committee of the Whole Meeting
<input checked="" type="checkbox"/>	City Council Meeting	<input type="checkbox"/>	Special City Council Meeting
<input type="checkbox"/>	Public Hearing	<input type="checkbox"/>	Other -
Associated Strategic Plan Goal/Objective: EMS II			
Estimated Cost: \$ 6,383,000.00	Budgeted?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Other Funding? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<i>If "Other Funding," please explain how the item will be funded:</i>			
<b>Executive Summary:</b>			
Bids were advertised and opened on Monday, April 27, 2023 for the procurement of all equipment and devices as well as construction of the Kautz Rd Substation. One bid was received and five companies declined to submit a bid.			
Haugland Energy LLC		Bid Price 6,383,000.00	
This project will be paid in part through the Rebuild Illinois Grant that the City received in 2022.			
<b>Attachments:</b> <i>(please list)</i>			
<ul style="list-style-type: none"> <li>• Resolution</li> <li>• Draft Conformed Contract</li> <li>• Memo from Superintendent Holton</li> <li>• Recommendation letter and supporting documents from Stanley Consultants.</li> </ul>			
<b>Voting Requirements:</b>			
<i>This motion requires a simple majority of votes for passage.</i>			
<i>The Mayor may vote on three occasions: (a) when the vote of the aldermen or trustees has resulted in a tie; (b) when one half of the aldermen or trustees elected have voted in favor of an ordinance, resolution, or motion even though there is no tie vote; or (c) when a vote greater than a majority of the corporate authorities is required by state statute or local ordinance to adopt an ordinance, resolution, or motion.</i>			
<b>Recommendation / Suggested Action:</b> <i>(how the item should be listed on agenda)</i>			
Recommend resolution awarding bid to Haugland Energy LLC for the procurement of equipment and devices and the construction of the Kautz Rd Substation in an amount of \$6,383,000.00 and allow the City Administrator to approve change orders not to exceed 10% of the contracted amount.			

**RESOLUTION NO. 2023-61**

**AWARDING BID TO HAUGLAND ENERGY LLC FOR THE PROCUREMENT OF EQUIPMENT AND DEVICES AND THE CONSTRUCTION OF THE KAUTZ RD SUBSTATION IN AN AMOUNT OF \$6,383,000.00 AND ALLOW THE CITY ADMINISTRATOR TO APPROVE CHANGE ORDERS NOT TO EXCEED 10% OF THE CONTRACTED AMOUNT.**

**BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF GENEVA, KANE COUNTY, ILLINOIS, as follows:**

**SECTION 1:** That the City Administrator is hereby authorized to award, on behalf of the City of Geneva, the bid to Haugland Energy LLC for the procurement of equipment and devices and the construction of the Kautz Rd Substation in an amount of \$6,383,000.00 and allow the City Administrator to approve change orders not to exceed 10% of the contracted amount, in the form attached hereto.

**SECTION 2:** This Resolution shall become effective from and after its passage as in accordance with law.

**PASSED** by the City Council of the City of Geneva, Kane County, Illinois, this 19<sup>th</sup> day of June, 2023

**AYES: \_\_ NAYS: \_\_ ABSENT: \_\_ ABSTAINING: \_\_ HOLDING OFFICE: \_\_**

Approved by me this 19<sup>th</sup> day of June, 2023.

\_\_\_\_\_  
Mayor

ATTEST:

\_\_\_\_\_  
City Clerk

**Draft Conformed Contract**

**for**

**Bid Proposal No. 23-01  
Kautz Road Substation  
Procurement/Construction**

**between**

**City of Geneva  
Geneva, Illinois**

**and**

**Haugland Energy, LLC.  
Melville, New York**

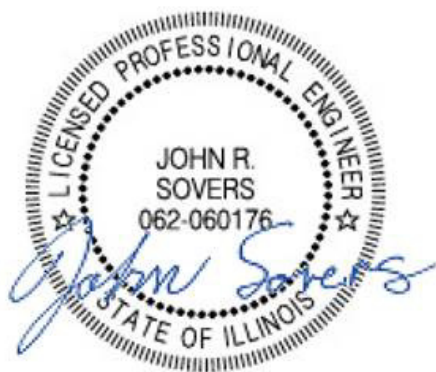
**May 2023**

# Project Manual

for

## Bid Proposal No. 23-01 Kautz Road Substation Procurement/Construction

### City of Geneva Geneva, Illinois



License Expiration Date: 11-30-2023  
Illinois Firm Registration No. 184-001533



License Expiration Date: 11-30-2023



License Expiration Date: 11-30-2024

**February 15, 2023**



A Stanley Group Company  
Engineering, Environmental and Construction Services - Worldwide

BID PROPOSAL NO. 23-01  
KAUTZ RAOD SUBSTATION  
PROCUREMENT/CONSTRUCTION

CITY OF GENEVA  
GENEVA, ILLINOIS

**PROCUREMENT AND CONTRACTING REQUIREMENTS GROUP**

DIVISION 00      PROCUREMENT AND CONTRACTING REQUIREMENTS

Resp. Charge	Document	Title	Page
JRS	00 01 15	Drawing List	1
JRS	00 52 13	Agreement between Owner and Contractor –	
JRS		EJCDC C-520 (2013 Edition)	1 to 6
		Exhibit A	1 to 23
JRS	00 61 13-13	Performance Bond – EJCDC C-610 (2013 Edition)	1 to 3
JRS	00 61 13-16	Payment Bond – EJCDC C-615 (2013 Edition)	1 to 3
JRS	00 72 13	Standard General Conditions of the Construction Contract –	
JRS		EJCDC C-700 (2013 Edition)	1 to 38
JRS	00 73 00	Supplementary Conditions – EJCDC C-800 (2013 Edition)	1 to 14
	00 91 13	Addendum No. 1 03-01-2023	1 to 6
	00 91 13	Addendum No. 2 03-20-2023	1 to 2

**SPECIFICATIONS GROUP**

**GENERAL REQUIREMENTS SUBGROUP**

Resp. Charge	Section	Title	Page
DIVISION 01      GENERAL REQUIREMENTS			
JRS	01 11 00	Summary of Work	1 to 2
JRS	01 20 00	Price and Payment Procedures	1 to 3
JRS	01 25 13	Product Substitutions Procedures	1 to 2
JRS		Product Substitution Request Form	1
JRS	01 30 00	Administrative Requirements	1 to 3
JRS	01 32 00	Construction Progress Documentation	1 to 2
JRS	01 33 00	Submittal Procedures	1 to 6
JRS		Submittal Transmittal Form	1
JRS	01 43 30	Welding Qualifications	1
JRS	01 43 33	Manufacturer's Field Services	1
JRS	01 45 29	Testing Laboratory Services	1 to 3
JRS	01 50 00	Temporary Facilities and Controls	1 to 4
JRS	01 60 00	Product Requirements	1 to 3
JRS	01 70 00	Execution and Closeout Requirements	1
JRS	01 78 23	Operating and Maintenance Data	1 to 4
		Operating and Maintenance Manual Cover Diagram	1

**FACILITY CONSTRUCTION SUBGROUP**

DIVISION 03      CONCRETE			
NJP	03 00 10	Concrete Work	1 to 11
NJP	03 45 00	Precast Concrete Wall	1 to

DIVISION 05	METALS		
JLV	05 50 00	Metal Fabrications	1 to 4

DIVISION 13	SPECIAL CONSTRUCTION		
JRS	13 34 23-26	Fabricated Substation Control Building	1 to 15

#### **FACILITY SERVICES SUBGROUP**

DIVISION 26	ELECTRICAL		
JRS	26 05 00	Common Work Results for Electrical	1 to 11
JRS	26 13 13	Medium-Voltage Metal-Clad Switchgear	1 to 22

#### **SITE AND INFRASTRUCTURE SUBGROUP**

DIVISION 31	EARTHWORK		
GSS	31 22 00	Grading	1 to 3
NJP	31 23 16-16	Structural Excavation and Backfill	1 to 6

DIVISION 32	EXTERIOR IMPROVEMENTS		
GSS	32 15 00	Aggregate Surfacing	1
GSS	32 92 19	Seeding	1 to 4

DIVISION 33	UTILITIES		
JRS	33 71 49	Medium-Voltage Cable and Accessories	1 to
JRS	33 72 25	Distribution Substation Equipment	1 to 13
NJP	33 72 26	Substation Structures, Buses, and Insulators	1 to 12
JRS	33 73 17	Medium Power Transformers	1 to 23
JRS	33 79 00	Grounding and Bonding for Electrical Systems	1 to 4

Drawing No.	Title	Rev. No.
GG01	COVER SHEET AND DRAWING INDEX	A
CG01	GRADING PLAN	A
EO01	ONE-LINE DIAGRAM SHEET 1	A
EO02	ONE-LINE DIAGRAM SHEET 2	A
EO03	KAUTZ ROAD COMMUNICATION ONE-LINE	A
EP01	GENERAL ARRANGEMENT	A
EP02	12.47kV SWITCHGEAR BUILDING EQUIPMENT LAYOUT	A
EP03	12.47kV SWITCHGEAR PANEL ELEVATIONS	A
EP04	GROUNDING PLAN	A
EP05	UNDERGROUND CONDUIT AND FOUNDATION PLAN	A
EP06	ELEVATION	A
EP07	BILL OF MATERIAL	A
SF01	FOUNDATION PLAN	A
SF02	FOUNDATION DETAILS AND SCHEDULE	A
SF03	TRANSFORMER FOUNDATION	A
SF04	OIL SEPARATOR TANK	A
SF05	SWITCHGEAR FOUNDATION	A

**THIS AGREEMENT** is by and between City of Geneva, Illinois (Owner) and Haugland Energy, LLC. (Contractor). Owner and Contractor hereby agree as follows:

#### **ARTICLE 1 - WORK**

1.1 Contractor shall furnish the Goods and Special Services for and complete all Work as specified or indicated in the Contract Documents. The Work is generally procurement and construction of new Kautz Road Substation.

#### **ARTICLE 2 - THE PROJECT**

2.1 The Project for which Goods and Special Services and Work under the Contract Documents may be the whole or only a part is generally described as Kautz Road Substation.

#### **ARTICLE 3 - ENGINEER**

3.1 The Project has been designed by Stanley Consultants, Inc.

3.2 The Owner has retained Stanley Consultants, Inc. (Engineer) to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the furnishing of Goods and Special Services and completion of the Work in accordance with the Contract Documents.

#### **Article 4. POINT OF DESTINATION**

4.1 The place where the Goods are to be delivered is defined in the General Conditions as the Point of Destination and is designated as: Kautz Road Substation (approximate address: 2000 South Kautz Road, Geneva, IL 60134).

#### **ARTICLE 5 - CONTRACT TIMES**

5.1 *Time of the Essence.* All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

5.2 *Contract Times: Dates.* The Work will be substantially completed on or before May 31, 2025, and completed and ready for final payment in accordance with paragraph 15.06 of the General Conditions on or before July 31, 2025.

5.3 *Milestones.* Equipment procurement may start within 21 days after Notice to Proceed.

5.4 The City shall be notified 48 hours prior to any shipment of materials or equipment. Please contact Mr. Jose Ruiz at (630) 232-1503 during the hours of 7:00 am to 3:00 pm Monday through Friday.

5.5 Deliveries shall be made during City of Geneva Electric Utility business hours of 7:00 am to 11:30 am and 12:30 pm to 3:00 pm Monday through Friday.

5.4 *Liquidated Damages.* Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.1 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.2 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

- A. Substantial Completion: Contractor shall pay Owner \$750 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.2 above for Substantial Completion until the Work is substantially complete.
- B. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner \$750 for each day that expires after such time until the Work is completed and ready for final payment.



- C. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

5.6 *Special Damages.* In addition to the amount provided for liquidated damages, Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.

5.7 After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.

**ARTICLE 6 - CONTRACT PRICE**

6.1 Owner shall pay Contractor for furnishing the Goods and Special Services and for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

- A. For all Work, other than Unit Price Work, a Lump Sum of:

Six Million Three Hundred Eighty-Three Thousand Dollars (\$6,383,000.00).

Price includes:

Bonding for Material and Equipment only: \$26,000

- B. *Unit Adjustment Prices.* To adjust Lump Sum for changes from quantities required by Contract Documents.

Item No.	Description	Unit	Unit Adjustment Price
1.	Concrete	cubic yard	\$ 1,800.00
2.	Cut	cubic yard	\$ 25.00
3.	Fill	cubic yard	\$ 40.00
4.	Site services of Service Engineer	per day	\$ 3,125.00
5.	Transportation, travel time, and out-of-pocket expenses for travel of Service Engineer to Site	per round trip	\$ 1,500.00

**ARTICLE 7 - PAYMENT PROCEDURES**

7.1 *Submittal and Processing of Payments.* Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

7.2 *Progress Payments; Retainage.* Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the last day of each month during performance of the Work as provided in Paragraph 6.2.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

- A. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below, but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract:
  1. 90% percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been

satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and

2. 90% of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 90% of the Work completed, less such amounts set off by Owner pursuant to paragraph 15.01. E. of the General Conditions and less 10% of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

7.3 *Final Payment.* Upon final completion and acceptance of the Work in accordance with paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said paragraph 15.06.

#### **ARTICLE 8 - INTEREST**

8.1 All amounts not paid when due shall bear interest at the rate of 4% per annum.

#### **ARTICLE 9 - CONTRACTOR'S REPRESENTATIONS**

9.1 In order to induce Owner to enter into this Contract, Contractor makes the following representations:

- A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.
- B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. No site related reports are available for this project.

#### **ARTICLE 10 - CONTRACT DOCUMENTS**

10.1 *Contents:* The Contract Documents consist of the following:

- A. This Agreement (pages 1 to 5, inclusive).
- B. Exhibits to this agreement (pages 1 to 21, inclusive).
- C. Performance Bond (pages 1 to 3, inclusive).
- D. Payment Bond (pages 1 to 3, inclusive).
- E. General Conditions (pages 1 to 38, inclusive).
- F. Supplementary Conditions (pages 1 to 12, inclusive).
- G. Specifications as listed in Project Manual table of contents.
- H. Drawings as listed on the Drawing List.
- I. Addenda numbers 1 to 2, inclusive.
- J. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:

1. Notice to Proceed.
2. Instructions to Contractors.
3. Change Orders.
4. Field Orders.

10.2 The documents listed in paragraph 9.1 are attached to this Agreement (except as expressly noted otherwise above).

10.3 There are no Contract Documents other than those listed above in this Article 9.

10.4 The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

#### **ARTICLE 11 - MISCELLANEOUS**

11.1 *Terms.* Terms used in this Agreement will have the meanings indicated in the General Conditions and the Supplementary Conditions.

11.2 *Assignment of Contract.* Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

11.3 *Successors and Assigns.* Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

11.4 *Severability.* Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

11.5 *Contractor's Certification.* Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.5:

- A. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
- B. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
- C. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
- D. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

11.6 *Other Provisions.* Owner stipulates that the General Conditions that are made a part of this Contract are based on EJCDC® C-700, Standard General Conditions for the Construction Contract, published by the Engineers Joint Contract Documents Committee®, and Owner is the party that has furnished said General Conditions, and has

plainly shown all modifications to the standard wording of such published document to the Contractor in the Supplementary Conditions.

**IN WITNESS WHEREOF**, Owner and Contractor have signed this Agreement. This Agreement will be effective on \_\_\_\_\_, 20\_\_ (which is the Effective Date of the Agreement).

**OWNER:**

**CONTRACTOR:**

\_\_\_\_\_

\_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

*(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*

Attest \_\_\_\_\_

Attest \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

Address for giving notices:

Address for giving notices:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

*(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Owner-Contractor Agreement.)*

License No. \_\_\_\_\_

*(Where applicable)*

END OF DOCUMENT

KAUTZ ROAD SUBSTATION PROCUREMENT/CONSTRUCTION 23-01  
3/27/23

***Contractor license response:***

A contractor license will be obtained prior to official award, if applicable.



336 S. Service Road  
Melville, NY 11747  
516.336.6720

[hauglandgroup.us](http://hauglandgroup.us)

## CONSENT RESOLUTION OF HAUGLAND ENERGY GROUP LLC

The undersigned, on behalf of Haugland Energy Group LLC, a Delaware limited liability company (the “**Company**”), hereby consents to and adopts, on March 22, 2023, the following resolution:

WHEREAS, the Company desires to enter a Bid Submission (“Bid”) with the City of Geneva, IL.

NOW, THEREFORE, BE IT RESOLVED, that the Company hereby authorizes Michael Riello, in his capacity as Executive Vice President of the Company, to sign the Bid on behalf of the Company for the Company to submit a Bid for the Kautz Road Substation Procurement / Construction Project in the City of Geneva, IL.

IN WITNESS WHEREOF, the undersigned has executed this Consent as of the date first written above.

The undersigned, as the sole managing member of Haugland Energy Group LLC, a Delaware limited liability company, does hereby consent in lieu of meeting, to the adoption of this resolution effective as of March 22, 2023.



\_\_\_\_\_  
William J. Haugland

DCEO Grant # 22-911003

BEP Utilization Goal: 25% (MBE 20% / WBE 5%)

## BEP UTILIZATION PLAN

### **Minority, Female, Persons with Disability Status and Subcontracting**

The Business Enterprise Program Act for Minorities, Females, and Persons with Disabilities (BEP) (30 ILCS 5757) establishes a goal for contracting with businesses that have been certified as owned and controlled by persons who are minority, female or who have disabilities.

**Goal to be achieved by the Grantee:** This Utilization Plan (UP) includes a specific Business Enterprise Program (BEP) utilization goal based on the availability of certified vendors to perform the anticipated direct subcontracting opportunities of this plan. **The UP must demonstrate that the Grantee has either met the UP goal or that it has made good faith efforts to do so.**

At the time of proposal submission, the certified vendor may not yet be certified with the CMS Business Enterprise Program; however, the proposed vendor must meet the eligibility requirements and be fully certified in the BEP before Grant award. Visit [http://www.sell2.illinois.gov/bep/business\\_enterprise.htm](http://www.sell2.illinois.gov/bep/business_enterprise.htm) for complete requirements and to apply for certification in the BEP.

**Certified Vendor Locator References:** Grantees may consult CMS' BEP Certified Vendor Directory at <https://cms.diversitycompliance.com/>, as well as the directories of other certifying agencies, but subcontracting vendors must be certified by CMS as BEP vendors before the time of award.

**Grantee Assurance:** The Grantee shall not discriminate on the basis of race, color, national origin, sexual orientation or sex in the performance of this plan. Failure by the Grantee to carry out these requirements is a material breach of this plan, which may result in the termination of the Grant Agreement or such other remedy, as the Agency/Grantor deems appropriate. **This assurance must be included in each contract that the Grantee signs with a contractor, subcontractor or supplier.**

**Calculating Certified Vendor Participation:** The UP should include the work anticipated to be performed by all certified vendors and paid for upon satisfactory completion. Only the value of payments made for the work actually performed by certified BEP vendors is counted toward the plan goal. Counting guidelines are summarized below:

1. The value of the work actually performed by the certified vendor shall be counted towards the goal. The entire amount of that portion the Grant Agreement that is performed by the certified vendors, including supplies purchased or equipment leased by the BEP vendor shall be counted except supplies purchased and equipment rented from the Grantee.
2. A joint venture shall count toward the portion of the total dollar value of the Grant Agreement equal to the distinct, clearly defined portion of the work of the Grant Agreement that the certified vendor performs with its forces toward the goal. A joint venture shall also count the dollar value of work subcontracted to other certified vendors. Work performed by the forces of a non-certified joint venture partner shall not be counted toward the goal.
3. When a certified vendor subcontracts part of the work to another firm, the value of the subcontracted work shall be counted toward the Grant Agreement goal only if the certified vendor's subcontractor is also certified. Work that a certified vendor subcontracts to a non-certified vendor will NOT count towards the goal.
4. A Grantee shall count towards the goal 100% of its expenditure for materials and supplies required under the Grant Agreement when obtained from a certified vendor manufacturer, regular dealer, or supplier.
5. A Grantee shall count towards the goal the following expenditures to certified vendors that are not manufacturers, regular dealers, or suppliers:
  - a. The fees or commissions charged for providing a bona fide service, such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment, materials, or supplies required for the performance of the Grant Agreement, provided that the fee or commission is determined by the Agency/Grantor to be reasonable and not excessive as compared with fees customarily allowed for similar services.
  - b. The fees charged for delivery of materials and supplies required by the Grant Agreement (but not the cost of the materials and supplies themselves) when the hauler, trucker or delivery service is also not the manufacturer of or a regular dealer in the materials and supplies provided that the fee is determined by the Agency/Grantor to be reasonable and not excessive as compared with fees customarily allowed for similar services. The certified vendor trucking firm must be responsible for the management and supervision of the entire trucking operation for which it is responsible and must itself own and operate at least one fully licensed, insured, and operational truck used on the project.



DCEO Grant # 22-911003

BEP Utilization Goal: 25% (MBE 20% / WBE 5%)

- c. The fees or commissions charged for providing any bonds or insurance specifically required for the performance on the project, provided that the fee or commission is determined by the Agency/Grantor to be reasonable and not excessive as compared with fees customarily allowed for similar services.
- 6. A Grantee shall count towards the goal only expenditures to firms that perform a commercially useful function in the work of the Grant Agreement.
  - a. A firm is considered to perform a commercially useful function when it is responsible for execution of a distinct element of the work on the project and carries out its responsibilities by actually performing, managing, and supervising the work involved. The certified vendor must also be responsible, with respect to materials or supplies used on the project, for negotiating price, determining quality and quantity, ordering the materials or supplies, and installing the materials (where applicable and paying for the materials or supplies. To determine whether a firm is performing a commercially useful function, the Agency/Grantor shall evaluate the amount of work subcontracted, whether the amount the firm is to be paid under this plan is commensurate with the work it is actually performing and the certify claimed for its performance of the work, industry practices, and other relevant factors.
  - b. A certified vendor does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction through which funds are passed in order to obtain certain vendor participation. In determining whether a certified vendor is such an extra participant, the Agency/Grantor shall examine similar transactions, particularly those in which certified vendor do not participate, and industry practices.
- 7. A Grantee shall not count towards the goal expenditures that are not direct, necessary and proximately related to the work of this plan. Only the amount of services or goods that are directly attributable to the performance of the scope of work shall be counted. Ineligible expenditures include general office overhead or other Grantee support activities.

City of Geneva (Grantee) submits the following Utilization Plan as part of our proposal in accordance with the requirements of the Business Enterprise Program Act for Minorities, Females, and Persons with Disabilities (ACT) (30 ILCS 575). We understand that compliance with this Act is a required part of this plan.

City of Geneva (Grantee) makes the following assurance and agrees to include the assurance in each contract with a contractor, subcontractor, or supplier utilized on this plan: We shall not discriminate on the basis of race, color, national origin, sexual orientation, or sex in the performance of this plan. Failure to carry out these requirements is a material breach of this plan, which may result in the termination of this plan or such other remedy, as the Agency/Grantor deems appropriate.

**Grantee's persons responsible for compliance:**


Name Alanna Wynne

Title MWDBE Manager

Telephone 516-336-6720

Email awynne@gracecivil.com

- We are certified (or are eligible and have applied to be certified) with BEP and plan to fully meet the BEP utilization goal through self-performance
- We attach Section I to demonstrate our Plan fully meets the BEP utilization goal of 25% through subcontracting.
- We attached Section I to detail that we do not fully meet the BEP utilization goal. We also attach Section II, Demonstration of Good Faith Efforts.

  
 \_\_\_\_\_ 3/27/23  
 Authorized Official's Signature Date

DCEO Grant # 22-911003

BEP Utilization Goal: 25% (MBE 20% / WBE 5%)

Section I
Utilization of Certified Vendors
(Submit a separate Section for each proposed certified vendor)

The City of Geneva's (Grantee) DCEO Rebuild Illinois grant totaling \$1,270,017.00 is subject to a BEP utilization goal of 25% (MBE 20% / WBE 5%), which requires, a total of \$317,504.25 be used for direct subcontracting to BEP certified minority-owned and women-owned businesses for completion of the grant-funded project.

To achieve the BEP utilization goal through subcontracting, the following is proposed:

- 1. The proposed certified vendor's company name, address, and phone number:

Forefront Electrical Testing
1447 Howard Street
Elk Grove Village, IL 60007

At the time of submission, the above vendor is:

- [X] Certified with the CMS Business Enterprise Program (BEP) as a MBE or WBE or WMBE (circle one).
[] \*Certified with [ ], a Reciprocal Certification Agency and submitted an application to CMS BEP.
[] \*Meets the criteria and has submitted an application for certification with BEP. Application # [ ]

- 2. A detailed description of the commercially useful work to be done by this certified vendor is as follows:

Electrical testing of all equipment & cables

- 3. The total estimated cost to the state for the Grant Agreement is \$1,270,017.00. The portion of the Grant Agreement which will be contracted/subcontracted to this certified vendor is \$ 41,770.00, or 3 % of the total cost of the Grant Agreement.

- 4. A joint venture agreement is not required, as the arrangement between Haugland Energy LLC and Forefront Electrical Testing is that of contractor/sub-contractor and not a joint venture.

- 5. The Grantee has not prohibited or otherwise limited Forefront Electrical Testing (certified vendor) from providing contractor/sub-contractor quotes to other potential bidders/Grantees.

We understand the Agency/Grantor may require additional information to verify our compliance and we agree to cooperate immediately in submitting to interviews, allowing entry to any of our office locations, providing further documentation, or soliciting the cooperation of our proposed certified vendor. We will maintain appropriate records relating to our utilization of the certified vendor, including invoices, cancelled checks, books of account, and time records.

[Signature]
Authorized Signature
3/27/23
Date

\*Must be certified with CMS BEP prior to entering into a contract for BEP Utilization credit.



DCEO Grant # 22-911003

BEP Utilization Goal: 25% (MBE 20% / WBE 5%)

**Section I**  
**Utilization of Certified Vendors**  
*(Submit a separate Section for each proposed certified vendor)*

The City of Geneva's (Grantee) DCEO Rebuild Illinois grant totaling \$1,270,017.00 is subject to a BEP utilization goal of 25% (MBE 20% / WBE 5%), which requires, a total of \$317,504.25 be used for direct subcontracting to BEP certified minority-owned and women-owned businesses for completion of the grant-funded project.

To achieve the BEP utilization goal through subcontracting, the following is proposed:

1. The proposed certified vendor's company name, address, and phone number:

MBE Fence, Inc.  
 \_\_\_\_\_  
 35340 Rockwell St, Unit #101  
 \_\_\_\_\_  
 Warrenville, IL 60555  
 \_\_\_\_\_  
 708-223-5700  
 \_\_\_\_\_

At the time of submission, the above vendor is:

- Certified with the CMS Business Enterprise Program (BEP) as a MBE or WBE or WMBE (*circle one*).
- \*Certified with \_\_\_\_\_, a Reciprocal Certification Agency and submitted an application to CMS BEP.
- \*Meets the criteria and has submitted an application for certification with BEP. Application # \_\_\_\_\_.

2. A detailed description of the commercially useful work to be done by this certified vendor is as follows:

Furnish & Install Pre cast concrete fence

3. The total estimated cost to the state for the Grant Agreement is \$1,270,017.00. The portion of the Grant Agreement which will be contracted/subcontracted to this certified vendor is \$301,170.00, or 24 % of the total cost of the Grant Agreement.

4. A joint venture agreement is not required, as the arrangement between Haugland Energy LLC and MBE Fence, Inc is that of contractor/sub-contractor and not a joint venture.

5. The Grantee has not prohibited or otherwise limited MBE Fence, Inc (certified vendor) from providing contractor/sub-contractor quotes to other potential bidders/Grantees.

We understand the Agency/Grantor may require additional information to verify our compliance and we agree to cooperate immediately in submitting to interviews, allowing entry to any of our office locations, providing further documentation, or soliciting the cooperation of our proposed certified vendor. We will maintain appropriate records relating to our utilization of the certified vendor, including invoices, cancelled checks, books of account, and time records.

 3/27/23  
 Authorized Signature Date

*\*Must be certified with CMS BEP prior to entering into a contract for BEP Utilization credit.*

DCEO Grant # 22-911003

**\*NOT APPLICABLE**

BEP Utilization Goal: 25% (MBE 20% / WBE 5%)

### Section II

## Demonstration of Good Faith Efforts to Achieve BEP Contracting/Subcontracting Goal

If the BEP contracting/sub-contracting goal was not achieved, the Good Faith Efforts Checklist (Section IIA) and Contacts Log (Section IIB) must be submitted with the solicitation response (or as otherwise specified by Central Management Services (CMS). The Grantee will promptly provide evidence whether hard copy or via electronic format in support of its Good Faith Efforts to CMS/BEP upon request.

### Section II A

#### Good Faith Efforts Checklist

Insert in each box below the initials of the authorized Grantee representative who is certifying on behalf of the Grantee that the Grantee has completed the corresponding activity described. If any of the items below were not completed, attach a detailed written explanation why each such item was not completed. If any other efforts were made to obtain BEP participation in addition to the items listed below, attach a detailed written explanation.

- Utilized the website: <https://cms.diversitycompliance.com> to identify BEP certified vendors within the respective NIGP code(s) on the solicitation documents. At a minimum, email all listed vendors with project specifications sufficient to build a quote, then solicit quotes from all vendors who express an interest with follow-up emails and telephone calls. Documentation of these efforts must be submitted as evidence, including copies of all emails sent.
- Identified portions of the project work capable of performance by available BEP vendors, including where appropriate, breaking out Grant Agreement work items into economically feasible units to facilitate BEP participation even when the Grantee could perform those scopes with its own forces.
- Solicited through all reasonable and available means (written notices, advertisements) the interest of BEP certified vendors that have the capability to perform the work of the contract with sufficient time to allow for response.
- Provided timely and adequate information about the plans, specifications, and requirements of the Grant Agreement. Followed-up initial solicitations to answer questions and encourage BEP vendors to submit proposals or bids.
- Negotiated in good faith with interested BEP vendors that submitted proposals or bids and thoroughly investigated their capabilities.
- Made efforts to assist interested BEP vendors in obtaining bonding, lines of credit, or insurance as may be required for performance of the Grant Agreement (if applicable).
- Utilized resources available to identify available certified vendors, including but not limited to BEP assistance staff; local, state, and federal minority or women business assistance offices; and other organizations that provide assistance in the recruitment and placement of diverse businesses.

  
Authorized Signature

3/27/23  
Date



## ATTACHMENT A

## CERTIFICATION OF COMPLIANCE

The undersigned hereby certifies as follows:

1. That he has the authority and consent to make this certification on behalf of the bidder,  

HAUGLAND ENERGY LLC  
 (Name of Company)
2. That he has knowledge of the City of Geneva Codes pertaining to the disqualification of certain bidders.
3. That he knows that the bidder listed above is not disqualified from bidding under the aforementioned sections.
4. That he has knowledge of the City of Geneva ordinances relating to Fair Employment Practices and knows and understands the contents thereof; he certifies hereby that it is the policy of the bidder to recruit, hire, train, upgrade, promote, and discipline its employees without regard to race, creed, color, religion, age, sex, or physical or mental impairment.
5. That said bidder is not barred from bidding on the aforementioned contract as a result of a violation of Sections 33E-3 or 33E-4 of Chapter 38 of the Illinois Revised Statutes, 1989.
6. That pursuant to Chapter 24, Section 11-42.1-1 of the Illinois Revised Statutes, the bidder is not delinquent in the payment of any taxes administered by the Department of Revenue.
7. That the contractor (either as an individual or company) agrees to provide a drug free workplace as provided for by the Public Act 86-1459.
8. That all work under this contract shall comply with the Occupational Safety and Health Act (OSHA) of 1975, and all other Federal, State, or Local statutes, rules, or regulations including all City of Geneva Safety Procedures affecting the work done under the contract.
9. That all work done in Kane County, Illinois under this contract shall comply with the Prevailing Wage Rate Act of the State of Illinois, County of Kane, Illinois Revised Statutes, 1987, Chapter 48, par 39s-1, et. seq. and as amended by Public Acts 86-799 and 86-693, in effect at the time work is performed.

ATTACHMENT A (continued)

By submission of this bid, I certify that the bid has been arrived at independently and has been submitted without collusion between or among any vendor of materials, supplies, equipment, or services.

HAUGLAND ENERGY LLC  
 Name of Corporation, Partnership, or Proprietor

336 S SERVICE RD  
 Address

<u>MELVILLE</u>	<u>NY</u>	<u>11747</u>
City	State	Zip

516-336-6720  
 Telephone

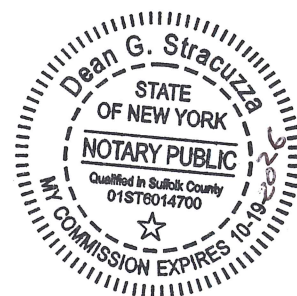
*[Signature]*  
 Authorized Signature/Title

SUBSCRIBED AND SWORN to before me

this 24 day of MARCH, 2023.

[Signature]  
 Notary Public

My commission expires: 10/19/26





Contractor Name	Trade	Contact	E mail	Phone	Minority
Concord Excavating	Civil Contractor	Brian Kubinski	<a href="mailto:brian@concordexcavating.net">brian@concordexcavating.net</a>	(815) 341-4392	Yes -WBE
Utility Industrial Concrete	Concrete	Bob Nash	<a href="mailto:RNASH@UANDICC.COM">RNASH@UANDICC.COM</a>	(708) 243-0983	No
CJ Drilling	Civil Contractor	Dominic Guida	<a href="mailto:dguida@cidrilling.com">dguida@cidrilling.com</a>	(847) 858-9792	Yes - WBE (Nationally)
Forefront Electrical Testing	Electrical testing	Brian Richmond	<a href="mailto:brian@forefronttesting.com">brian@forefronttesting.com</a>	(630) 484-8297	Yes -WBE
MBE Fence	Fencing	Mary Young	<a href="mailto:mbefence@gmail.com">mbefence@gmail.com</a>	(708) 800-6008	Yes -MBE/WBE/DBE
Dude Electrical Testing	Electrical testing	Scott Dude	<a href="mailto:scott.dude@dudetesting.com">scott.dude@dudetesting.com</a>	(815) 293-3388	Yes - VOSB
PowerCom	Electrical testing	Jim Murray II	<a href="mailto:info@powercom-corp.com">info@powercom-corp.com</a>	(847) 540-2394	Yes DBE(MBE) SDVOSB
RESA Power	Electrical testing	Mike Trujillo	<a href="mailto:mike.Trujillo@resapower.com">mike.Trujillo@resapower.com</a>	(704) 658-7278	No
Zlinc	Landscaping	Brenda Zeiter	<a href="mailto:zlinc2@aol.com">zlinc2@aol.com</a>	(1815) 693-6468	Yes -WBE/MBE

<u>Contractor Name</u>	<u>Trade</u>	<u>Contact</u>	<u>E mail</u>	<u>Phone</u>	<u>Minority</u>
Wesco/Anixter	Substation Equip/Material Supply	Cody Corr	<a href="mailto:ccoor@wesco.com">ccoor@wesco.com</a>	(630) 234-7163	No
Switchgear Solutions LTD	Substation Equip/Material Supply	Andres Gracia	<a href="mailto:andreg@ssllynj.com">andreg@ssllynj.com</a>	(732) 874-0281	No for II; YES MBE in NY/NJ
SEC Electrical Equipment Sales	Substation Transformer Only	Todd Millpointer	<a href="mailto:todd@secees.com">todd@secees.com</a>	(262) 443-0156	No

ITEM #	QTY	UOM	DESCRIPTION	MFG	CAT. NO.	EST. LEAD TIME FOR SHIPMENT
<b>PROJECT TOTAL:</b>						
<b>STRUCTURES:</b>						
S1	1	EA	34.5KV, H-FRAME DEADEND, 16FT COLUMN SPACING, 21'-8" LINE TAKE-OFF, 7FT SHIELD MAST, 4FT PHASE SPACING, ARRESTER MTG ON PULL-OFF BEAM (HORIZONTAL MTG), SWITCH MOUNTING (HORIZONTAL) AT 11'-9 5/8"	WESCO GRID SERVICES	STR-S1	38 - 40 WEEKS AFTER DWG APPROVAL
S1A	2	EA	ANCHOR BOLT CAGE, SIZED AS REQUIRED BY DESIGN	WESCO GRID SERVICES	CAGE-S1A	10 - 12 WEEKS AFTER DWG APPROVAL
S2	4	EA	30FT SHIELD MAST, ATTACHMENT AT 30FT, LUMINAIRE MOUNTING AT 25FT	WESCO GRID SERVICES	STR-S2	38 - 40 WEEKS AFTER DWG APPROVAL
S2A	4	EA	ANCHOR BOLT CAGE, SIZED AS REQUIRED BY DESIGN	WESCO GRID SERVICES	CAGE-S2A	10 - 12 WEEKS AFTER DWG APPROVAL
S3	1	EA	34.5KV, VT STAND, 3-PHASE, 1-COLUMN, 4FT PHASE SPACING, 8FT STAND HEIGHT	WESCO GRID SERVICES	STR-S3	14 - 16 WEEKS AFTER DRAWING APPROVAL
TP1	1	EA	ANCHOR BOLT SETTING TEMPLATE, PL-16"X1/4"X1'-4" (A36) WITH (4) 1 1/8" DIA. HOLES SPACED 12" X 12", (1) 8" DIA. HOLE IN CENTER. NO GALV. 18.1 LBS EACH	WESCO GRID SERVICES	ST08-12-16-04	6 - 8 WEEKS AFTER APPROVAL
AB1	4	EA	ANCHOR BOLT, STRAIGHT TYPE, 3/4" DIA. X 24" ASTM F1554 GRADE 36, WITH 5 1/2" THRD TOP, 1 1/2" THRD BOTTOM, (3) ASTM A563 HEAVY HEX NUTS, (3) ASTM F436 HARDENED FLAT WASHER (ALL GALV.) 3.78 LBS	WESCO GRID SERVICES	2B8	6 - 8 WEEKS AFTER APPROVAL
S4	1	EA	34.5KV, CT STAND, 3-PHASE, 1-COLUMN, 4FT PHASE SPACING, 10FT STAND HEIGHT	WESCO GRID SERVICES	STR-S4	14 - 16 WEEKS AFTER DRAWING APPROVAL
TP1	1	EA	ANCHOR BOLT SETTING TEMPLATE, PL-16"X1/4"X1'-4" (A36) WITH (4) 1 1/8" DIA. HOLES SPACED 12" X 12", (1) 8" DIA. HOLE IN CENTER. NO GALV. 18.1 LBS EACH	WESCO GRID SERVICES	ST08-12-16-04	6 - 8 WEEKS AFTER APPROVAL
AB1	4	EA	ANCHOR BOLT, STRAIGHT TYPE, 3/4" DIA. X 24" ASTM F1554 GRADE 36, WITH 5 1/2" THRD TOP, 1 1/2" THRD BOTTOM, (3) ASTM A563 HEAVY HEX NUTS, (3) ASTM F436 HARDENED FLAT WASHER (ALL GALV.) 3.78 LBS <span style="color: red;">14FT</span>	WESCO GRID SERVICES	2B8	6 - 8 WEEKS AFTER APPROVAL
S5	1	EA	34.5KV, SWITCH STAND, 16FT COLUMN SPACING, 4FT PHASE SPACING, 13'-9 5/8" STAND HEIGHT	WESCO GRID SERVICES	STR-S5	14 - 16 WEEKS AFTER DRAWING APPROVAL
TP1	2	EA	ANCHOR BOLT SETTING TEMPLATE, PL-16"X1/4"X1'-4" (A36) WITH (4) 1 1/8" DIA. HOLES SPACED 12" X 12", (1) 8" DIA. HOLE IN CENTER. NO GALV. 18.1 LBS EACH	WESCO GRID SERVICES	ST08-12-16-04	6 - 8 WEEKS AFTER APPROVAL
AB1	8	EA	ANCHOR BOLT, STRAIGHT TYPE, 3/4" DIA. X 24" ASTM F1554 GRADE 36, WITH 5 1/2" THRD TOP, 1 1/2" THRD BOTTOM, (3) ASTM A563 HEAVY HEX NUTS, (3) ASTM F436 HARDENED FLAT WASHER (ALL GALV.) 3.78 LBS	WESCO GRID SERVICES	2B8	6 - 8 WEEKS AFTER APPROVAL
S6	1	EA	TRANSFORMER OIL CONTAINMENT PIT STEEL WITH GRATING, PER DWG SF03 REV. B	WESCO GRID SERVICES	STR-S6	14 - 16 WEEKS AFTER DRAWING APPROVAL
S7	3	EA	GROUND MAT, 3FT X 4FT X 1", 1" X 3/16" BARING BARS 1 3/16" O.C., CROSS BARS 4" O.C., WITH 1/4" BANDING, (4) 2-HOLE NEMA PADS, APPROX. WGT 98.4 LBS GALV.	WESCO GRID SERVICES	GM34-04-000	8 - 10 WEEKS AFTER APPROVAL
<b>STRUCTURES TOTAL:</b>						
<b>ENGINEERING SERVICES:</b>						
ES1	1	LOT	STRUCTURE DESIGN CALCULATIONS, TAPERED STRUCTURES, <b>ILLINOIS PE STAMP</b>	<b>PROVIDED WITH STRUCTURE</b>		6 - 8 WEEKS AFTER ALL REQ'D INFO
ES2	1	LOT	STRUCTURE DESIGN CALCULATIONS, STANDARD SHAPE STRUCTURES, <b>ILLINOIS PE STAMP</b>	WESCO GRID SERVICES	STR-CALCS	8 - 9 WEEKS AFTER ALL REQ'D INFO
ES3	1	LOT	ANCHOR BOLT PLAN, WITH ANCHOR BOLT & SETTING PLATE DETAILS, <b>ILLINOIS PE STAMP</b>	WESCO GRID SERVICES	AB-PLAN	1 - 2 WEEKS AFTER CALC. APPROVAL
ES4	1	LOT	STRUCTURE FABRICATION & ERECTION DRAWINGS - TAPERED STRUCTURES, <b>ILLINOIS PE STAMP</b>	<b>PROVIDED WITH STRUCTURE</b>		6 - 8 WEEKS AFTER CALC. APPROVAL

ITEM #	QTY	UOM	DESCRIPTION	MFG	CAT. NO.	EST. LEAD TIME FOR SHIPMENT
ES5	1	LOT	STRUCTURE FABRICATION & ERECTION DRAWINGS - STANDARD SHAPE STRUCTURES, <b>ILLINOIS PE STAMP</b>	WESCO GRID SERVICES	STR-DWGS	2 - 3 WEEKS AFTER AB PLAN APPROVAL
ES6	1	LOT	ANY ENGINEERING SERVICES OR DRAWINGS NOT LISTED ABOVE	<b>PROVIDED BY OTHERS</b>		-----
<b>EQUIPMENT:</b>						
A1	1	EA	CLASS I, MEDIUM POWER TRANSFORMER, 34.5-12.47KV W/LTC, 12/16/20 MVA, PER SPECIFICATION 28606.01.00; SECTION 33 73 17	WEG	POWER XFMR	90 - 95 WEEKS AFTER APPROVAL
A1.1	1	LOT	DELIVERY TO JOB SITE, COMPLETE WITH IMPACT RECORDERS, PER SPECIFICATION 28606.01.00; SECTION 33 73 17; 1.10	WESCO GRID SERVICES	DELIVERY - OFFLOADING	-----
A1.2	1	LOT	FIELD SERVICE PER SPECIFICATION 28606.01.00; SECTION 33 73 17; 3.04	WESCO GRID SERVICES	FIELD SERVICE	-----
A2	2	EA	ALDUTI-RUPTER LOAD BREAK SWITCH, MOTOR OPERATED, GANG OPERATED, UPRIGHT, 34.5KV, PORCELAIN, PER SPECIFICATION 28606.01.00; SECTION 33 72 25	S&C	135974R3; ED-59ER1	21 - 23 WEEKS AFTER APPROVAL
A2.1	44	EA	EQUIPMENT MOUNTING BOLT SET, HDG, HEX HEAD 1/2" DIA. X 2 1/2", (1) HEX NUT, (1) LOCK WASHER & (2) FLAT WASHERS, LENGTH VERIFIED AT TIME OF ORDER	WESCO GRID SERVICES	TYPE B	6 - 8 WEEKS AFTER APPROVAL
A3	1	EA	CIRCUIT SWITCHER, 69KV, 1200AMP, 48" PHASE SPACING, COMPLETE WITH STAND, PER SPECIFICATION 28606.01.00; SECTION 33 72 25	S&C	398436-E10	21 - 23 WEEKS AFTER APPROVAL
A3.1	1	EA	ANCHOR BOLT SETTING TEMPLATE, PL-26"X5/16"X2'-2" (A36) WITH (4) 1 5/8" DIA. HOLES SPACED 20" X 20", (1) 16" DIA. HOLE IN CENTER. NO GALV. 60.1 LBS EACH	WESCO GRID SERVICES	ST12-20-26-05	6 - 8 WEEKS AFTER APPROVAL
A3.2	4	EA	ANCHOR BOLT, STRAIGHT TYPE, 1 1/2" DIA. X 48" ASTM F1554 GRADE 36, WITH 7 1/2" THRD TOP, 2 1/2" THRD BOTTOM, (3) ASTM A563 HEAVY HEX NUTS, (3) ASTM F436 HARDENED FLAT WASHER (ALL GALV.) 29.60 LBS	WESCO GRID SERVICES	2B12	6 - 8 WEEKS AFTER APPROVAL
A4	3	EA	CURRENT TRANSFORMER, 34.5KV, 1200:5 MR, 200KV BIL, PER SPECIFICATION 28606.01.00; SECTION 33 72 25; 2.05	GE	757X030017	89 - 90 WEEKS AFTER APPROVAL
A4.1	12	EA	EQUIPMENT MOUNTING BOLT SET, HDG, HEX HEAD 1/2" DIA. X 2 1/2", (1) HEX NUT, (1) LOCK WASHER & (2) FLAT WASHERS, LENGTH VERIFIED AT TIME OF ORDER	WESCO GRID SERVICES	TYPE B	6 - 8 WEEKS AFTER APPROVAL
A4.2	1	EA	CURRENT TRANSFORMER JUNCTION BOX	WESCO GRID SERVICES	CT-J-BOX	8 - 9 WEEKS AFTER APPROVAL
A4.3	4	EA	EQUIPMENT MOUNTING BOLT SET, HDG, HEX HEAD 3/8" DIA. X 2", (1) HEX NUT, (1) LOCK WASHER & (2) FLAT WASHERS, LENGTH VERIFIED AT TIME OF ORDER	WESCO GRID SERVICES	TYPE Y	6 - 8 WEEKS AFTER APPROVAL
A5	3	EA	VOLTAGE TRANSFORMER, 34.5KV, 19,900:115V, 200KV BIL, PER SPECIFICATION 28606.01.00; SECTION 33 72 25; 2.06	GE	767X030002	30 - 32 WEEKS AFTER APPROVAL
A5.1	12	EA	EQUIPMENT MOUNTING BOLT SET, HDG, HEX HEAD 1/2" DIA. X 2 1/2", (1) HEX NUT, (1) LOCK WASHER & (2) FLAT WASHERS, LENGTH VERIFIED AT TIME OF ORDER	WESCO GRID SERVICES	TYPE B	6 - 8 WEEKS AFTER APPROVAL
A5.2	1	EA	VOLTAGE TRANSFORMER JUNCTION BOX	WESCO GRID SERVICES	VT-J-BOX	8 - 9 WEEKS AFTER APPROVAL
A5.3	4	EA	EQUIPMENT MOUNTING BOLT SET, HDG, HEX HEAD 3/8" DIA. X 2", (1) HEX NUT, (1) LOCK WASHER & (2) FLAT WASHERS, LENGTH VERIFIED AT TIME OF ORDER	WESCO GRID SERVICES	TYPE Y	6 - 8 WEEKS AFTER APPROVAL



**CITY OF GENEVA MUNICIPAL  
ELECTRIC UTILITY  
CITY OF GENEVA, KAUTZ SUBSTATION  
SUBMITTAL SCHEDULE**

ITEM #	QTY	UOM	DESCRIPTION	MFG	CAT. NO.	EST. LEAD TIME FOR SHIPMENT	
A6	3	EA	SURGE ARRESTER, STATION CLASS, 27KV RATING, 22KV MCOV, PER SPECIFICATION 28606.01.00: SECTION 33 72 25; 2.04	ABB	Q027SA022A	6 - 8 WEEKS AFTER APPROVAL	
A6.1	9	EA	EQUIPMENT MOUNTING BOLT SET, HDG, HEX HEAD 1/2" DIA. X 1 3/4", (1) HEX NUT, (1) LOCK WASHER & (2) FLAT WASHERS, LENGTH VERIFIED AT TIME OF ORDER	WESCO GRID SERVICES	TYPE M	6 - 8 WEEKS AFTER APPROVAL	
A7	6	EA	250W LED FLOODLIGHT, 120V, W/ MOUNTING BRACKET FOR POLE MOUNTING & PHOTOCCELL	WESCO GRID SERVICES	LIGHTING	8 - 10 WEEKS AFTER APPROVAL	
A8	2	EA	STATION SERVICE TRANSFORMER, 7.2KV-120/240V, 50KVA, PADMOUNT, SINGLE PHASE	WESCO GRID SERVICES	50KVA-SST	74 - 78 WEEKS AFTER APPROVAL	
A9	1	EA	17FT X 24'-8", CONTROL BUILDING AND SWITCHGEAR, PER SPECIFICATIONS 28606.01.00	POWELL	CONTROL HOUSE & SWGR	T.B.D.	
A9.1	1	LOT	DELIVERY TO JOB SITE	WESCO GRID SERVICES	DELIVERY	-----	
A9.2	1	LOT	FIELD SERVICE	WESCO GRID SERVICES	FIELD SERVICE	-----	
			<b>EQUIPMENT TOTAL:</b>				
			<b>BUS CONDUCTOR &amp; FITTINGS:</b>				
B1.1	120	FT	3" SPS, SCH 40, 6063-T6 ALUMINUM BUS, 3.500" OD, 0.216" WALL THK, 2040 AMPS, 3 PCS, 40' LONG, WRAPPED FOR EHV SHIPMENT	WESCO GRID SERVICES	A300SCH40X40	26 - 27 WEEKS AFTER APPROVAL	
B1.2	100	FT	266.8 KCMIL, 26/7 STR, BARE ACSR, "PARTRIDGE", 0.642" DIA., 457 AMPS @ 75 DEG. C, DAMPER CABLE, <b>PER SPEC. 28606.01.00; SECTION 33 72 26; 2.05; C</b>	WESCO GRID SERVICES	PARTRIDGE	6 - 8 WEEKS AFTER APPROVAL	
B2.1	100	FT	477 KCMIL, 26/7 STR, BARE ACSR, "HAWK", 0.858" DIA., 659 AMPS @ 75 DEG. C	WESCO GRID SERVICES	HAWK	6 - 8 WEEKS AFTER APPROVAL	
B3	3	EA	INCOMING OVERHEAD LINE (34.5KV) SUSPENSION INSULATORS, HARDWARE & DOUBLE TONGUE COMPRESSION DEADEND, <b>PER MEETING NOTES 02/28/2023; 5; C; i</b>	<b>PROVIDED BY OTHERS</b>		-----	
B3.1	6	EA	TERMINAL, ALUM, COMPRESSION, 477 KCMIL, 26/7 STR TO 2-HOLE PAD, 15 DEGREES	HUBBELL	JTF10	39 - 40 WEEKS AFTER APPROVAL	
B4.1	9	EA	TERMINAL, ALUM, COMPRESSION, 477 KCMIL, 26/7 STR TO 4-HOLE PAD	HUBBELL	CCLS883C	25 - 26 WEEKS AFTER APPROVAL	
B4.2	3	EA	TERMINAL, ALUM, COMPRESSION, 477 KCMIL, 26/7 STR ACSR, TO 4-HOLE PAD, 90 DEGREES	HUBBELL	CCLS883C90	25 - 26 WEEKS AFTER APPROVAL	
B4.3	3	EA	TEE, ALUM, COMPRESSION, 477 KCMIL, 26/7 STR ACSR, TO 4-HOLE PAD	HUBBELL	ORT2110C	25 - 26 WEEKS AFTER APPROVAL	
B4.4	6	EA	TERMINAL, ALUM, COMPRESSION, 477 KCMIL, 26/7 STR TO 2-HOLE PAD	HUBBELL	CCLS883B2	25 - 26 WEEKS AFTER APPROVAL	
B5.1	9	EA	TERMINAL, ALUM, WELDED, 3" SPS BUS TO 4-HOLE PAD, CENTERFORMED	HUBBELL	WSTF30CCF	25 - 26 WEEKS AFTER APPROVAL	
B5.2	9	EA	TERMINAL, ALUM, WELDED, 3" SPS BUS TO 4-HOLE PAD, CENTERFORMED, EXPANSION	HUBBELL	WTF30C	25 - 26 WEEKS AFTER APPROVAL	
B5.3	3	EA	TEE, ALUM, WELDED, 3" SPS BUS, TO 2-HOLE PAD	HUBBELL	WTTFR3060B2	25 - 26 WEEKS AFTER APPROVAL	
B6.1	2	EA	INCOMING OVERHEAD SHIELD LINE, HARDWARE & DOUBLE TONGUE COMPRESSION DEADEND, <b>PER MEETING NOTES 02/28/2023; 5; C; i</b>	<b>PROVIDED BY OTHERS</b>		-----	
B6.2	175	FT	3/8", 7 STR, EXTRA HIGH STRENGTH STEEL, GALV.	WESCO GRID SERVICES	3/8 EHS	6 - 8 WEEKS AFTER APPROVAL	
B6.3	4	EA	ANCHOR SHACKLE	HUBBELL	AS25L	3 - 4 WEEKS AFTER APPROVAL	



**CITY OF GENEVA MUNICIPAL  
ELECTRIC UTILITY  
CITY OF GENEVA, KAUTZ SUBSTATION  
SUBMITTAL SCHEDULE**

ITEM #	QTY	UOM	DESCRIPTION	MFG	CAT. NO.	EST. LEAD TIME FOR SHIPMENT
B6.4	4	EA	STRAIN CLAMP, 3/8 EHS	HUBBELL	SWDE46N	13 - 14 WEEKS AFTER APPROVAL
B7.1	1	LOT	ELECTRICAL JOINT COMPOUND	WESCO GRID SERVICES	COMPOUND	12 - 14 WEEKS AFTER APPROVAL
B7.2	180	EA	TERMINAL BOLT SET, STAINLESS STEEL, HEX HEAD 1/2" DIA. X 2 1/4", (1) HEX NUT, (1) LOCK WASHERS & (2) BELLEVILLE WASHER, LENGTH VERIFIED AT TIME OF ORDER	WESCO GRID SERVICES	TYPE E	6 - 8 WEEKS AFTER APPROVAL
<b>BUS CONDUCTOR &amp; FITTINGS TOTAL:</b>						
<b>CONDUIT &amp; RACEWAYS:</b>						
<b>ABOVE GRADE - STRUCTURE &amp; EQUIPMENT:</b>						
<b>POWER TRANSFORMER</b>						
C1.1	20	FT	CONDUIT, PVC, 4" SCH 40, 10FT LENGTHS	PRIME	59615-010	4 - 6 WEEKS AFTER APPROVAL
C1.2	4	EA	COUPLING, PVC CONDUIT, 4" EXPANSION	PRIME	EC2PC400	6 - 8 WEEKS AFTER APPROVAL
C1.3	4	EA	ADAPTER, BOX, PVC CONDUIT, 4"	PRIME	BA400	6 - 8 WEEKS AFTER APPROVAL
<b>34.5KV SWITCH</b>						
C2.1	10	FT	CONDUIT, PVC, 2", SCH 40, 10FT LENGTH	PRIME	59611-010	4 - 6 WEEKS AFTER APPROVAL
C2.2	2	EA	COUPLING, PVC CONDUIT, 2" EXPANSION	PRIME	EC2PC200	6 - 8 WEEKS AFTER APPROVAL
C2.3	2	EA	ADAPTER, BOX, PVC CONDUIT, 2"	PRIME	BA200	6 - 8 WEEKS AFTER APPROVAL
<b>34.5KV CT'S</b>						
C3.1	35	FT	CONDUIT, PVC, 2", SCH 40, 10FT LENGTH	PRIME	59611-010	4 - 6 WEEKS AFTER APPROVAL
C3.2	2	EA	COUPLING, PVC CONDUIT, 2" EXPANSION	PRIME	EC2PC200	6 - 8 WEEKS AFTER APPROVAL
C3.3	3	EA	ADAPTER, BOX, PVC CONDUIT, 2"	PRIME	BA200	6 - 8 WEEKS AFTER APPROVAL
C3.4	1	EA	2" LIQUIDTIGHT FITTING, 45 DEGREE, BOX CONNECTOR ELBOW	OZ GEDNEY	4Q-4200	8 - 10 WEEKS AFTER APPROVAL
C3.5	50	FT	CONDUIT, FLEXIBLE, 2 IN DIA.,	ELECTRI-FLEX COMPANY	26102	8 - 10 WEEKS AFTER APPROVAL
C3.6	1	EA	CONNECTOR, BOX OR TRANSITION, 2" LIQUIDTIGHT, FLEXIBLE	APPLETON	STNM-200	8 - 10 WEEKS AFTER APPROVAL
C3.7	1	EA	ADAPTER FEMALE/FEMALE, 2" IPS, PVC 2" IPS STEEL	PRIME	FA200	6 - 8 WEEKS AFTER APPROVAL
C3.8	2	EA	BODY CONDUIT, 2", TYPE T, PVC	PRIME	AFT200	6 - 8 WEEKS AFTER APPROVAL
C3.9	1	EA	BODY CONDUIT, 2", TYPE LL, PVC	PRIME	AFL200	6 - 8 WEEKS AFTER APPROVAL
C3.10	1	EA	BODY CONDUIT, 2", TYPE LR, PVC	PRIME	AFLR200	6 - 8 WEEKS AFTER APPROVAL
C3.11	3	EA	COUPLING, PVC CONDUIT, 2"	PRIME	CP200	6 - 8 WEEKS AFTER APPROVAL
C3.12	3	EA	ADAPTER BOX PVC CONDUIT 2"	PRIME	TA200	6 - 8 WEEKS AFTER APPROVAL
<b>34.5KV VT'S</b>						
C4.1	35	FT	CONDUIT, PVC, 2", SCH 40, 10FT LENGTH	PRIME	59611-010	4 - 6 WEEKS AFTER APPROVAL

ITEM #	QTY	UOM	DESCRIPTION	MFG	CAT. NO.	EST. LEAD TIME FOR SHIPMENT
C4.2	2	EA	COUPLING, PVC CONDUIT, 2" EXPANSION	PRIME	EC2PC200	6 - 8 WEEKS AFTER APPROVAL
C4.3	3	EA	ADAPTER, BOX, PVC CONDUIT, 2"	PRIME	BA200	6 - 8 WEEKS AFTER APPROVAL
C4.4	1	EA	2" LIQUIDTIGHT FITTING, 45 DEGREE, BOX CONNECTOR ELBOW	OZ GEDNEY	4Q-4200	8 - 10 WEEKS AFTER APPROVAL
C4.5	50	FT	CONDUIT, FLEXIBLE, 2 IN DIA.,	ELECTRI-FLEX COMPANY	26102	8 - 10 WEEKS AFTER APPROVAL
C4.6	1	EA	CONNECTOR, BOX OR TRANSITION, 2" LIQUIDTIGHT, FLEXIBLE	APPLETON	STNM-200	8 - 10 WEEKS AFTER APPROVAL
C4.7	1	EA	ADAPTER FEMALE/FEMALE, 2" IPS, PVC 2" IPS STEEL	PRIME	FA200	6 - 8 WEEKS AFTER APPROVAL
C4.8	2	EA	BODY CONDUIT, 2", TYPE T, PVC	PRIME	AFT200	6 - 8 WEEKS AFTER APPROVAL
C4.9	1	EA	BODY CONDUIT, 2", TYPE LL, PVC	PRIME	AFL200	6 - 8 WEEKS AFTER APPROVAL
C4.10	1	EA	BODY CONDUIT, 2", TYPE LR, PVC	PRIME	AFLR200	6 - 8 WEEKS AFTER APPROVAL
C4.11	3	EA	COUPLING, PVC CONDUIT, 2"	PRIME	CP200	6 - 8 WEEKS AFTER APPROVAL
C4.12	3	EA	ADAPTER BOX PVC CONDUIT 2"	PRIME	TA200	6 - 8 WEEKS AFTER APPROVAL
			<b>CIRCUIT SWITCHER</b>			
C5.1	10	FT	CONDUIT, PVC, 2", SCH 40, 10FT LENGTH	PRIME	59611-010	4 - 6 WEEKS AFTER APPROVAL
C5.2	2	EA	COUPLING, PVC CONDUIT, 2" EXPANSION	PRIME	EC2PC200	6 - 8 WEEKS AFTER APPROVAL
C5.3	2	EA	ADAPTER, BOX, PVC CONDUIT, 2"	PRIME	BA200	6 - 8 WEEKS AFTER APPROVAL
C5.4	10	FT	CONDUIT, PVC, 4" SCH 40, 10FT LENGTHS	PRIME	59615-010	4 - 6 WEEKS AFTER APPROVAL
C5.5	2	EA	COUPLING, PVC CONDUIT, 4" EXPANSION	PRIME	EC2PC400	6 - 8 WEEKS AFTER APPROVAL
C5.6	2	EA	ADAPTER, BOX, PVC CONDUIT, 4"	PRIME	BA400	6 - 8 WEEKS AFTER APPROVAL
C5.7	1	LOT	ABOVE GRADE CONDUIT MATERIAL, NOT LISTED (WILL NEED LIST OF REQUIRED)	WESCO GRID SERVICES	MISC-CONDUIT	8 - 10 WEEKS AFTER APPROVAL
			<b>BELOW GRADE:</b>			
C6.1	950	FT	CONDUIT, PVC, 2", SCH 40, 10FT LENGTH	PRIME	59611-010	4 - 6 WEEKS AFTER APPROVAL
C6.2	820	FT	CONDUIT, PVC, 4" SCH 40, 10FT LENGTHS	PRIME	59615-010	4 - 6 WEEKS AFTER APPROVAL
C6.3	160	FT	CONDUIT, PVC, 6" SCH 40, 10FT LENGTHS	PRIME	59617-010	6 - 8 WEEKS AFTER APPROVAL
C6.4	240	FT	CONDUIT, FIBERGLASS, 2", SCH 40, 20FT LENGTH	CHAMPION	20A-SW-20-1	10 - 12 WEEKS AFTER APPROVAL
C6.5	300	FT	CONDUIT, FIBERGLASS, 4" SCH 40, 20FT LENGTHS	CHAMPION	40A-SW-20-1	10 - 12 WEEKS AFTER APPROVAL
C6.6	80	FT	CONDUIT, FIBERGLASS, 6" SCH 40, 20FT LENGTHS	CHAMPION	60A-SW-20-1	10 - 12 WEEKS AFTER APPROVAL
C6.7	14	EA	ELBOW, PVC, 2", SCH 40, 36" RADIUS, 45 DEGREES	PRIME	UC7FJB	6 - 8 WEEKS AFTER APPROVAL
C6.8	4	EA	ELBOW, PVC, 2", SCH 40, 36" RADIUS, 90 DEGREES	PRIME	UC9FJB	6 - 8 WEEKS AFTER APPROVAL

ITEM #	QTY	UOM	DESCRIPTION	MFG	CAT. NO.	EST. LEAD TIME FOR SHIPMENT
C6.9	14	EA	ELBOW, FIBERGLASS, 2", SCH 40, 36" RADIUS, 90 DEGREES	CHAMPION	20A-SW-92-P	10 - 12 WEEKS AFTER APPROVAL
C6.10	15	EA	ELBOW, PVC, 4", SCH 40, 36" RADIUS, 45 DEGREES	PRIME	UC7FNB	6 - 8 WEEKS AFTER APPROVAL
C6.11	23	EA	ELBOW, FIBERGLASS, 4", SCH 40, 36" RADIUS, 90 DEGREES	CHAMPION	40A-SW-92-P	10 - 12 WEEKS AFTER APPROVAL
C6.12	4	EA	ELBOW, PVC, 6", SCH 40, 36" RADIUS, 45 DEGREES	PRIME	UC7FR	6 - 8 WEEKS AFTER APPROVAL
C6.13	4	EA	ELBOW, FIBERGLASS, 6", SCH 40, 36" RADIUS, 90 DEGREES	CHAMPION	60A-SW-92-P	10 - 12 WEEKS AFTER APPROVAL
C6.14	12	EA	COUPLER, PVC, 2"	PRIME	CP200	6 - 8 WEEKS AFTER APPROVAL
C6.15	21	EA	COUPLER, PVC, 4"	PRIME	CP400	6 - 8 WEEKS AFTER APPROVAL
C6.16	4	EA	COUPLER, PVC, 6"	PRIME	CP600	6 - 8 WEEKS AFTER APPROVAL
C6.17	7	EA	END BELL, PVC, 2"	PRIME	EB200	6 - 8 WEEKS AFTER APPROVAL
C6.18	18	EA	END BELL, PVC, 4"	PRIME	EB400	6 - 8 WEEKS AFTER APPROVAL
C6.19	4	EA	END BELL, PVC, 6"	PRIME	EB600	6 - 8 WEEKS AFTER APPROVAL
C6.20	1	LOT	BELOW GRADE CONDUIT MATERIAL, NOT LISTED (WILL NEED LIST OF REQUIRED	WESCO GRID SERVICES	MISC-CONDUIT	8 - 10 WEEKS AFTER APPROVAL
				<b>CONDUIT &amp; RACEWAYS TOTAL:</b>		
<b>GROUNDING:</b>						
<b>ABOVE GRADE - STRUCTURE &amp; EQUIPMENT:</b>						
D1.1	400	FT	4/0 AWG, 7 STR, BARE, SOFT DRAWN, COPPER, 0.5217" DIA.	WESCO GRID SERVICES	4/0AWG7STRSDCU	6 - 8 WEEKS AFTER APPROVAL
D1.2	10	FT	#4 AWG, 7 STR, BARE, SOFT DRAWN, COPPER, 0.2316" DIA.	WESCO GRID SERVICES	#4AWG7STRSDCU	6 - 8 WEEKS AFTER APPROVAL
D1.3	15	EA	GROUND CLAMP, (2) 4/0 AWG CU. TO FLAT	HUBBELL	GC143A02	11 - 12 WEEKS AFTER APPROVAL
D1.4	54	EA	GROUND CLAMP, (1) 4/0 AWG CU. TO FLAT	HUBBELL	GC141A02	10 - 11 WEEKS AFTER APPROVAL
D1.5	2	EA	GROUND CLAMP, 4/0 AWG CU TO #4 AWG CU	HUBBELL	ST4	41 - 42 WEEKS AFTER APPROVAL
D1.6	25	EA	GROUND TERMINAL, (1) 4/0 AWG CU, TO 2 HOLE PAD	HUBBELL	SWH050B2	25 - 26 WEEKS AFTER APPROVAL
D1.7	28	EA	GROUND TERMINAL, (2) 4/0 AWG CU, TO 2 HOLE PAD	HUBBELL	SWHD050B2	25 - 26 WEEKS AFTER APPROVAL
D1.8	82	EA	TERMINAL BOLT SET, SILICONE BRONZE, HEX HEAD 1/2" DIA. X 1 3/4", (1) HEX NUT, (2) FLAT WASHERS & (1) LOCK WASHER, LENGTH VERIFIED AT TIME OF ORDER	WESCO GRID SERVICES	TYPE H	6 - 8 WEEKS AFTER APPROVAL
D1.9	2	EA	GROUND CLAMP, 4/0 AWG CU TO 1 1/2" PIPE	HUBBELL	GC1116C	25 - 26 WEEKS AFTER APPROVAL
<b>ABOVE GRADE - GATES:</b>						
D2.1	50	FT	#2 AWG, 7 STR, BARE, SOFT DRAWN, COPPER, 0.2922" DIA.	WESCO GRID SERVICES	#2AWG7STRSDCU	6 - 8 WEEKS AFTER APPROVAL
D2.2	4	EA	GROUND CLAMP, 4/0 AWG CU TO 4" PIPE	HUBBELL	GC11111C	25 - 26 WEEKS AFTER APPROVAL
D2.3	2	EA	GROUND CLAMP, 4" PIPE TO BRAID	HUBBELL	GC10910	25 - 26 WEEKS AFTER APPROVAL





**CITY OF GENEVA MUNICIPAL  
ELECTRIC UTILITY  
CITY OF GENEVA, KAUTZ SUBSTATION  
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ITEM #	QTY	UOM	DESCRIPTION	MFG	CAT. NO.	EST. LEAD TIME FOR SHIPMENT
D2.4	2	EA	GROUND CLAMP, 2" PIPE TO BRAID	HUBBELL	GC10906	25 - 26 WEEKS AFTER APPROVAL
D2.5	2	EA	GROUND BRAID	HUBBELL	GB2005A	14 - 15 WEEKS AFTER APPROVAL
D2.6	4	EA	GROUND CLAMP, #2 AWG CU TO 2" PIPE	HUBBELL	GC1116B	25 - 26 WEEKS AFTER APPROVAL
D2.7	6	EA	GROUND CLAMP, #2 AWG CU TO BARBED WIRE	HUBBELL	GC5002S	3 - 4 WEEKS AFTER APPROVAL
<b>BELOW GRADE - GRID:</b>						
D3.1	3400	FT	4/0 AWG, 7 STR, BARE, SOFT DRAWN, COPPER, 0.5217" DIA.	WESCO GRID SERVICES	4/0AWG7STRSDCU	6 - 8 WEEKS AFTER APPROVAL
D3.2	25	EA	GROUND ROD, 3/4" X 10', <b>STD PACK = 5</b>	ERICO	613400	24 - 26 WEEKS AFTER APPROVAL
D3.3	2	EA	EXOTHERMIC MOLD, HORIZONTAL CROSS, TYPE XB	ERICO	XBM2Q2Q	6 - 8 WEEKS AFTER APPROVAL
D3.4	70	EA	CHARGE METAL, WELD METAL UNIT #250, <b>STD PACK = 10</b>	ERICO	250	5 - 6 WEEKS AFTER APPROVAL
D3.5	2	EA	EXOTHERMIC MOLD, HORIZONTAL TEE, TYPE TA	ERICO	TAC2Q2Q	6 - 8 WEEKS AFTER APPROVAL
D3.6	60	EA	CHARGE METAL, WELD METAL UNIT #150, <b>STD PACK = 10</b>	ERICO	150	5 - 6 WEEKS AFTER APPROVAL
D3.7	1	EA	EXOTHERMIC MOLD, 4/0 TO GROUND ROD, TYPE GY	ERICO	GYE182Q	6 - 8 WEEKS AFTER APPROVAL
D3.7	30	EA	CHARGE METAL, WELD METAL UNIT #250, <b>STD PACK = 10</b>	ERICO	250	5 - 6 WEEKS AFTER APPROVAL
<b>GROUNDING TOTAL:</b>						
<b>POWER &amp; CONTROL CABLE:</b>						
E1.1	800	FT	CONTROL CABLE, 600V, XHHW-2, 4/C #10	WESCO GRID SERVICES	XHHW-2, 4/C #10	28 - 30 WEEKS AFTER APPROVAL
E1.2	640	FT	CONTROL CABLE, 600V, XHHW-2, 4/C #8	WESCO GRID SERVICES	XHHW-2, 4/C #8	28 - 30 WEEKS AFTER APPROVAL
E1.3	600	FT	CONTROL CABLE, 600V, XHHW-2, 2/C #12	WESCO GRID SERVICES	XHHW-2, 2/C #12	28 - 30 WEEKS AFTER APPROVAL
E1.4	640	FT	CONTROL CABLE, 600V, XHHW-2, 12/C #12	WESCO GRID SERVICES	XHHW-2, 12/C #12	28 - 30 WEEKS AFTER APPROVAL
E1.5	310	FT	CONTROL CABLE, 600V, XHHW-2, 12/C #10	WESCO GRID SERVICES	XHHW-2, 12/C#10	28 - 30 WEEKS AFTER APPROVAL
E1.6	420	FT	CONTROL CABLE, 600V, XHHW-2, 4/C #12	WESCO GRID SERVICES	XHHW-2, 4/C #12	28 - 30 WEEKS AFTER APPROVAL
E2.1	480	FT	POWER CABLE, 12.47 KV, 1/C-1000 MCM AL	<b>PROVIDED BY OTHERS</b>		-----
E2.2	450	FT	POWER CABLE, 12.47 KV, 3/C-1000 MCM CU	WESCO GRID SERVICES	15KV-3/C-1000MCM CU	28 - 30 WEEKS AFTER APPROVAL
E2.3	50	FT	POWER CABLE, 12.47 KV, 1/C-1/0 AWG CU	WESCO GRID SERVICES	15KV-1/C-1/0 AWG CU	28 - 30 WEEKS AFTER APPROVAL
E2.4	270	FT	POWER CABLE, 12.47 KV, 1/C-4/0 AWG CU	WESCO GRID SERVICES	15KV-1/C-4/0 AWG CU	28 - 30 WEEKS AFTER APPROVAL
<b>POWER &amp; CONTROL CABLE TOTAL:</b>						
<b>TERMINATIONS:</b>						
F1.1	18	EA	TERMINATOR, POWER CABLE, 12.47 KV, 1/C-1000 MCM AL, WITH 4-HOLE TERMINAL	WESCO GRID SERVICES	TERMINATOR-AL	10 - 12 WEEKS AFTER APPROVAL
F1.2	36	EA	TERMINATOR, POWER CABLE, 12.47 KV, 1/C-1000 MCM CU, WITH 4-HOLE TERMINAL	WESCO GRID SERVICES	TERMINATOR-CU	10 - 12 WEEKS AFTER APPROVAL



CITY OF GENEVA MUNICIPAL  
ELECTRIC UTILITY  
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SUBMITTAL SCHEDULE

ITEM #	QTY	UOM	DESCRIPTION	MFG	CAT. NO.	EST. LEAD TIME FOR SHIPMENT
F1.3	2	EA	TERMINATOR, POWER CABLE, 12.47 KV, 1/C-1/0 AWG CU, WITH 2 HOLE PAD	WESCO GRID SERVICES	TERMINATOR-CU	10 - 12 WEEKS AFTER APPROVAL
F1.4	12	EA	TERMINATOR, POWER CABLE, 12.47 KV, 1/C-4/0 AWG CU, WITH 2 HOLE PAD	WESCO GRID SERVICES	TERMINATOR-CU	10 - 12 WEEKS AFTER APPROVAL
F2.1	40	EA	TERMINALS, UNINSULATED, RING-TONGUE, FOR #8 WIRE, 1/4" STUD, <b>STD PACK =20</b>	BURNDY	YAV6CLBOX	4 - 6 WEEKS AFTER APPROVAL
F2.2	250	EA	TERMINALS, UNINSULATED, RING-TONGUE, FOR #10-#12 WIRE, 1/4" STUD, <b>STD PACK =50</b>	BURNDY	YAV10T3BOX	4 - 6 WEEKS AFTER APPROVAL
F3.1	250	EA	TERMINAL BOLT SET, STAINLESS STEEL, HEX HEAD 1/2" DIA. X 2 1/4", (1) HEX NUT, (1) LOCK WASHERS & (2) BELLEVILLE WASHER, LENGTH VERIFIED AT TIME OF ORDER	WESCO GRID SERVICES	TYPE E	6 - 8 WEEKS AFTER APPROVAL
<b>TERMINATIONS TOTAL:</b>						
<b>MISC:</b>						
G1.1	1	LOT	PHASE MARKER TAGS	WESCO GRID SERVICES	TAGS	10 - 12 WEEKS AFTER APPROVAL
G1.2	1	LOT	MARKER TAPE	WESCO GRID SERVICES	TAPE	10 - 12 WEEKS AFTER APPROVAL
<b>MISC TOTAL:</b>						
<b>FREIGHT:</b>						
----	1	LOT	FREIGHT, FOB DESTINATION, PREPAID AND ALLOWED TO JOB SITE: GENEVA, ILLINOIS 60134	WESCO GRID SERVICES	FREIGHT	-----
<b>PROJECT TOTAL:</b>						

336 South Service Road  
Melville, NY 11747

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## CLARIFICATIONS

- Our pricing is valid for 90 days, due to material market volatility we reserve the right to negotiate pricing adjustments, if necessary, after pricing expiration.
- Pricing for Transformer w/ Witness Testing allowance does not include any installation pricing.
- Pricing for Building/Switchgear w/ Witness Testing allowance does not include any installation pricing.
- Pricing for Steel & Equipment does not include any installation pricing.
- Pricing does NOT include any City, State, Local permits or SWPP.
- Pricing assumes the average existing site is at ELEV. 770.17 with 9" of topsoil.
- Pricing does NOT include any soils / compaction testing / IEPA 663 or CCDD testing.
- Pricing does NOT include Undercutting soils with structural fill.

## Contract 23-01 Kautz Road Substation Procurement/Construction

## Bid Review Questions for Haugland Energy LLC

Question	Haugland Energy LLC Response
1. Section 1: Utilization of Certified Vendors form that was filled out for MBE Fence, Inc. does not have an item circled in the checkbox row of "Certified with the CMS Business Enterprises Program (BPE) as a ..." Please updated this sheet and provide updated copy.	Addressed Previously – Revision sent prior to receiving this document.
2. Data Sheets provided in the bidding documents have not been filled out. Please fill out supplied Data Sheets and provide Copy for review.	Submitted via email – 4/18/23
3. Clarification states "Price for Transformer w/ Witness Testing allowance does not include any installation pricing." Verify that the pricing for the installation is included elsewhere in the pricing and will be performed in the overall project.	Installation is included in the General Construction item.
4. Clarification states "Price for Building/Switchgear w/ Witness Testing allowance does not include any installation pricing." Verify that the pricing for the installation is included elsewhere in the pricing and will be performed in the overall project	Installation is included in the General Construction item.
5. Clarification states "Price for Steel & Equipment does not include any installation pricing." Verify that the pricing for the installation is included elsewhere in the pricing and will be performed in the overall project	Installation is included in the General Construction item.
6. Clarification states, "Pricing does NOT include any soils/compaction testing/IEPA 663 or CCDD testing" Structural Excavation and Backfill, Grading and Aggregate surface spec require soil compaction testing. Please confirm that the test required in the spec will be performed as part of this overall project.	Installation is included in the General Construction item.
7. Transformer Spec requires warranty information be sent with bid. Please provide.	Submitted via email – 4/18/23
8. Transformer Supplier calls out SEC Electrical Equipment Sales in the List of Suppliers, but Submittal Schedule page 2 calls out WEG as the manufacturer. Our understanding is that PowerOne is the rep for WEG in Northern Illinois and that SEC Electrical Equipment Sales is the rep for Niagara. Please clarify manufacturer of transformer for this project.	Niagra from SEC Data Sheet Submitted was only one received at time of bid. Transformer Manufacturer will be Niagra and supplied by SEC.
9. Markup of Terms and Conditions show ending bond upon delivery. Protection for warranty of substation is needed for the year after construction. Would Haugland consider providing a reduced bond for the year after installation that would just cover the material cost instead of the overall project price?	HE is amenable to providing and can submit pricing should the determination be made to include. <b>Full Bond-\$58,000</b> <b>Bond on Material/Equip only -\$26,000</b>

# PERFORMANCE BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

## CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*:

## BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form:  None  See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

### CONTRACTOR AS PRINCIPAL

\_\_\_\_\_  
Contractor's Name and Corporate Seal *(seal)*

By: \_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

Attest: \_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

### SURETY

\_\_\_\_\_  
Surety's Name and Corporate Seal *(seal)*

By: \_\_\_\_\_  
Signature *(attach power of attorney)*

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

Attest: \_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

**Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.**

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:
  - 3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
  - 3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
  - 3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
  - 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
  - 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
  - 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or
  - 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
    - 5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
    - 5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.
7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
  - 7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
  - 7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and
  - 7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.
9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.
12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.
13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
14. Definitions
  - 14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
  - 14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
  - 14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
  - 14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
  - 14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.
15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.
16. Modifications to this Bond are as follows:

# PAYMENT BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

## CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*:

## BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form:  None  See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

### CONTRACTOR AS PRINCIPAL

### SURETY

\_\_\_\_\_  
Contractor's Name and Corporate Seal *(seal)*

\_\_\_\_\_  
Surety's Name and Corporate Seal *(seal)*

By: \_\_\_\_\_  
Signature

By: \_\_\_\_\_  
Signature *(attach power of attorney)*

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

Attest: \_\_\_\_\_  
Signature

Attest: \_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

**Notes:** (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.



1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
  - 5.1 Claimants who do not have a direct contract with the Contractor,
    - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
    - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
  - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
  - 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
  - 7.2 Pay or arrange for payment of any undisputed amounts.
  - 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by

anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

## 16. Definitions

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

## STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

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STANDARD GENERAL CONDITIONS OF THE  
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## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
  2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
  3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
  4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
  5. *Bidder*—An individual or entity that submits a Bid to Owner.
  6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
  7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
  8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
  9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
  10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.
  11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
  12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
  13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
  14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
  15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
  16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
  17. *Cost of the Work*—See Paragraph 13.01 for definition.
  18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
  19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

## 1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

### B. Intent of Certain Terms or Adjectives:

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

### C. Day:

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

### D. Defective:

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
- does not conform to the Contract Documents; or
  - does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
  - has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).

### E. Furnish, Install, Perform, Provide:

- The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
- The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
- The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

## ARTICLE 2 – PRELIMINARY MATTERS

### 2.01 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

### 2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

### 2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
  1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and
3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

### 2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

### 2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
  1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor’s full responsibility therefor.
  2. Contractor’s Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
  3. Contractor’s Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

### 2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall

accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

### ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

#### 3.01 Intent

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

#### 3.02 Reference Standards

- A. Standards Specifications, Codes, Laws and Regulations
  - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
  - 2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners,

employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

#### 3.03 Reporting and Resolving Discrepancies

##### A. Reporting Discrepancies:

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

##### B. Resolving Discrepancies:

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
  - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
  - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

### 3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

### 3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
  - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
  - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

## **ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK**

### 4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to

Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

### 4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

### 4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

### 4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
  - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
  - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

### 4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and

within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
  2. abnormal weather conditions;
  3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
  4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.
- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

## **ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS**

### *5.01 Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent

improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

### *5.02 Use of Site and Other Areas*

#### *A. Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations

of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

- C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures*: 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 structures or land to stresses or pressures that will endanger them.

#### 5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
  2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
  3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
  2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
  3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

#### 5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
  2. is of such a nature as to require a change in the Drawings or Specifications; or
  3. differs materially from that shown or indicated in the Contract Documents; or
  4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;
- then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.
- B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments*:
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase



or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
  - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
  - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
    - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
    - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
    - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
  3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
  4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

#### 5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
  1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
  2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
    - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
    - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
    - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
    - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

- E. Possible Price and Times Adjustments:

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
  - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
  - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
  - d. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
  3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

#### 5.06 Hazardous Environmental Conditions at Site

- A. *Reports and Drawings:* The Supplementary Conditions identify:
    1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
    2. Technical Data contained in such reports and drawings.
  - B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
    1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
    2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
  - D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
  - E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
  - F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
  - G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
  - H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion

of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

## ARTICLE 6 – BONDS AND INSURANCE

### 6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or

other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

### 6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Contract.

Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.
- 6.03 *Contractor's Insurance*
- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
  2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
  3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).
  4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
  2. claims for damages insured by reasonably available personal injury liability coverage.
  3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage:
    - a. Such insurance shall be maintained for three years after final payment.
    - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
  2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
  3. Broad form property damage coverage.
  4. Severability of interest.
  5. Underground, explosion, and collapse coverage.
  6. Personal injury coverage.
  7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
  8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—

Engineers, Architects or Surveyors Not Engaged by the Named Insured” or its equivalent.

- D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer’s liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor’s pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor’s operations and completed operations. This insurance shall be maintained for no less than three years after final completion.
- G. *Additional insureds*: The Contractor’s commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor’s professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
- I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:
1. include at least the specific coverages provided in this Article.
  2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
  3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
  4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
  5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor’s performance of the Work and Contractor’s other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

#### 6.04 *Owner’s Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner’s option, may purchase and maintain at Owner’s expense Owner’s own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner’s liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner’s liability policies for any of Contractor’s obligations to the Owner, Engineer, or third parties.

#### 6.05 *Property Insurance*

- A. *Builder’s Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder’s risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
  1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder’s risk policy, as insureds or named insureds. For purposes of the remainder of

- this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as “insureds.”
2. be written on a builder’s risk “all risk” policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder’s risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
  3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
  4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
  5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
  6. extend to cover damage or loss to insured property while in transit.
  7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder’s risk insurance.
  8. allow for the waiver of the insurer’s subrogation rights, as set forth below.
  9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
  10. not include a co-insurance clause.
  11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
  12. include performance/hot testing and start-up.
  13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
  - C. *Deductibles:* The purchaser of any required builder’s risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
  - D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder’s risk policy, or through Contractor) will provide notice of such occupancy or use to the builder’s risk insurer. The builder’s risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder’s risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder’s risk insurance.
  - E. *Additional Insurance:* If Contractor elects to obtain other special insurance to be included in or supplement the builder’s risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor’s expense.
  - F. *Insurance of Other Property:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

#### 6.06 Waiver of Rights

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder’s risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its

consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
  2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

#### 6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

### **ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES**

#### 7.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct 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 solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

#### 7.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

### 7.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

### 7.04 *“Or Equals”*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or equal” item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
  1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an “or equal” item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
    - a. in the exercise of reasonable judgment Engineer determines that:
      - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
      - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

- 3) it has a proven record of performance and availability of responsive service; and
- 4) it is not objectionable to Owner.

b. Contractor certifies that, if approved and incorporated into the Work:

- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
- 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

- B. *Contractor’s Expense:* Contractor shall provide all data in support of any proposed “or equal” item at Contractor’s expense.
- C. *Engineer’s Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each “or-equal” request. Engineer may require Contractor to furnish additional data about the proposed “or-equal” item. Engineer will be the sole judge of acceptability. No “or-equal” item will be ordered, furnished, installed, or utilized until Engineer’s review is complete and Engineer determines that the proposed item is an “or-equal”, which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer’s Determination:* Neither approval nor denial of an “or-equal” request shall result in any change in Contract Price. The Engineer’s denial of an “or-equal” request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an “or-equal” item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

### 7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
  1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
  2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the



Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

- a. shall certify that the proposed substitute item will:
- 1) perform adequately the functions and achieve the results called for by the general design,
  - 2) be similar in substance to that specified, and
  - 3) be suited to the same use as that specified.
- b. will state:
- 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
  - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
  - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
- c. will identify:
- 1) all variations of the proposed substitute item from that specified, and
  - 2) available engineering, sales, maintenance, repair, and replacement services.
- d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

#### 7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.
- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted

it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
- O. Nothing in the Contract Documents:

- 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
- 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

#### 7.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

#### 7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work

which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

#### 7.09 Taxes

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

#### 7.10 Laws and Regulations

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

#### 7.11 Record Documents

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record

documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

#### 7.12 Safety and Protection

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. 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 persons on the Site or who may be affected by the Work;
  2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part,

to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

- F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

#### 7.13 Safety Representative

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

#### 7.14 Hazard Communication Programs

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

#### 7.15 Emergencies

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

#### 7.16 Shop Drawings, Samples, and Other Submittals

- A. Shop Drawing and Sample Submittal Requirements:
  1. Before submitting a Shop Drawing or Sample, Contractor shall have:
    - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
    - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
    - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping,

handling, storage, assembly, and installation pertaining to the performance of the Work; and

- d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
  2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
  3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.
    1. Shop Drawings:
      - a. Contractor shall submit the number of copies required in the Specifications.
      - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.
    2. Samples:
      - a. Contractor shall submit the number of Samples required in the Specifications.
      - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
    3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
  - C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
  - D. Engineer's Review:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
  2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
  3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
  4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
  5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
  6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
  7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.
  8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.
- E. Resubmittal Procedures:
1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
  2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
  3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.
- 7.17 *Contractor's General Warranty and Guarantee*
- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
  - B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
    1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
    2. normal wear and tear under normal usage.
  - C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
    1. observations by Engineer;
    2. recommendation by Engineer or payment by Owner of any progress or final payment;
    3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
    4. use or occupancy of the Work or any part thereof by Owner;
    5. any review and approval of a Shop Drawing or Sample submittal;
    6. the issuance of a notice of acceptability by Engineer;
    7. any inspection, test, or approval by others; or
    8. any correction of defective Work by Owner.
  - D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

### 7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
  - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
  - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

### 7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment

are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

## **ARTICLE 8 – OTHER WORK AT THE SITE**

### 8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided,

however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

#### 8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
  2. an itemization of the specific matters to be covered by such authority and responsibility; and
  3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

#### 8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential

to Contractor's ability to complete the Work within the Contract Times.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.
- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

### **ARTICLE 9 – OWNER'S RESPONSIBILITIES**

#### 9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

#### 9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

### 9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

### 9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

### 9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

### 9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

### 9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

### 9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

### 9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

### 9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

### 9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

### 9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of

Contractor's safety programs of which Owner has been informed.

- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

## **ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION**

### 10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

### 10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

### 10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.



#### 10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

#### 10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

#### 10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

#### 10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

#### 10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance

and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

#### 10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

### **ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK**

#### 11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

##### 1. Change Orders:

- a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
- b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

- 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the

Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

#### 11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

#### 11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

#### 11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
  1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the

items involved (subject to the provisions of Paragraph 13.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
  3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).
- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
  2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
    - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
    - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
    - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
    - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
    - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
    - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

### 11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

### 11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the

Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

### 11.07 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
  1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
  2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
  3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
  4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

### 11.08 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

## ARTICLE 12 – CLAIMS

### 12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
  1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
  2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
  2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.
  3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval:* If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim:* If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied,

thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

- G. *Final and Binding Results:* If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

## **ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK**

### *13.01 Cost of the Work*

- A. *Purposes for Determination of Cost of the Work:* The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
  2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be

- included in the above to the extent authorized by Owner.
2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
  3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
  4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
  5. Supplemental costs including the following:
    - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
    - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
    - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
    - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
    - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
  - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
  - g. The cost of utilities, fuel, and sanitary facilities at the Site.
  - h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
  - i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:
1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
  2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
  3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
  4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.
- E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

### 13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances*: Contractor agrees that:
1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
  2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

### 13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
  2. there is no corresponding adjustment with respect to any other item of Work; and
  3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

## ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

### 14.01 Access to Work

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

### 14.02 Tests, Inspections, and Approvals

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered

Work shall be governed by the provisions of Paragraph 14.05.

- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
  1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
  2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
  3. by manufacturers of equipment furnished under the Contract Documents;
  4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
  5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

#### 14.03 Defective Work

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

#### 14.04 Acceptance of Defective Work

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

#### 14.05 Uncovering Work

- A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request,

shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

#### 14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

#### 14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants

access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

### **ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD**

#### 15.01 *Progress Payments*

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. Applications for Payments:
  1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
  2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
  3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.



C. Review of Applications:

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
  - a. the Work has progressed to the point indicated;
  - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
  - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
  - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
  - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
  - a. to supervise, direct, or control the Work, or
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
  - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
  - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
  - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
  - a. the Work is defective, requiring correction or replacement;
  - b. the Contract Price has been reduced by Change Orders;
  - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
  - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. Payment Becomes Due:

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. Reductions in Payment by Owner:

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
  - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
  - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

- c. Contractor has failed to provide and maintain required bonds or insurance;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
  - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
  - f. the Work is defective, requiring correction or replacement;
  - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - h. the Contract Price has been reduced by Change Orders;
  - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
  - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
  - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
  - l. there are other items entitling Owner to a set off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
  3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

#### 15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

#### 15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to

allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

#### 15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

#### 15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 15.06 *Final Payment*

A. Application for Payment:

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all

maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents;
  - b. consent of the surety, if any, to final payment;
  - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
  - d. a list of all disputes that Contractor believes are unsettled; and
  - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. Engineer's Review of Application and Acceptance:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice

to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

- C. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.
- D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

#### 15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

#### 15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
  1. correct the defective repairs to the Site or such other adjacent areas;
  2. correct such defective Work;
  3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.

- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

### **ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION**

#### 16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

#### 16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
  1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
  3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
  4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
  2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.
- 16.03 *Owner May Terminate For Convenience***
- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
  2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
  3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.
- 16.04 *Contractor May Stop Work or Terminate***
- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

## ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

### 17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
  2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
  2. agree with the other party to submit the dispute to another dispute resolution process; or
  3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

## ARTICLE 18 – MISCELLANEOUS

### 18.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
  2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

### 18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

### 18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

### 18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

### 18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

### 18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

### 18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

### 18.08 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700 (2013 Edition). All provisions that are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

## **ARTICLE 1 - DEFINITIONS AND TERMINOLOGY**

### *SC-1.01 Defined Terms*

Add the following new paragraphs immediately after paragraph 1.01.A.48 of the General Conditions to read as follows:

49. *Instruction to Contractor* — Same as "Field Order."
50. *Geotechnical Baseline Report (GBR)* — The interpretive report prepared by or for Owner regarding subsurface conditions at the Site, and containing specific baseline geotechnical conditions that may be anticipated or relied upon for bidding and contract administration purposes, subject to the controlling provisions of the Contract, including the GBR's own terms. The GBR is a Contract Document.

## **ARTICLE 2 – PRELIMINARY MATTERS**

### *SC-2.01 Delivery of Bonds and Evidence of Insurance*

Delete Paragraphs 2.01 B. and C. in their entirety and insert the following in their place:

- B. Evidence of Contractor's Insurance: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner copies of the policies of insurance (including all endorsements, and identification of applicable self-insured retentions and deductibles) required to be provided by Contractor in Article 6. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- C. Evidence of Owner's Insurance: After receipt from Contractor of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor copies of the policies of insurance to be provided by Owner under Article 6 (if any). Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

### *SC-2.02 Copies of Documents*

Delete Paragraph 2.02.A in its entirety and insert the following new paragraph in its place:

- A. Owner will furnish to Contractor 1 copy of the conformed Contract Documents incorporating and integrating all Addenda and any amendments negotiated prior to the Effective Date of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies of the conformed Contract Documents will not be provided.

### ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

#### SC-3.01 Intent

Delete Paragraph 3.01C in its entirety.

### ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

#### SC/GBR-5.04 Differing Subsurface or Physical Conditions

- A. Notice: If Contractor believes that any subsurface condition that is uncovered or revealed at the Site:
1. differs materially from conditions shown or indicated in the GBR; or
  2. differs materially from conditions shown or indicated in Contract Documents other than the GBR, to the extent the GBR are inapplicable; or
  3. to the extent the GBR are inapplicable, is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
  4. to the extent the GBR are inapplicable, is of such a nature as to require a change in the Drawings or Specifications; or
  5. to the extent the GBR are inapplicable, is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph SC/GBR 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption or continuation of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption or continuation of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:



- a. such condition must fall within any one or more of the categories described in Paragraph SC/GBR 5.04.A;
  - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03 of the General Conditions; and,
  - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
    - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
    - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
    - c. Contractor failed to give the written notice as required by Paragraph SC/GBR 5.04.A.
  3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
  4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

#### *SC-5.06 Hazardous Environmental Condition*

Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

- A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

### **ARTICLE 6 – BONDS AND INSURANCE**

#### *SC-6.01 Performance, Payment and Other Bonds*

Add the following paragraph immediately after Paragraph 6.01.F:

- G. Performance and payment bond shall be deemed amended automatically and immediately without formal and separate amendments hereto, upon any amendment to the contract so as to bind the Principal and Surety to the full and faithful performance of the contract, as so amended, providing only that the total amount of all increases in the cost shall not exceed 20 percent of the amount of the maximum price set forth in the original contract.

#### *SC-6.02 Insurance—General Provisions*

Add the following paragraph immediately after Paragraph 6.02.B:

1. Contractor may obtain worker's compensation insurance from an insurance company that has not been rated by A.M. Best, provided that such company (a) is domiciled in the state in which the project is located, (b) is certified or authorized as a worker's compensation

insurance provider by the appropriate state agency, and (c) has been accepted to provide worker's compensation insurance for similar projects by the state within the last 12 months.

### SC-6.03 Contractor's Insurance

In paragraph 6.03.1.3., delete the words "materially changed"

Add the following new paragraph immediately after paragraph 6.03.J:

- K. The limits of liability for the insurance required by paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:
1. Workers' Compensation, and related coverages under paragraphs 6.03.A.1 and A.2 of the General Conditions:
    - a. State: Statutory
    - b. Federal, if applicable (e.g., Longshoreman's): Statutory
    - c. Jones Act coverage, if applicable:
 

Bodily injury by accident, each accident	\$ <u>    N/A    </u>
Bodily injury by disease, aggregate	\$ <u>    N/A    </u>
    - c. Employer's Liability:
 

Bodily injury, each accident	\$ <u>  1,000,000  </u>
Bodily injury by disease, each employee	\$ <u>  1,000,000  </u>
Bodily injury/disease, aggregate	\$ <u>  1,000,000  </u>
    - d. For work performed in monopolistic states, stop-gap liability coverage shall be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of: \$     N/A
    - e. Foreign voluntary worker compensation \$     N/A
    - f. Workers' Compensation and Employer's Liability insurance shall include the proprietor/partners/executive officers.
  2. Contractor's Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:
    - a. General Aggregate \$   5,000,000
    - b. Products--Completed Operations Aggregate \$   5,000,000
    - c. Personal and Advertising Injury \$   5,000,000
    - d. Each Occurrence (Bodily Injury and Property Damage) \$   5,000,000
    - e. Damage to Rented Premises (Each Occurrence) \$   1,000,000
  3. Business Automobile Liability under paragraph 6.03.D of the General Conditions:
    - a. Bodily Injury
 

Each person	\$ <u>  2,000,000  </u>
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- |    |  |                          |
|----|--|--------------------------|
|    | Each accident  | \$ <u>2,000,000</u>      |
| b. | Property Damage  |                          |
|    | Each accident  | \$ <u>2,000,000</u>      |
| 4. | Excess or Umbrella Liability:  |                          |
| a. | General Aggregate  | \$ <u>5,000,000</u>      |
| b. | Each Occurrence  | \$ <u>5,000,000</u>      |
| 5. | Contractor's Pollution Liability:  |                          |
| a. | General Aggregate  | \$ <u>5,000,000</u>      |
| b. | Each Occurrence  | \$ <u>5,000,000</u>      |
| c. | If box is checked, Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract  | <input type="checkbox"/> |
| 6. | Additional Insureds: Stanley Consultants, City of Geneva and subcontractors shall be specifically named on policy as additional insureds by endorsement, including completed operations. |                          |
| 7. | Contractor's Professional Liability:   |                          |
| a. | Each Claim   | \$ <u>2,000,000</u>      |
| b. | Annual Aggregate   | \$ <u>5,000,000</u>      |

#### SC-6.05 Property Insurance

In paragraph 6.05.A.2., change the words "all risk policy" to read "special perils policy."

Add the following to the list of requirements in Paragraph 6.05.A, as a numbered item:

13. be subject to a deductible amount of choice for direct physical loss in any one occurrence.

Add the following to the list of items in Paragraph 6.05.A, as numbered items:

14. include for the benefit of Owner loss of profits and soft cost coverage including, without limitation, fixed expenses and debt service for a minimum of 12 months with a maximum deductible of 30 days, plus attorneys fees and engineering or other consultants' fees, if not otherwise covered;
15. include by express endorsement coverage of damage to Contractor's equipment.

Delete Paragraph 6.05.A in its entirety and insert the following in its place:

- A. Contractor shall provide and maintain installation floater insurance for property under the care, custody, or control of Contractor. The installation floater insurance shall be a broad form or "all risk" policy providing coverage for all materials, supplies, machinery, fixtures, and equipment that will be incorporated into the Work. Coverage under the Contractor's installation floater will include:
1. any loss to property while in transit,
  2. any loss at the Site, and
  3. any loss while in storage, both on-site and off-site.

Coverage cannot be contingent on an external cause or risk, or limited to property for which the Contractor is legally liable. The Contractor shall be solely responsible for any deductible carried under this coverage and claims on materials, supplies, machinery, fixture, and equipment that will be incorporated into the Work while in transit or in storage. This policy will include a waiver of subrogation applicable to Owner, Contractor, Engineer, all Subcontractors, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them.

Delete the first sentence of Paragraph 6.05.A and insert the following sentence in its place:

- A. Owner will purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). . . .

## **ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES**

### *SC-7.02 Labor; Working Hours*

Amend the first and second sentences of Paragraph 7.02.B to read:

“ all Work at site shall be performed during regular working hours, and Contractor shall not permit overtime work or performance of Work on Saturday, Sunday, or any legal holiday without Owner's written consent given after prior written notice to Engineer.”

Add the following new subparagraphs immediately after Paragraph 7.02.B:

1. Regular working hours will be established by the City of Geneva.
2. Owner's legal holidays will be established by the City of Geneva.

Add the following new paragraph immediately after Paragraph 7.02.B:

- C. Contractor shall be responsible for the cost of any overtime pay or other expense incurred by the Owner for Engineer's services (including those of the Resident Project Representative, if any), Owner's representative, and construction observation services, occasioned by the performance of Work on Saturday, Sunday, any legal holiday, or as overtime on any regular work day. If Contractor is responsible but does not pay, or if the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

Add the following new subparagraph immediately after Paragraph 7.02.C:

1. For purposes of administering the foregoing requirement, additional overtime costs are defined as work performed not during regular working hours and Contractors shall not permit overtime work.

### *SC-7.04.C "Or-Equals"*

Amend the third sentence of paragraph 7.04.C of the General Conditions to read as follows:

"No "or-equal" item will be ordered, furnish, installed or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by a Change Order or other written communication. Engineer will advise Contractor in writing of any negative determination"

### *SC-7.09 Taxes*

Add a new paragraph immediately after Paragraph 7.09.A:

- B. Owner is exempt from payment of sales and compensating use taxes of the State of Illinois and of cities and counties thereof on all materials to be incorporated into the Work.

1. Owner will furnish the required certificates of tax exemption to Contractor for use in the purchase of supplies and materials to be incorporated into the Work.
2. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.

#### SC-7.12 *Safety and Protection*

Add a new paragraph immediately after paragraph 7.12.G:

- H. Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connections with the Work. The Owner and Engineer will not have such responsibility. No action under taken by the Owner or Engineer under General Conditions paragraphs 16.01 or 16.02, or article 10 will constitute a transfer of this responsibility or acceptance of this responsibility by the Owner or Engineer.

#### SC-7.16 *Shop Drawings, Samples, and Other Submittals*

Amend paragraph 7.16 by deleting the following words:

"and approval" and "and approve"

Delete paragraph 7.16.A.3. in its entirety and insert the following in its place:

3. If Contractor wishes to propose a variation from the requirements of the Contract Documents and a drawing or sample will be used to help describe the variation, the drawing or Sample shall not be submitted as a Shop Drawing or Sample, but rather will have specific notations regarding the variation and shall be transmitted to the Engineer with a letter describing all aspects of the variation, including any effect the variation will have on work of separate contractors, if any, and its effect, if any, on the Contract Price or Contract Time. If Engineer determines that the variation will be acceptable, the variation will be authorized by a Change Order executed by the Owner and Contractor.

Delete paragraph 7.16.D.3. in its entirety and insert the following in its place:

3. Engineer's review of Shop Drawings or Samples shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents; nor will any review by Engineer relieve Contractor from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the requirements of paragraph 7.16.A.3.

Add the following new paragraphs immediately after Paragraph 7.16.E:

- F. Contractor shall furnish required submittals with sufficient information and accuracy in order to obtain required review of an item with no more than 3 submittals. Engineer will record Engineer's time for reviewing subsequent submittals of Shop Drawings, samples or other items requiring review and Contractor shall reimburse Owner for Engineer's charges for such time.
- G. In the event that Contractor requests a substitution for a previously approved item, Contractor shall reimburse Owner for Engineer's charges for such time unless the need for such substitution is beyond the control of Contractor.

#### SC-7.18 *Indemnification*

Add a new paragraph immediately after paragraph 7.18.C.2.

- D. Contractor (and any Subcontractor into whose subcontract this clause is incorporated) agrees to assume the entire liability for all personal injury claims suffered by its own employees, including without limitation claims under the Illinois Structural Work Act, asserted by persons allegedly injured on the Project; waives any limitation of liability defense based upon the Worker's Compensation Act, court interpretations of said Act or otherwise; and agrees to indemnify and defend Owner and Engineer and their agents, employees and consultants (the "Indemnitees") from and against all such loss, expense,

damage or injury, including reasonable attorneys' fees, that the Indemnitees may sustain as a result of such claims, except to the extent that Illinois law prohibits indemnity for the Indemnitees' own negligence.

## **ARTICLE 8 – OTHER WORK AT THE SITE**

### **SC-8.02 *Coordination***

Delete Paragraph 8.02.A in its entirety and replace with the following:

- A. Owner intends to contract with others for the performance of other work at or adjacent to the Site.
  - 1. Owner shall have authority and responsibility for coordination of the various contractors and work forces at the Site;

## **ARTICLE 9 – OWNER'S RESPONSIBILITIES**

### **SC-9.12 *Safety Programs***

Delete Paragraph 9.12.A in its entirety.

## **ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION**

### **SC-10.03 *Project Representative***

Add the following new paragraphs immediately after Paragraph 10.03.A:

- B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.
  - 1. General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner only with the knowledge of and under the direction of Engineer.
  - 2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
  - 3. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.
  - 4. Liaison:
    - a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.
    - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
    - c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.
  - 5. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.

6. Shop Drawings and Samples:
  - a. Record date of receipt of Samples and Contractor-approved Shop Drawings.
  - b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.
  - c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.
7. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.
8. Review of Work and Rejection of Defective Work:
  - a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
  - b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.
9. Inspections, Tests, and System Start-ups:
  - a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.
  - b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.
10. Records:
  - a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.
  - b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.
  - c. Maintain records for use in preparing Project documentation.
11. Reports:
  - a. Furnish to Engineer periodic reports as required of progress of the Work and of

Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.

- b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.
  - c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.
12. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.
  13. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.
  14. Completion:
    - a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.
    - b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.
    - c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.
- C. The RPR shall not:
1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
  2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
  3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.
  4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work.
  5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
  6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
  7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
  8. Authorize Owner to occupy the Project in whole or in part.



- B. On this Project, by agreement with the Owner, Engineer will not furnish a Resident Project Representative to represent Engineer at the Site or assist Engineer in observing the progress and quality of the Work

## **ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN WORK**

### **SC-11.04 *Change of Contract price***

Amend Paragraph 11.04.C.1 to read:

“a mutually acceptable fixed fee;”

Delete Paragraph 11.04.C.2 and all subparagraphs in their entirety.

### **SC-11.06 *Change Proposals***

Delete Paragraph 11.06.A.3 in its entirety and insert the following in its place:

3. Binding *Decision*:
  - a. In the event the change order causes a change in completion date of increase in contract price exceeding 10% of the original contract price, the decision will only be binding pending approval by Geneva City Council at the next regularly scheduled City Council meeting after Engineer’s approval of change order.
  - b. Change orders causing an increase in the original contract price that does not exceed 10% of the original price will be binding after the approval of the Engineer’s approval by the Geneva City Administrator.

## **ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK**

### **SC-13.01 *Cost of the Work***

Delete Paragraph 13.01.B.5.c in its entirety and insert the following in its place:

- c. Construction Equipment and Machinery:
  - 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
  - 2) Costs for equipment and machinery owned by Contractor will be paid at a rate shown for such equipment in the Lump Sum Bid. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs. Costs will include the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, shall cease to accrue when the use thereof is no longer necessary for the changed Work. Equipment or machinery with a value of less than \$1,000 will be considered small tools.

### **SC-13.03 *Unit Price Work***

Delete Paragraph 13.03 and all subparagraphs in their entirety.

## **ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD**

### SC-15.01.A *Basis for Progress Payments:*

Amend Paragraph 15.01.A to read as follows:

- A. “*Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.”

### SC-15.01.D *Payment Becomes Due*

Delete subparagraph 15.01.D.1 in its entirety and insert the following in its place:

1. Forty -five days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer’s recommendation, including but not limited to, liquidated damages, will become due and, will be paid by Owner to Contractor.

### SC-15.03 *Substantial Completion*

Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, shall be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

### SC-15.06 *Final Payment*

Amend Paragraph 15.06.D by deleting “Thirty” and replacing with “Forty-five”.

## **ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION**

### SC-16.04 *Contractor May Stop Work or Terminate*

Amend Paragraph 16.04.A by deleting “30” and replacing with “45”.

Amend Paragraph 16.04.B by deleting “30” and replacing with “45”.

## **ARTICLE 17 – FINAL RESOLUTION OF DISPUTES**

### SC-17.01 *Methods of Procedures*

Delete Subparagraph 17.01 Methods of Procedures and replace with the following:

#### 17.01 Dispute Resolution Method

- A. Either Owner or Contractor may initiate the mediation of any Claim decided in writing by Engineer under Paragraph 10.07.A or 11.06A before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the Engineer’s decision from becoming final and binding. The venue for any mediation proceeding shall be in an agreed upon location in Kane County, IL.

- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the mediation process does not result in resolution of the Claim, then Engineer's written decision or denial under Paragraph 10.07A. or 11.06.A shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
  1. elects in writing to invoke any dispute resolution process provided for in Article 17, or
  2. agrees with the other party to submit the Claim to another dispute resolution process, or
  3. if no dispute resolution process has been provided for in Article 17, delivers to the other party written notice of the intent to submit the Claim to a court of competent jurisdiction, and within 60 days of the termination of the mediation institutes such formal proceeding.

#### 17.02 Arbitration

- A. All Claims or counterclaims, disputes, or other matters in question between Owner and Contractor arising out of or relating to the Contract Documents or the breach thereof (except for Claims which have been waived by the making or acceptance of final payment as provided by Paragraph 15.07) not resolved under the provisions of Paragraph 17.01 will be decided by binding arbitration in accordance with the rules of American Arbitration Association, subject to the conditions and limitations of this Paragraph. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction. Arbitration shall take place in or near Kane County, Illinois.
- B. No demand for arbitration of any Claim or counterclaim, dispute, or other matter that is required to be referred to Engineer initially for decision in accordance with Paragraph 10.07 or 11.06.A will be made until the earlier of: (i) the date on which Engineer has rendered a written decision, or (ii) the 31st day after the parties have presented their final evidence to Engineer if a written decision has not been rendered by Engineer before that date. Subject to the provisions of Paragraph 17.02.A, no demand for arbitration of any such Claim or counterclaim, dispute, or other matter will be made later than 30 days after the date on which Engineer has rendered a written decision in respect thereof in accordance with Paragraph 10.07 or 11.06A; and the failure to demand arbitration within said 30 day period will result in Engineer's decision being final and binding upon Owner and Contractor. If Engineer renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but will not supersede the arbitration proceedings, except where the decision is acceptable to the parties concerned.
- C. Notice of the demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitrator or arbitration provider, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the 30 day period specified in Paragraph 17.02.B, and in all other cases within a reasonable time after the Claim or counterclaim, dispute, or other matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such Claim or other dispute or matter in question would be barred by the applicable statute of limitations.
- D. No arbitration arising out of or relating to the Contract Documents shall include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:
  1. the inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration; and
  2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings.
- E. The award rendered by the arbitrator shall be in writing and include: (i) a concise breakdown of the award; (ii) a written explanation of the award specifically citing the Contract Document provisions deemed applicable and relied on in making the award.

- F. The award will be consistent with the agreement of the parties and final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal.

SC-17.03 *Attorneys' Fees*

SC-17.03 *Attorneys' Fees*

- A. For any matter subject to final resolution under this Article, the prevailing party shall be entitled to an award of its attorneys' fees incurred in the final resolution proceedings, in an equitable amount to be determined in the discretion of the court, arbitrator, arbitration panel, or other arbiter of the matter subject to final resolution, taking into account the parties' initial demand or defense positions in comparison with the final result.

END OF DOCUMENT

# Addendum No. 1

for

## Bid Proposal No. 23-01 Kautz Road Substation Procurement/Construction

**City of Geneva  
Geneva, Illinois**



License Expiration Date: 11-30-2023

Illinois Firm Registration No. 184-001533

**March 1, 2023**



ADDENDUM NO. 1

March 1, 2023

BID PROPOSAL NO. 23-01  
KAUTZ ROAD SUBSTATION  
PROCUREMENT/CONSTRUCTION

CITY OF GENEVA  
GENEVA, ILLINOIS

1. SECTION 26 05 93 - TESTING OF ELECTRICAL SYSTEMS

Add Section 26 05 93, pages 1 through 3, attached hereto.

2. SECTION 01 11 00 – SUMMARY OF WORK

Article "1.01 WORK COVERED BY CONTRACT DOCUMENTS"

Add subparagraph A., 9. to read:

9. Substation testing and checkout.

Change paragraph B. to read:

- B. SCADA testing and checkout: Provide 2 days of 1 person on site, during testing to correct issues found by Owner provided SCADA checkout.

3. SECTION 26 13 13 - MEDIUM-VOLTAGE, METAL-CLAD SWITCHGEAR

Article "2.01 MANUFACTURERS"

Change article A. to read:

- A. ABB.  
B. AZZ.  
C. Crown Technical Systems.  
D. Eaton Cutler-Hammer.  
E. Meyers Power Products.  
F. Powell Electric.

G. Siemens.

H. Square D.

END OF ADDENDUM NO. 1

- 1) Phil E. Schulz
- 2) John Sovers

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Circuit tests.
- B. Relay tests.
- C. Equipment start up.
- D. Acceptance for operation.

## 1.02 SUBMITTALS

- A. Quality assurance data:
  - 1. Document as-commissioned condition on interconnection diagram Shop Drawings.
  - 2. Record as-built variations from design drawings and submit to Owner.
  - 3. Provide 2 copies of certified test data and reports for all tests specified; include specified and "as-left" settings.

## 1.03 QUALITY ASSURANCE

- A. Test equipment shall have recent calibration checks by equipment manufacturer or authorized facility to assure accuracy of commissioning process.

**PART 2 PRODUCTS**

## 2.01 TEST EQUIPMENT

- A. Furnish equipment for performing tests specified. Test equipment shall remain property of Contractor.
- B. Insulation resistance tester:
  - 1. Equivalent to "Megger" as manufactured by Biddle Instruments.
  - 2. Motor-driven or rectifier-type with nominal ranges of 500 and 2,500 volts dc.
  - 3. Zero to 50,000 megohm capability.
  - 4. "Low Supply" indicator on scale to indicate low cranking speed or low battery condition.
  - 5. Accuracy of at least 2.5% of scale length.
- C. Metering, instruments, hot-line equipment, potential transformers, and other equipment required for phasing tests.

**PART 3 EXECUTION**

## 3.01 TESTING - GENERAL

- A. Notify Owner prior to performing tests to permit observation.
- B. Work involved with testing shall be coordinated with Owner and other contractors.
- C. Clean equipment interiors and exteriors prior to start-up and testing.
- D. Unless specified otherwise, tests performed shall be standard tests listed by ANSI/IEEE for intended equipment.



- E. Provide certified test reports listing circuit or equipment tested, date, equipment used, person or persons performing and witnessing tests, and results of tests.
- F. Test shall be performed by qualified test engineer.
- G. Schedule service of manufacturer's authorized service representative for each equipment to inspect installation prior to energization.
- H. Subsequent to wire and cable hook-ups and installation of auxiliary devices and equipment, energize equipment and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and retest to demonstrate compliance. Correct deficiencies, at no cost to Owner, until equipment operates properly.

### 3.02 CIRCUIT TESTING

- A. Circuits shall be electrically tested after installation. Splices shall be complete prior to testing.
  - 1. Provide equipment and labor required for testing.
  - 2. Circuit failing to test satisfactorily shall be replaced or repaired by Contractor, and retested at no additional cost to Owner.
  - 3. Check power, dc power, and control circuits for:
    - a. Correct terminations.
    - b. Continuity.
    - c. Unintentional shorts and grounds.
  - 4. Check power conductors for correct phasing.
  - 5. Control, and instrumentation, wire shall be checked for correct termination, continuity, freedom from shorts or grounds, and identification.
  - 6. Current transformer wiring shall be loop checked by injecting current at one end of loop and checking with clip-on ammeter at each field termination point to assure continuity and phase identification.
  - 7. Voltage transformer wiring shall be tested by applying voltage at one point and checking with voltmeter phase rotation meter and phase angle meter at each field termination point to assure continuity, identification and phase shift.

### 3.03 RELAY TESTS

- A. Provide services of certified testing firm to test, calibrate, and commission all relays and meters.
- B. Apply settings to all relays and meters provided by Owner.
- C. Commissioning test for installation of new relay shall include as a minimum:
  - 1. Dc and ac connections are correct and of correct magnitude.
  - 2. Polarity and phase rotation of ac connections
  - 3. Test verification of each protection element per settings provided using brief fault test values.
  - 4. Verify control signal inputs and outputs and associated contact operations operate per settings provided.
  - 5. Verify that all auxiliary equipment (breaker auxiliary contacts, relay initiate contacts, switch device contacts and remote device tripping) is properly connected to relay per schematics and wiring diagrams.
  - 6. Functional tests by application of secondary single-phase and 3-phase voltage to voltage circuits and injection of current and current transformer secondary circuits.
  - 7. Functional testing for proper operation relay targets.

### 3.04 EQUIPMENT START-UP PROCEDURES

- A. Equipment: In accordance with instruction manuals and vendor's service representative recommendations.

- B. Provide supervision, labor, coordination, tools, material, equipment, and services required to perform starting of each respective item of equipment and to completely commission equipment, and systems furnished and installed or installed as a part of this Contract.
- C. Provide construction labor required for commissioning process necessary to support schedule as determined by Owner, including initial total system startup.
- D. Provide supervision, labor, and assistance to service engineers and technical directors of installation for equipment installed as a part of this Contract. Follow specified procedures and instructions provided by these representatives. These representatives will not be present at all times. Owner will determine when representatives are required.

### 3.05 ACCEPTANCE FOR OPERATION

- A. Electrical installation shall be complete in every detail and capable of normal operation in presence of Owner to verify its readiness.
- B. Owner will accept equipment and systems for operation when construction has been substantially completed by Contractor. "Acceptance for Operation" shall mean Owner will assume operational and routine maintenance duties. "Acceptance for Operation" does not relieve Contractor from responsibilities related to defective materials and workmanship; neither does it constitute final acceptance of materials and equipment.
- C. After Owner has accepted a system for operation, Contractor shall continue to perform following as requested and scheduled by Owner at no additional cost to Owner:
  - 1. Troubleshooting and adjustments, until system operation and performance is acceptable.
  - 2. Provision of technical services when needed until final acceptance.

END OF SECTION

- 1) Phil. E. Schulz
- 2) John R. Sovers

# Addendum No. 2

for

## Bid Proposal No. 23-01 Kautz Road Substation Procurement/Construction

**City of Geneva  
Geneva, Illinois**



License Expiration Date: 11-30-2023

Illinois Firm Registration No. 184-001533

**March 20, 2023**



ADDENDUM NO. 2

March 20, 2023

BID PROPOSAL NO. 23-01  
 KAUTZ ROAD SUBSTATION  
 PROCUREMENT/CONSTRUCTION

CITY OF GENEVA  
 GENEVA, ILLINOIS

1. DRAWINGS

The following Drawings have been revised, as indicated by date, and are reissued herewith:

Drawing No.	Title	Date
CG01	Grading Plan	3/20/2023
EO05	Underground Conduit and Foundation Plan	3/20/2023

END OF ADDENDUM NO. 1

- 1) Philip E. Schulz
- 2) John R. Sovers

## **PART 1 GENERAL**

### **1.01 WORK COVERED BY CONTRACT DOCUMENTS**

- A. Work of this Agreement comprises furnishing and installation of all materials and equipment and general construction for the Kautz Road Substation Geneva, Illinois for The City of Geneva, Owner including:
  - 1. Performing substation grading.
  - 2. Furnishing and installing power transformer.
  - 3. Furnishing and installing control building and switchgear.
  - 4. Furnishing and installing substation steel structures.
  - 5. Furnishing and installing substation foundations and oil containment system.
  - 6. Furnishing and installing control and power conduits and wiring.
  - 7. Furnishing and installing grounding system.
  - 8. Furnish an install substation yard rock.
- B. Substation testing and checkout: Provide 4 days of 1 person on site, during testing to correct issues found by Owner provided testing firm.
- C. ComEd witness testing: Provide one person on site during testing to fix issues found by testing firm.

### **1.02 AGREEMENT**

- A. Procure and Construct Work under single lump sum Agreement.

### **1.03 WORK SEQUENCE**

- A. Construct Work in stages to provide for public convenience. Do not close off public use of public and private roads.

### **1.04 CONTRACTOR'S USE OF PREMISES**

- A. Complete and exclusive use of premises for execution of Work.
- B. Limit Contractor's use of premises for Work and for storage, to allow for: Public and private use streets and roads.
- C. Coordinate use of premises under direction of Contractor. Contractor shall confine construction equipment, storage of materials and equipment and operations of workers to areas permitted by law, ordinances, permits, or requirements of Contract Documents, and shall not unreasonably encumber premises with construction equipment or other material or equipment.
- D. Assume full responsibility for protection and safekeeping of items under this Agreement, stored on Site.
- E. Move any stored items, under Contractor's control, which interfere with operations of Owner or separate contractor.
- F. Obtain and pay for use of additional storage or Work areas needed for operations.

### **1.05 OWNER-FURNISHED ITEMS**

- A. None.

- B. Owner's responsibilities:
1. Arrange for and deliver necessary Shop Drawings and Samples to Contractor.
  2. Arrange and pay for product delivery to Site, in accordance with construction schedule.
  3. Deliver supplier's bill of materials to Contractor.
  4. Inspect deliveries jointly with Contractor.
  5. Submit claims for transportation damage.
  6. Arrange for replacement of damaged, defective, or missing items.
  7. Arrange for manufacturer's warranties, Bonds, service, inspections, as required.
- C. Contractor's responsibilities:
1. Designate delivery date for each product in Construction Schedule.
  2. Protect products from exposure to elements, and from damage.
  3. Repair or replace items damaged by Contractor.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

NOT USED

END OF SECTION

**PART 1 GENERAL**

## 1.01 SCHEDULE OF VALUES

- A. Submit a printed schedule on EJCDC C-620 – Contractor's Application for Payment.
- B. Submit Schedule of Values in duplicate within 15 days after date established in Notice to Proceed.
- C. Format: Use Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section.
- D. Include within each line item, a direct proportional amount of Contractor's overhead and profit.
- E. Revise schedule to list approved Change Orders, with each Application for Payment.

## 1.02 APPLICATIONS FOR PAYMENT

- A. Submit 3 copies of each application on EJCDC C-620 – Contractor's Application for Payment.
- B. Content and format: Use Schedule of Values for listing items in Application for Payment.
- C. Submit an updated construction schedule with each Application for Payment.
- D. Payment period: Submit at intervals stipulated in Agreement.
- E. Submit with transmittal letter as specified for Submittals in Section 01 33 00.
- F. Include a Company invoice for the amount listed on the payment application.
- G. Substantiating data: When Engineer requires substantiating information, submit data justifying dollar amounts in question. Include following with application:
  - 1. Current construction photographs specified in Section 01 32 33.
  - 2. Partial release of liens from major subcontractors and vendors.
  - 3. Record documents as specified in Sections 01 32 00 and 01 70 00, for review by Owner which will be returned to Contractor.
  - 4. Affidavits attesting to off-site stored products.
  - 5. Construction progress schedules, revised and current as specified in Section 01 32 00.
  - 6. Certified payroll for Contractor and all Subcontractors.

## 1.03 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to Work.
- B. Engineer will advise of minor changes in Work not involving an adjustment to Contract Price or Contract Time by issuing supplemental instructions on Engineer's Instruction to Contractor (ITC) Form SC2264-1299.
- C. Engineer may issue a notice of change which includes detailed description of proposed change with supplementary or revised Drawings and Specifications, change in Contract Time for executing change and period of time during which requested price will be considered valid. Contractor will prepare and submit an estimate within 7 days.
- D. Contractor may propose changes by submitting a request for change to Engineer, describing proposed change and its full effect on Work. Include a statement describing reason for change, and

effect on Contract Price and Contract Time with full documentation and a statement describing effect on Work by separate or other contractors.

- E. Stipulated price Change Order: Based on notice of change and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Engineer.
- F. Work Directive Change: Engineer may issue a directive, on EJCDC C940 - Work Directive Change signed by Owner, instructing Contractor to proceed with a change in Work, for subsequent inclusion in a Change Order. Document will describe changes in Work, and designate method of determining any change in Contract Price or Contract Time. Promptly execute change.
- G. Document each quotation for a change in cost or time with sufficient data to allow evaluation of quotation.
- H. Change Order Forms: EJCDC C-941 Change Order.
- I. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in Conditions of Contract.
- J. Correlation of Contractor submittals:
  1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust Contract Price.
  2. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by change, and resubmit.
  3. Promptly enter changes in Project Record Documents.

#### 1.04 DEFECT ASSESSMENT

- A. Replace Work, or portions of Work, not conforming to specified requirements.
- B. If, in opinion of Engineer, it is not practical to remove and replace Work, Engineer will direct an appropriate remedy or adjust payment.
- C. Individual specification sections may modify these options or may identify a specific formula or percentage price reduction.
- D. Authority of Engineer to assess defect and identify payment adjustment, is final.
- E. Nonpayment for rejected products: Payment will not be made for rejected products for any of following:
  1. Products wasted or disposed of in a manner that is not acceptable.
  2. Products determined as unacceptable before or after placement.
  3. Products not completely unloaded from transporting vehicle.
  4. Products placed beyond lines and levels of required Work.
  5. Products remaining on hand after completion of Work.
  6. Loading, hauling, and disposing of rejected products.

#### 1.05 UNIT ADJUSTMENT PRICES

- A. Unit adjustment prices will be used to adjust Contract Price for additions to or deductions from quantities required by Contract Documents.
  1. Additions to Work will be made at 115% of prices submitted.
  2. Deletions from Work will be made at 90% of prices submitted.
  3. Net changes of quantities shall first be determined before price factors are applied.
- B. Unit adjustment prices apply only to additions to or deductions from quantities required by Contract Documents made necessary by unforeseen conditions or changes deemed necessary or desirable by



Engineer or Owner during construction. Additions or deductions necessary to accommodate equipment furnished and installed under Agreement shall be made by Contractor at its expense, and unit adjustment prices shall not apply.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

NOT USED

END OF SECTION

## PART 1 GENERAL

### 1.01 SUBSTITUTIONS

- A. For period of 30 days after effective date of Agreement, Engineer will consider formal requests from Contractor for substitution of products in place of those specified. After end of that period, requests will be considered only in case of product unavailability or other conditions beyond control of Contractor.
- B. Submit 3 copies of request for substitution for consideration using attached Product Substitution Request Form. Limit each request to one proposed Substitution. Support each request with:
  - 1. Complete data substantiating compliance of proposed substitutions with requirements stated in Contract Documents. Burden of proof is on proposer.
    - a. Product identification, including manufacturer's name and address.
    - b. Manufacturer's literature; identify:
      - 1) Product description.
      - 2) Reference standards.
      - 3) Performance and test data.
    - c. Samples, as applicable.
    - d. Name and address of similar projects on which product has been used, and date of each installation.
  - 2. Itemized comparison of proposed substitution with product specified; list significant variations.
  - 3. Data relating to changes in construction schedule.
  - 4. Any effect of substitution on separate contracts.
  - 5. List of changes required in other work or products.
  - 6. Accurate cost data comparing proposed substitution with product specified. Amount of any net change to Contract Price.
  - 7. Designation of required license fees or royalties.
  - 8. Designation of availability of maintenance services, sources, or replacement materials.
- C. Substitutions will not be considered for acceptance when:
  - 1. They are indicated or implied on Shop Drawings.
  - 2. They are requested directly by Subcontractor or supplier.
  - 3. Acceptance will require substantial revision of Contract Documents.
- D. Substitute products shall not be ordered or installed without written notification from Engineer of Owner's acceptance.
- E. Engineer will determine acceptability of proposed substitutions.

### 1.02 CONTRACTOR'S REPRESENTATION

- A. In making formal request for substitution Contractor represents that:
  - 1. It has investigated proposed product and has determined that it is equal to or superior in all respects to that specified.
  - 2. It will provide same warranties or Bonds for substitution as for product specified or as required by Owner.
  - 3. It will coordinate installation of accepted substitution into Work, and will make such changes as may be required for Work to be complete in all respects.
  - 4. It waives claims for additional costs caused by substitution which may subsequently become apparent.
  - 5. Cost data is complete and includes related costs under its Agreement, but not:
    - a. Costs under separate contracts.
    - b. Engineer's costs for redesign or revision of Contract Documents.
  - 6. It will reimburse Owner for charges of Engineer or Engineer's consultants for evaluating any proposed substitute, whether proposed substitute is accepted or rejected.

**1.03 ENGINEER DUTIES**

- A. Review Contractor's requests for substitution with reasonable promptness and advise Owner.
- B. Notify Contractor in writing of Owner's decision to accept or reject requested substitution.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

NOT USED

END OF SECTION

To: \_\_\_\_\_

Project: \_\_\_\_\_

Specified Item:	Section	Page	Paragraph	Description
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The undersigned request consideration of the following:

PROPOSED SUBSTITUTION \_\_\_\_\_

Attached data includes product description, specifications, drawings, photographs, performance, and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments are correct:

1. The proposed substitution does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by:

Signature \_\_\_\_\_

Firm \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

Date \_\_\_\_\_

Telephone \_\_\_\_\_

Attachments

For use by Engineer/Architect

Approved       Approved as noted

Not Approved     Received too late

By \_\_\_\_\_

Date \_\_\_\_\_

Remarks \_\_\_\_\_

## **PART 1 GENERAL**

### **1.01 COORDINATION AND PROJECT CONDITIONS**

- A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements, supports, and installation of electrical Work which is indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.
- E. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

### **1.02 COPIES OF DRAWINGS AND PROJECT MANUALS**

- A. After Notice of Award, Contractor may obtain, at no charge, up to 3 printed or hard copies of the Drawings and Project Manual and one set in electronic format. Additional copies will be furnished upon request at the cost of reproduction plus handling charge.
- B. Additional copies of project manuals may be obtained under following conditions:
  - 1. Furnished at Engineer's reproduction cost plus handling charge.
  - 2. If Contractor's requirement for additional project manuals necessitates reprinting of project manuals, Contractor shall pay entire cost of such reprinting.
  - 3. Partial sets of project manuals will not be provided.
- C. Revised Drawings and project manuals, if required, will be provided by Engineer to show authorized changes or extra Work under following conditions:
  - 1. Project manuals: Furnished at no charge, in same quantity as original issuance.
  - 2. Half-size Drawings:
    - a. Half-size Drawings will be available as revised Drawings.
    - b. One revised, complete set of half-size Drawings will be issued, at no charge, for each half-size set originally issued and for each half-size set purchased by Contractor after Notice of Award.
  - 3. Full-size Drawings:
    - a. One revised, complete set of full-size Drawings will be issued, at no charge, for each full-size set originally issued.
    - b. One revised, complete set of full-size Drawings will be issued, at no charge, for each full-size set originally issued, and for each full-size set purchased by Contractor after Notice of Award, up to 4 copies maximum.
  - 4. One full-size reproducible set will be issued to accommodate fifth and subsequent sets purchased by Contractor. Contractor shall use reproducible set to complete printing for additional Drawings in its possession.

### **1.03 PROJECT SITE ADMINISTRATION**

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out Work and perform construction as required by Contract Documents. Contractor shall at all times maintain good discipline and order at site.

- B. Except in connection with safety or protection of persons or Work or property at site or adjacent thereto, and except as otherwise indicated in Contract Documents, all Work at site shall be performed during regular working hours, and Contractor shall not permit overtime work or performance of Work on Saturday, Sunday, or any legal holiday without Owner's written consent given after prior written notice to Engineer.
- C. Incompetent or incorrigible employees shall be dismissed from Work by Contractor or its representative when requested by Engineer, and such persons shall not again be permitted to return to Work without written consent of Engineer.
- D. Workmanship shall be of best quality.

#### 1.04 PRECONSTRUCTION MEETING

- A. Engineer will schedule a meeting 15 days after Notice to Proceed.
- B. Attendance Required: Owner, Engineer, and Contractor.
- C. Agenda:
  1. Execution of Owner-Contractor Agreement.
  2. Submission of executed bonds and insurance certificates.
  3. Distribution of Contract Documents.
  4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
  5. Designation of personnel representing the parties in Contract, Owner, and the Engineer.
  6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  7. Scheduling.
- D. Record minutes and distribute copies within 2 days after meeting to participants, with 1 copy to those affected by decisions made.

#### 1.05 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Engineer, as appropriate to agenda topics for each meeting.
- C. Agenda:
  1. Review minutes of previous meetings.
  2. Review of Work progress.
  3. Field observations, problems, and decisions.
  4. Identification of problems which impede planned progress.
  5. Review of submittals schedule and status of submittals.
  6. Review of off-site fabrication and delivery schedules.
  7. Maintenance of progress schedule.
  8. Corrective measures to regain projected schedules.
  9. Planned progress during succeeding work period.
  10. Coordination of projected progress.
  11. Maintenance of quality and work standards.
  12. Effect of proposed changes on progress schedule and coordination.
  13. Other business relating to Work.
- D. Record minutes and distribute copies within 2 days after meeting to participants, with 1 copy to those affected by decisions made.

**PART 2 PRODUCTS**

## 2.01 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.

**PART 3 EXECUTION**

## 3.01 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements which affect:
  - 1. Structural integrity of element.
  - 2. Integrity of weather-exposed or moisture-resistant elements.
  - 3. Efficiency, maintenance, or safety of element.
  - 4. Visual qualities of sight exposed elements.
  - 5. Work of Owner or separate Contractor.
- C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
  - 1. Fit the several parts together, to integrate with other Work.
  - 2. Uncover Work to install or correct ill-timed Work.
  - 3. Remove and replace defective and non-conforming Work.
  - 4. Remove samples of installed Work for testing.
  - 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D. Execute work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products in accordance with requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with material to full thickness of the penetrated element.
- J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
- K. Identify hazardous substances or conditions exposed during the Work to the Engineer for decision or remedy.

END OF SECTION

## **PART 1 GENERAL**

### **1.01 CONSTRUCTION PROGRESS SCHEDULES**

- A. Promptly after Notice of Award, prepare and submit to Engineer estimated construction progress schedules for Work, with subschedules of related activities which are essential to its progress.
- B. Submit revised progress schedules with each Application for Payment.

### **1.02 FORM OF SCHEDULES**

- A. Prepare schedules in form of horizontal bar chart.
  - 1. Provide separate horizontal bar for each trade or operation.
  - 2. Horizontal time scale: Identify first work day of each week.
  - 3. Scale and spacing: To allow space for notations and future revisions.
  - 4. Minimum sheet size: 11 x 17.
- B. Format of listings: Chronological order of start of each item of Work.
- C. Identification of listings: By major Specification Section numbers.

### **1.03 CONTENT OF SCHEDULES**

- A. Construction Progress Schedule show:
  - 1. Complete sequence of construction by activity, with Contract Price breakdown at each stage.
  - 2. Dates for beginning, and completion of, each major element of construction specifically listing:
    - a. Equipment ordering and shipping.
    - b. Site utilities.
    - c. Subcontractor Work.
    - d. Equipment installations.
    - e. Finishings.
  - 3. Projected percentage of completion for each item, as of first day of each month.
- B. Provide subschedules to define critical portions of prime schedules.

### **1.04 PROGRESS REVISIONS**

- A. Indicate progress of each activity to date of submission.
- B. Show changes occurring since previous submission of schedule:
  - 1. Major changes in scope.
  - 2. Activities modified since previous submission.
  - 3. Revised projections of progress and completion.
  - 4. Other identifiable changes.
- C. Provide narrative report as needed to define:
  - 1. Problem areas, anticipated delays, and impact on schedule.
  - 2. Corrective action recommended, and its effect.
  - 3. Effect of changes on schedules of other prime contractors.

### **1.05 SUBMISSIONS**

- A. Submit initial schedules within 15 days after Notice of Award.
  - 1. Engineer will review schedules and return review copy within reasonable time after receipt.
  - 2. If required, resubmit within 7 days after return of review copy.
- B. Submit revised progress schedules with each Application for Payment.



- C. Submit number of opaque reproductions which Contractor requires, plus 5 copies which will be retained by Engineer.

1.06 DISTRIBUTION

- A. Distribution copies of reviewed schedules to:
  - 1. Job site file.
  - 2. Subcontractors.
  - 3. Other concerned parties.
- B. Instruct recipients to report promptly to Contractor, in writing, any problems anticipated by projects shown in schedules.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

NOT USED

END OF SECTION

## PART 1 GENERAL

### 1.01 SUBMITTAL PROCEDURES

- A. Submit electronically when required by Specification Sections. Contact Engineer as listed below for submittal instructions. An FTP/FTA site or direct posting site will be provided after award to post submittals and to receive return submittals:

Mr. Philip Schulz  
Email: [schulzphil@stanleygroup.com](mailto:schulzphil@stanleygroup.com)  
Office Phone: 563-264-6461  
Stanley Consultants, Inc.  
Stanley Building  
225 Iowa Avenue  
Muscatine, Iowa 52761-3764

- B. Engineer will make internal distribution to the Owner and other interested parties.
- C. Submittals shall be in English language.
- D. Weights, measures, and units shall be English units with SI metric values following in parenthesis.
- E. Symbols and drawings shall conform to ANSI Y32.2/IEEE 315/CSA Z99.

### 1.02 CONTRACTOR RESPONSIBILITIES

- A. Review submittals prior to submission.
- B. Determine and verify:
  - 1. Field measurements.
  - 2. Field construction criteria.
  - 3. Catalog numbers and similar data.
  - 4. Conformance to Specifications.
- C. Coordinate each submittal with other submittals and with requirements of Work and of Contract Documents.
- D. Notify Engineer in writing, at time of submission, of any deviations in submittals from requirements of Contract Documents. Any such deviations permitted by Engineer will require modifications of Contract Documents.
- E. Provide space on Shop Drawings for Contractor and Engineer stamps.
- F. When Shop Drawings are revised for resubmission, identify all changes made since previous submission.
- G. Submittals containing language imposing duties on others (such as verification of dimensions or supply of related information) inconsistent with contract language shall be null and void.
- H. Submittals shall not be used as media for inquiries for information or for verification of information that must be supplied by others to Contractor. Inquiries or verification of information shall be made by separate Contractor submittal using Request for Information (RFI) process.
- I. Begin no fabrication or Work which requires submittal review until return of submittals by Engineer with stamp, as either "Reviewed", "Reviewed as Noted", or "Reviewed as Noted-Resubmit."

- J. Distribute copies of reviewed submittals that carry Engineer stamp as either "Reviewed" or "Reviewed as Noted" as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

### 1.03 ENGINEER DUTIES

- A. Review required submittals with reasonable promptness and in accord with schedule, only for general conformance to design concept of Project and compliance with information given in Contract Documents. Review shall not extend to means, methods, sequences, techniques, or procedures of construction or to safety precautions or program incident thereto. Review of a separate item as such will not indicate approval of assembly in which item functions.
- B. Affix stamp and initials or signature, and indicate requirements for resubmittal, or review of submittal. Engineer's action on submittals is classified as follows:
  1. Reviewed: Submittal has been reviewed and appears to be in conformance to design concept of Project and Contract Documents. Contractor may proceed with fabrication of work in submittal.
  2. Reviewed As Noted: Submittal has been reviewed and appears to be in conformance to design concept of Project and Contract Documents, except as noted by reviewer. Contractor may proceed with fabrication of work in submittal with modifications and corrections as indicated by reviewer.
  3. Reviewed As Noted-Resubmit: Submittal has been reviewed and appears to be in conformance to design concept of Project and Contract Documents, except as noted by reviewer. Contractor may proceed with fabrication of work in submittal with modifications and corrections as indicated by reviewer. Contractor shall make any corrections indicated by reviewer and resubmit for review.
  4. Resubmit: Submittal has been reviewed and appears not to be in conformance to design concept of Project or with Contract Documents. Contractor shall not proceed with fabrication of work in submittal, but instead shall make any corrections required by reviewer and resubmit for review.
  5. Returned without Review: Submittal is being returned without having been reviewed because: 1) not required by Contract Documents; 2) grossly incomplete; 3) indicates no attempt at conformance to Contract Documents; 4) cannot be reproduced; 5) lacks Contractor's completed approval stamp; or 6) lacks design professional's seal when required by law or Contract Documents. If submittal is required by Contract Documents, Contractor shall not proceed with Work as detailed in submittal, but instead shall correct defects and resubmit for review.
  6. For Information Only: Submittal has not been reviewed but is being retained for informational purposes only.
  7. Void: Submittal is voided because it is no longer required or has been superseded by another submittal.
- C. Return one electronic copy of submittals to Contractor. Contractor shall make additional distribution as required.
- D. Review of submittals shall not relieve Contractor from responsibility for any variation from Contract Documents unless Contractor has, in writing, called Engineer's attention to such variation at time of submission, and Engineer has given written concurrence pursuant to Contract Documents to specific variation, nor shall any concurrence by Engineer or other reviewer relieve Contractor from responsibility for errors or omissions in submittals.

### 1.04 SHOP DRAWINGS SUBMITTALS

- A. Submit for review for limited purpose of checking for conformance to information given and design concept expressed in Contract Documents. Produce copies and distribute in accordance with article "Submittal Procedures" and for record documents purposes as described in Section 01 70 00.
- B. Designate in construction schedule, or in separate coordinated submittal schedule, dates for submission and dates that reviewed submittals will be needed.

- C. Do not ship equipment until return of shop test results by Engineer as "Reviewed" or "Reviewed as Noted"
- D. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in Work or in work of other contractors.
- E. Present in clear and thorough manner, complete with respect to dimensions, design criteria, materials of construction, and like information to enable review of information as required.
- F. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Drawings.
- G. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- H. Equipment which is identified on Contract Documents with tag number or name shall be identified on Shop Drawing with same tag.
- I. Schedule submittals to expedite Project. Coordinate submission of related items.
- J. For each submittal for review, allow 15 days to complete review process.
- K. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.
- L. Shop Drawings shall be submitted in electronic format.
  - 1. Submittal Transmittal form (see pdf attached) shall be provided in Word format for each submittal. MSWord template will be provided after award.
  - 2. Text documents shall be submitted in .pdf or .doc format except for the shop drawing Transmittal Form.
  - 3. Drawings shall be submitted in .pdf or .tif format.
  - 4. Electronic submittal shall be suitable for reproduction in black and white.
  - 5. Samples may be submitted to Engineer at address given above.
- M. Submittals shall contain:
  - 1. Date of submission and dates of any previous submissions.
  - 2. Project title and number.
  - 3. Contract identification.
  - 4. Names of:
    - a. Contractor.
    - b. Supplier.
    - c. Manufacturer.
  - 5. Identification of product, with Specification section number and article number.
  - 6. Field dimensions, clearly identified as such.
  - 7. Relation to adjacent or critical features of Work or materials.
  - 8. Applicable standards, such as ASTM or Federal Specification numbers.
  - 9. Identification of deviations from Contract Documents.
  - 10. Identification of revisions on resubmittals.
  - 11. An 8" x 3" blank space for Contractor and reviewer stamps.
  - 12. Indication of Contractor's approval, initialed or signed, with wording substantially as follows:
 

"Contractor represents to Owner and Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, or assumes full responsibility for doing so and has reviewed or coordinated each submittal with requirements of Work and Contract Documents."
  - 13. If Contract Documents include performance specifications stating required results which can be verified as meeting stipulated criteria, so that further design by Contractor prior to fabrication is

necessary, Submittal depicting such design must be prepared under seal of professional engineer registered in appropriate state and Submittal shall be signed and sealed in accordance with applicable regulations and with following certification statement:

"I hereby certify that this engineering document was prepared by me or under my direct personal supervision, that I am a duly licensed professional engineer under laws of state of Iowa and I accept responsibility for adequacy of this document to meet criteria stipulated in Contract Documents."

N. Product Data:

1. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
2. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

O. Design data:

1. Submit for Engineer's knowledge as contract administrator or for Owner.
2. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

P. Data sheets:

1. Data sheets may require information not known until Contractor's engineering is complete. Furnish estimated values based on good engineering judgment. Estimated values shall be identified by placement of "(est.)" next to value.
2. Data Sheets shall be updated and resubmitted by Contractor once final values are known.
3. Do not leave items blank or labeled "To Be Determined" or "Later."
4. Do not submit manufacturer Product Data instead of completed data sheets.

Q. Test reports:

1. Submit for Engineer's knowledge as contract administrator or for Owner.
2. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

R. Certificates:

1. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor.
2. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
3. Certificates may be recent or previous test results on material or product, but must be acceptable to reviewer.

S. Manufacturer's instructions:

1. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for Product Data.
2. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

T. Samples:

1. Samples for selection as specified in product sections:
  - a. Submit for aesthetic, color, or finish selection.
  - b. Submit samples of finishes from full range of manufacturers' standard colors, textures, and patterns for selection.
2. Submit to illustrate functional and aesthetic characteristics of product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
3. Include identification on each sample, with full Project information.
4. Submit number specified in individual Specification Sections; one of which will be retained by Engineer.

5. Reviewed Samples which may be used in Work are indicated in individual Specification Sections.
6. Samples will not be used for testing purposes unless specifically stated in specification section.

U. Proposed products list:

1. Within 15 days after date of Notice to Proceed, submit list of major products proposed to Engineer for use, with name of manufacturer, trade name, and model number of each product.
2. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

V. Operations and maintenance manuals:

1. Designate in construction schedule, or in separate coordinated schedule, dates for submission and dates that reviewed operations and maintenance manuals will be needed.
2. Operations and maintenance manuals shall be presented in clear and thorough manner, complete with respect to dimensions, design criteria, materials of construction, and like information to enable reviewer to review information as required. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Drawings.

#### 1.05 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in submittals required by Engineer and resubmit until stamped as either "Reviewed," "Reviewed as Noted," or "For Information Only."
- B. Text and depictions changed on Submittal shall be back-circled (clouded).
- C. Engineer will assume that portions of Submittal not back-circled have not been changed by Contractor from previous submission.
- D. Indicate revision number and date in document revision block.

#### 1.06 DISTRIBUTION

- A. Distribute reproductions of Shop Drawings which carry Engineer stamp as either "Reviewed" or "Reviewed as Noted" to:
  1. Record Documents file.
  2. Other affected contractors.
  3. Subcontractors.
  4. Supplier or fabricator.
- B. Distribute Samples which carry Engineer stamp as either "Reviewed" or "Reviewed as Noted" as directed by Engineer.

#### 1.07 CONSTRUCTION PROGRESS DOCUMENTATION

- A. Construction progress schedules: Submit initial schedules to Engineer within 15 days after date of Notice to Proceed. After review, resubmit required revised data within ten days.
- B. Form of schedules:
  1. Prepare schedules in form of horizontal bar chart.
    - a. Provide separate horizontal bar for each trade or operation.
    - b. Horizontal time scale: Identify first work day of each week.
    - c. Scale and spacing: To allow space for notations and future revisions.
    - d. Minimum sheet size: 11 x 17.
  2. Format of listings: Chronological order of start of each item of Work.
  3. Identification of listings: By major Specification Section numbers.
- C. Submittal schedule shall show dates for Contractor's submittals.

- D. Progress revisions:
  - 1. Indicate progress of each activity to date of submission.
  - 2. Show changes occurring since previous submission of schedule:
    - a. Major changes in scope.
    - b. Activities modified since previous submission.
    - c. Revised projections of progress and completion.
    - d. Other identifiable changes.
  - 3. Provide narrative report as needed to define:
    - a. Problem areas, anticipated delays, and impact on schedule.
    - b. Corrective action recommended, and its effect.
    - c. Effect of changes on schedules of other prime contractors.
- E. Distribution copies of reviewed schedules to:
  - 1. Subcontractors.
  - 2. Other concerned parties.
- F. Instruct recipients to report promptly to Contractor, in writing, any problems anticipated by projects shown in schedules.

#### 1.08 SUBMITTAL TRANSMITTAL FORM PROCEDURES

- A. Submittals shall be accompanied by completed copies of Submittal Transmittal form, bound herein. An electronic version of transmittal form is available and may be obtained from Engineer. Reproduce additional copies required.
- B. Submit one copy of transmittal form for initial submittals and resubmittals. Sequentially number transmittal form. Revise submittals with original number and sequential alphabetic suffix.
- C. Prior to submittal, complete information under heading "Contractor's Transmittal."
- D. Engineer will complete information under "Reviewer's Action."
- E. Do not include submittals for more than one section of Specifications on Submittal Transmittal form.
- F. Identify project title, location, and number and contract title and number.
- G. Identify preparer name and, submittal number, including preparer's submittal revision number.
- H. A brief description under "Title" should clearly identify specific application of equipment or material covered by Submittal, utilizing where possible same title used in Drawings and Specifications.
- I. Identify Specification Section number.
- J. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of Work and Contract Documents.

#### **PART 2 PRODUCTS**

NOT USED

#### **PART 3 EXECUTION**

NOT USED

END OF SECTION





**PART 1 GENERAL**

## 1.01 WELDING REQUIREMENTS

- A. Welding shall be performed by qualified welding operators using procedures which have been qualified in accordance with applicable codes and standards specified.

## 1.02 PROCEDURE QUALIFICATION

- A. Contractor, subcontractor, or fabricator performing welding under jurisdiction of referenced codes shall be responsible for obtaining and qualifying welding procedures. Structural welding procedures conforming to AWS D1.1 are prequalified as defined in AWS D1.1.
- B. Contractor shall maintain records and make available to Engineer when requested, certifying successful completion of procedure qualification tests.

## 1.03 PERFORMANCE QUALIFICATION

- A. Contractor, subcontractor, or fabricator performing welding under jurisdiction of referenced codes shall be responsible for testing and qualifying its welding operators in accordance with applicable procedures.
- B. Welding operator's qualification as specified in code shall be considered as remaining in effect indefinitely unless welder has not engaged in given process of welding for which welding operator is qualified for period of 6 months.
- C. Engineer reserves right to require any welder to retake tests when, in opinion of Engineer, work of welder creates reasonable doubt as to welder's proficiency; Engineer reserves right to witness any required retesting; conduct such tests at no additional expense to Owner.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

NOT USED

END OF SECTION

**PART 1 GENERAL**

## 1.01 SERVICE ENGINEER RESPONSIBILITIES

- A. Contractor shall provide qualified Service Engineer(s), as necessary to:
  - 1. Supervise assembly of equipment.
  - 2. Inspect equipment after it is installed to assure that all details of installation are correct and that equipment is prepared for operation in accordance with manufacturer's instructions and recommendations.
  - 3. Check connections to equipment and adjust, or supervise adjustment of, control and indicating devices after equipment has been installed and connected.
  - 4. Fully instruct Owner's operating personnel in operation and maintenance of equipment.
- B. Presence of Service Engineer will in no way relieve Contractor of any responsibility assumed under Agreement.
- C. Work and abilities of Service Engineer shall be subject to review of Engineer. If Engineer determines that any Service Engineer is not properly qualified, Contractor shall replace Service Engineer upon written notification by Engineer.
- D. Contractor shall provide continuity in assignment of Service Engineer to Work. In event substitution of Service Engineer is made which is not at request of Engineer, substitute's time for "familiarization" shall be at Contractor's expense.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

NOT USED

END OF SECTION

## **PART 1 GENERAL**

### **1.01 RELATED SECTIONS**

- A. Conditions of Agreement: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.
- B. Respective sections of Specifications: Certification of products.
- C. Each Specification section listed: Laboratory tests required, and standards for testing.
- D. Testing laboratory inspection, sampling, and testing required for:
  - 1. Section 03 00 10 – Concrete Work.
  - 2. Section 05 50 00 – Metal Fabrications.
  - 3. Section 31 22 00 – Grading
  - 4. Section 31 23 16-16 – Structural Excavation and Backfill.
  - 5. Section 32 15 00 – Aggregate Surfacing

### **1.02 TESTING LABORATORY SERVICES**

- A. Contractor will employ services of independent testing laboratory to perform specified.
  - 1. Contractor shall cooperate with laboratory to facilitate execution of its required services.
  - 2. Employment of laboratory shall in no way relieve Contractor's obligations to perform Work of Agreement.

### **1.03 QUALIFICATION OF LABORATORY**

- A. Meet "Recommended Requirements for Independent Laboratory Qualifications," published by American Council of Independent Laboratories.
- B. Meet basic requirements of ASTM E329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction."
- C. Authorized to operate in state in which Project is located.
- D. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during most recent tour of inspection, with memorandum of remedies of any deficiencies reported by inspection.
- E. Testing equipment:
  - 1. Calibrated at reasonable intervals by devices of accuracy traceable to either:
    - a. National Bureau of Standards.
    - b. Accepted values of natural physical constants.

### **1.04 LABORATORY DUTIES**

- A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice.
- B. Perform specified inspections, sampling, and testing of materials and methods of construction:
  - 1. Comply with specified standards.
  - 2. Ascertain compliance of materials with requirements of Contract Documents.
- C. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of Work or products.
- D. Promptly submit five copies of written report of each test and inspection to Engineer.

- E. Promptly submit written report of each test and inspection; one copy each to Engineer, Owner, Contractor, and one copy to record documents file. Each report shall include:
  1. Date issued.
  2. Project title and number.
  3. Testing laboratory name, address, and telephone number.
  4. Name and signature of laboratory inspector.
  5. Date and time of sampling or inspection.
  6. Record of temperature and weather conditions.
  7. Date of test.
  8. Identification of product and Specification section.
  9. Location of sample or test in Project.
  10. Type of inspection or test.
  11. Results of tests and compliance with Contract Documents.
  12. Interpretation of test results, when requested by Engineer.
- F. Perform additional tests as required by Engineer or Owner.

#### 1.05 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
  1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
  2. Approve or accept any portion of Work.
  3. Perform any duties of Contractor.

#### 1.06 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel, provide access to Work and to manufacturer's operations.
- B. Secure and deliver to laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Provide laboratory preliminary design mix proposed to be used for concrete, and other materials mixes which require control by testing laboratory.
- D. Furnish copies of products test reports as required.
- E. Furnish incidental labor and facilities:
  1. To provide access to Work to be tested.
  2. To obtain and handle samples at Project Site or at source of product to be tested.
  3. To facilitate inspections and tests.
  4. For storage and curing of test samples.
- F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- G. Employ and pay for services of separate, equally qualified independent testing laboratory to perform additional inspections, sampling, and testing required:
  1. For Contractor's convenience.
  2. When initial tests indicate Work does not comply with Contract Documents.
- H. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.

## PART 2 PRODUCTS

NOT USED

**PART 3 EXECUTION**

NOT USED

END OF SECTION

**PART 1 GENERAL**

## 1.01 TEMPORARY ELECTRICITY

- A. Provide and pay for power service required from Owner as needed for construction operation.
- B. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
- C. Provide main service disconnect and over-current protection at convenient location meter.

## 1.02 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain lighting for construction operations.
- B. Provide and maintain lighting to exterior staging and storage areas for after dark for security purposes.
- C. Provide and maintain lighting to interior work areas after dark for security purposes.
- D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- E. Maintain lighting and provide routine repairs.

## 1.03 TEMPORARY HEATING

- A. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

## 1.04 TEMPORARY COOLING

- A. Provide and pay for cooling devices and cooling as needed to maintain specified conditions for construction operations. Provide separate metering and reimburse Owner for cost of energy used.

## 1.05 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

## 1.06 TELEPHONE SERVICE

- A. Provide, maintain, and pay for telephone service to field office at time of project mobilization, if needed.

## 1.07 FACSIMILE SERVICE

- A. Provide, maintain and pay for facsimile service to field office at time of project mobilization, if needed.

## 1.08 TEMPORARY WATER SERVICE

- A. Provide and pay for suitable quality portable water service as needed to maintain specified conditions for construction operations.

## 1.09 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

#### 1.10 FIELD OFFICES AND SHEDS

- A. Provide field office and sheds as needed.
- B. Office: Weather tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture drawing rack, and drawing display table.
- C. Locate offices and sheds a minimum distance of 30' from existing and new structures.
- D. Environmental control: Heating, cooling, and ventilating for offices: Automatic equipment to maintain comfort conditions.
- E. Storage Areas and sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 01 60 00.
- F. Preparation: Fill and grade sites for temporary structures to provide drainage away from buildings.
- G. Maintenance and cleaning:
  - 1. Weekly janitorial services for offices; periodic cleaning and maintenance for office and storage areas.
  - 2. Maintain approach walks free of mud, water, and snow.
- H. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

#### 1.11 VEHICULAR ACCESS

- A. Location approved by Owner.
- B. Provide unimpeded access for emergency vehicles.
- C. Provide and maintain access to fire hydrants and control valves free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets and parking lots.
- E. Existing on-site roads may be used for construction traffic.

#### 1.12 PARKING

- A. Arrange for temporary parking areas to accommodate construction personnel.
- B. Locate as approved by Owner.
- C. When site space is not adequate, provide additional off-site parking.
- D. Tracked vehicles not allowed on paved areas.
- E. Do not allow heavy vehicles or construction equipment in parking areas.
- F. Do not allow vehicle parking on existing pavement.
- G. Designate 1 parking space for the Owner.
- H. Permanent Pavements and parking facilities:
  - 1. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.
  - 2. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

- I. Maintenance:
  - 1. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
  - 2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.
- J. Removal, repair:
  - 1. Remove temporary materials and construction at Substantial Completion.
  - 2. Remove underground work and compacted materials to a depth of 2' (600 mm); fill and grade site as specified.
  - 3. Repair existing facilities damaged by use, to original condition.
- K. Mud from site vehicles: Provide means of removing mud from vehicle wheels before entering streets.

#### 1.13 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

#### 1.14 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect nonowned vehicular traffic, stored materials, site, and structures from damage.

#### 1.15 ENCLOSURES AND FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6' (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

#### 1.16 SECURITY

- A. Security program:
  - 1. Protect Work existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
  - 2. Initiate program in coordination with Owner's existing security system at project mobilization.
  - 3. Maintain program throughout construction period until Owner occupancy.



- B. Entry control:
  - 1. Restrict entrance of persons and vehicles into Project site and existing facilities.
  - 2. Allow entrance only to authorized persons with proper identification.
  - 3. Maintain log of workers and visitors, make available to Owner on request.
  - 4. Coordinate access of Owner's personnel to site in coordination with Owner's security forces.
- C. Restrictions:
  - 1. Do not allow cameras on site or photographs taken except by written approval of Owner.
  - 2. Do no work on days indicated in Owner-Contractor Agreement.

#### 1.17 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.

#### 1.18 PEST CONTROL

- A. Provide methods, means, and facilities to prevent pests and insects from entering the facility.

#### 1.19 POLLUTION CONTROL

- A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

#### 1.20 RODENT CONTROL

- A. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

#### 1.21 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2' (600 mm). Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

### **PART 2 PRODUCTS**

NOT USED

### **PART 3 EXECUTION**

NOT USED

END OF SECTION

## **PART 1 GENERAL**

### 1.01 PRODUCTS

- A. Provide products of qualified manufacturers suitable for intended use. Provide products of each type by a single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer for components being replaced.

### 1.02 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

### 1.03 RECEIVING, UNLOADING AND STORING

- A. Contractor shall take custody of equipment and materials received and shall be solely responsible for damage and shortages until acceptance of Contractor's work by Owner.
- B. Unload equipment as soon as possible after arrival. Contractor shall pay freight railcar and truck demurrage, detention, and any other costs which may be billed to Owner due to failure to unload railcars or trucks within time required by freight companies.
- C. Use of bare wire rope slings for unloading and handling equipment and materials is prohibited without Owner approval.
- D. Equipment and materials shall be stored and maintained in accordance with manufacturer's recommendations and these specifications.
- E. Provide physical protection for equipment placed in storage.
  - 1. Stored equipment shall be supported above ground and shall be covered with canvas or other heavy-duty sheeting. Cover shall be securely fastened and shall be replaced if torn or otherwise damaged during storage period.
  - 2. Following items shall be stored in weatherproof, heated (minimum 50°F) building complete with bins for storage of small pieces of equipment. Storage inside of existing plant will not be available.
    - a. Electronic instruments and cabinets.
    - b. Electrical equipment with general purpose enclosures.
    - c. Insulation materials.
    - d. Rotating equipment.
    - e. Miscellaneous electronic equipment, gaskets, and small machined parts.
    - f. Instruments and controls.
    - g. Protection panels.
    - h. Batteries.
- F. Inspect stored equipment weekly and document activities performed. Renew protective coatings as necessary to preserve fitness of equipment.

G. Contractor shall provide materials, equipment, and labor required for such storage and maintenance. Contractor shall be accountable for any deterioration of materials or equipment occasioned by improper storage or maintenance, and shall recondition, repair, or replace any such materials or equipment without additional cost to Owner.

H. Electrical equipment or equipment with any electrical components stored outdoors shall be supported at least 12" above ground.

#### 1.04 GENERAL STORAGE

A. Store products immediately on delivery in accordance with manufacturer's instructions, with seals and labels intact. Protect until installed.

B. Arrange storage in manner to provide access for maintenance of stored items and for inspection.

#### 1.05 ENCLOSED STORAGE

A. Store products subject to damage by elements in substantial weathertight enclosures.

B. Maintain temperature and humidity within ranges required by manufacturer's instructions.

C. Provide humidity control and ventilation for sensitive products, as required by manufacturer's instructions.

D. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.

#### 1.06 EXTERIOR STORAGE

A. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.

B. For products subject to discoloration or deterioration from exposure to elements, cover with impervious sheet material. Provide ventilation to avoid condensation.

C. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.

D. Provide surface drainage to prevent flow or ponding of rainwater.

E. Prevent mixing of refuse or chemically injurious materials or liquids.

#### 1.07 MAINTENANCE OF STORAGE

A. Periodically inspect stored products on scheduled basis. Maintain log of inspections, make available to Engineer on request.

B. Verify storage facilities comply with manufacturer's product storage requirements.

C. Verify manufacturer required environmental conditions are maintained continually.

D. Verify surfaces of products exposed to elements are not adversely affected and if weathering of finishes is acceptable under requirements of Contract Documents.

#### 1.08 MAINTENANCE OF EQUIPMENT STORAGE

A. For mechanical and electrical equipment in long-term storage, manufacturer's service instructions shall accompany each item, with notice of enclosed instructions shown on exterior of package.

- B. Service equipment on regularly scheduled basis, maintaining log of services; submit as record document.

#### 1.09 PRODUCTS LIST

- A. Within 30 days after effective date of Agreement, submit complete list of major products which are proposed for installation electronically to Engineer.
- B. Tabulate products by Specification section number and title.
- C. For products specified only by reference standards, list for each such product:
  - 1. Name and address of manufacturer.
  - 2. Trade name.
  - 3. Model or catalog designation.
  - 4. Manufacturer's data:
    - a. Reference standards.
    - b. Performance test data.

#### 1.10 PRODUCT OPTIONS

- A. For products specified only by reference standard, select product meeting that standard, by any manufacturer. For products specified by naming several products or manufacturers, select any one of products and manufacturers named which complies with Specifications.
- C. For products specified by naming one or more products or manufacturers and stating "or equal," submit request as for substitutions for any product or manufacturer which is not specifically named in accordance with Section 01 25 13.
- D. For products specified by naming only one product and manufacturer, there is no option and no substitution will be allowed.
- E. Whenever Specifications call for item by manufacturer's name and type and additional features of item are specifically required by Specifications, additional features specified shall be provided whether or not they are normally included in standard manufacturer's item listed.

### **PART 2 PRODUCTS**

NOT USED

### **PART 3 EXECUTION**

NOT USED

END OF SECTION

**PART 1 GENERAL**

## 1.01 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.
- B. Provide submittals to Engineer that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

## 1.02 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed Shop Drawings, Product Data, and Samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  - 1. Manufacturer's name and product model and number.
  - 2. Product substitutions or alternates utilized.
  - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
  - 1. Field changes of dimension and detail.
  - 2. Details not on original Contract Drawings.
- G. Submit documents to Engineer for final Application for Payment.

## 1.03 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

**PART 2 PRODUCTS**

NOT USED

**PART 3 EXECUTION**

NOT USED

END OF SECTION

## **PART 1 GENERAL**

### 1.01 OPERATING AND MAINTENANCE DATA REQUIREMENTS

- A. Operating and maintenance data shall be in English language.
- B. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Agreement.
- C. Prepare operating and maintenance data as specified in this section and as referenced in other pertinent sections of Specifications.
- D. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

### 1.02 QUALITY ASSURANCE

- A. Preparation of data shall be done by personnel:
  - 1. Trained and experienced in maintenance and operation of described products.
  - 2. Familiar with requirements of this section.
  - 3. Skilled as technical writers to extent required to communicate essential data.
  - 4. Skilled as draftsmen competent to prepare required drawings.

### 1.03 FORM OF SUBMITTALS

- A. Prepare data in form of an instructional manual for use by Owner's personnel.
- B. Format:
  - 1. Sheet size: 8-1/2" x 11" minimum.
  - 2. Paper: 20 lb minimum, white, for typed pages.
  - 3. Text: Manufacturer's printed data, or neatly typewritten.
  - 4. Drawings:
    - a. Provide reinforced punched binder tab, bind in with text.
    - b. Larger size drawings shall be folded to 8-1/2" x 11", and inserted into pockets.
  - 5. Provide fly-leaf for each separate product, or each piece of operating equipment.
    - a. Provide typed description of product, and major component parts of equipment.
    - b. Provide indexed tabs.
  - 6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS." List:
    - a. Title of Project.
    - b. Identity of separate structure as applicable.
    - c. Identity of general subject matter covered in manual.
  - 7. Binders:
    - a. Commercial quality 3-ring binders with durable and cleanable plastic covers.
    - b. Maximum ring size: 3".
    - c. When multiple binders are used, correlate data into related consistent groupings.

### 1.04 CONTENT OF MANUAL

- A. Neatly typewritten table of contents for each volume, arranged in systematic order.
  - 1. Contractor, name of responsible principal, address, and telephone number.
  - 2. List of each product required to be included, indexed to content of volume.
  - 3. List, with each product, name, address, and telephone number of:
    - a. Subcontractor or installer.
    - b. Maintenance contractor, as appropriate.
    - c. Identify area of responsibility of each.
    - d. Local source of supply for parts and replacement and list of recommended spare parts.

4. Identify each product by product name and other identifying symbols as set forth in Contract Documents, including nameplate information and shop order numbers for each item of equipment furnished.

B. Product data:

1. Include only those sheets which are pertinent to specific product.
2. Annotate each sheet to:
  - a. Clearly identify specific product or part installed.
  - b. Clearly identify data applicable to installation.
  - c. Delete references to inapplicable information.

C. Drawings:

1. Supplement product data with Drawings as necessary to clearly illustrate:
  - a. Relations of component parts of equipment and systems.
  - b. Control and flow diagrams.
2. Coordinate Drawings with information in Project record documents to assure correct illustration of completed installation.
3. Do not use Project record documents as maintenance Drawings.

D. Written text, as required to supplement product data for particular installation.

1. Organize in consistent format under separate headings for different procedures.
2. Provide logical sequence of instructions for each procedure.

E. Copy of each warranty, Bond, and service contract issued.

1. Provide information sheet for Owner's personnel, giving:
  - a. Proper procedures in event of failure.
  - b. Instances which might affect validity of warranties or Bonds.

#### 1.05 MANUAL FOR MATERIALS AND FINISHES

- A. Submit 4 copies of complete manual in final form (3 hard copies and one electronic copy).

B. Contents, for architectural products, applied materials and finishes:

1. Manufacturer's data, giving full information on products.
  - a. Catalog number, size, composition.
  - b. Color and texture designations.
  - c. Information required for re-ordering special-manufactured products.

C. Contents, for moisture protection and weather-exposed products:

1. Manufacturer's data, giving full information on products.
  - a. Applicable standards.
  - b. Chemical composition.
  - c. Details of installation.
2. Instructions for inspection, maintenance, and repair.

- D. Additional requirements for maintenance data: Respective sections of Specifications.

#### 1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit 4 copies of complete manual in final form (3 hard copies and 3 electronic copies)

B. Contents, for each unit of equipment and system, as appropriate:

1. Description of unit and component parts:
  - a. Function, normal operating characteristics, and limiting conditions.
  - b. Performance curves, engineering data, and tests.
  - c. Complete nomenclature and commercial number of replaceable parts.
2. Operating procedures:
  - a. Startup, break-in, routine, and normal operating instructions.
  - b. Regulation, control, stopping, shutdown, and emergency instructions.

- c. Summer and winter operating instructions.
    - d. Special operating instructions.
  - 3. Maintenance procedures:
    - a. Maintenance schedule:
      - 1) Show required maintenance for all equipment in package on one document, broken out by day, week, month, year, 5 years, etc.
      - 2) Set up as a checklist to be used by owner to verify maintenance is being completed.
    - b. Routine operations.
    - c. Guide to "trouble-shooting."
    - d. Disassembly, repair, and reassembly.
    - e. Alignment, adjusting, and checking.
  - 4. Servicing and lubrication schedule: List of lubricants required.
  - 5. Manufacturer's printed operating and maintenance instructions.
  - 6. Description of sequence of operation by control manufacturer.
  - 7. Original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
    - a. Predicted life of parts subject to wear.
    - b. Items recommended to be stocked as spare parts.
  - 8. As-installed control diagrams by controls manufacturer.
  - 9. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
  - 10. Other data as required under pertinent sections of Specifications.
- C. Content, for each electrical and electronic system, as appropriate.
- 1. Description of system and component parts:
    - a. Function, normal operating characteristics, and limiting conditions.
    - b. Performance curves, engineering data, and tests.
    - c. Complete nomenclature and commercial number of replacement parts.
  - 2. Circuit directories of panelboards:
    - a. Electrical service.
    - b. Controls.
    - c. Communications.
  - 3. As-installed color-coded wiring diagrams.
  - 4. Operating procedures:
    - a. Routine and normal operating instructions.
    - b. Sequences required.
    - c. Special operating instructions.
  - 5. Maintenance procedures:
    - a. Routine operations.
    - b. Guide to "trouble-shooting."
    - c. Disassembly, repair, and assembly.
    - d. Adjustment and checking.
  - 6. Manufacturer's printed operating and maintenance instructions.
  - 7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
  - 8. Other data as required under pertinent sections of Specifications.
- D. Prepare and include additional data when need for such data becomes apparent during instruction of Owner's personnel.
- E. Additional requirements for operating and maintenance data: Respective sections of Specifications.

#### 1.07 SUBMITTAL SCHEDULE

- A. Preliminary draft:
  - 1. Provide 2 copies with shipped equipment.
  - 2. Submit 2 copies to Owner.
  - 3. Submit 2 copies to Engineer of proposed formats and outlines of contents prior to start of Work. Engineer will review draft and return 1 copy with comments.



- B. Submit 1 copy of completed data in final form 15 days prior to final inspection or acceptance. Copy will be returned after final inspection or acceptance, with comments.
- C. Submit specified copies of approved data in final form 10 days after final inspection or acceptance.

**PART 2 PRODUCTS**

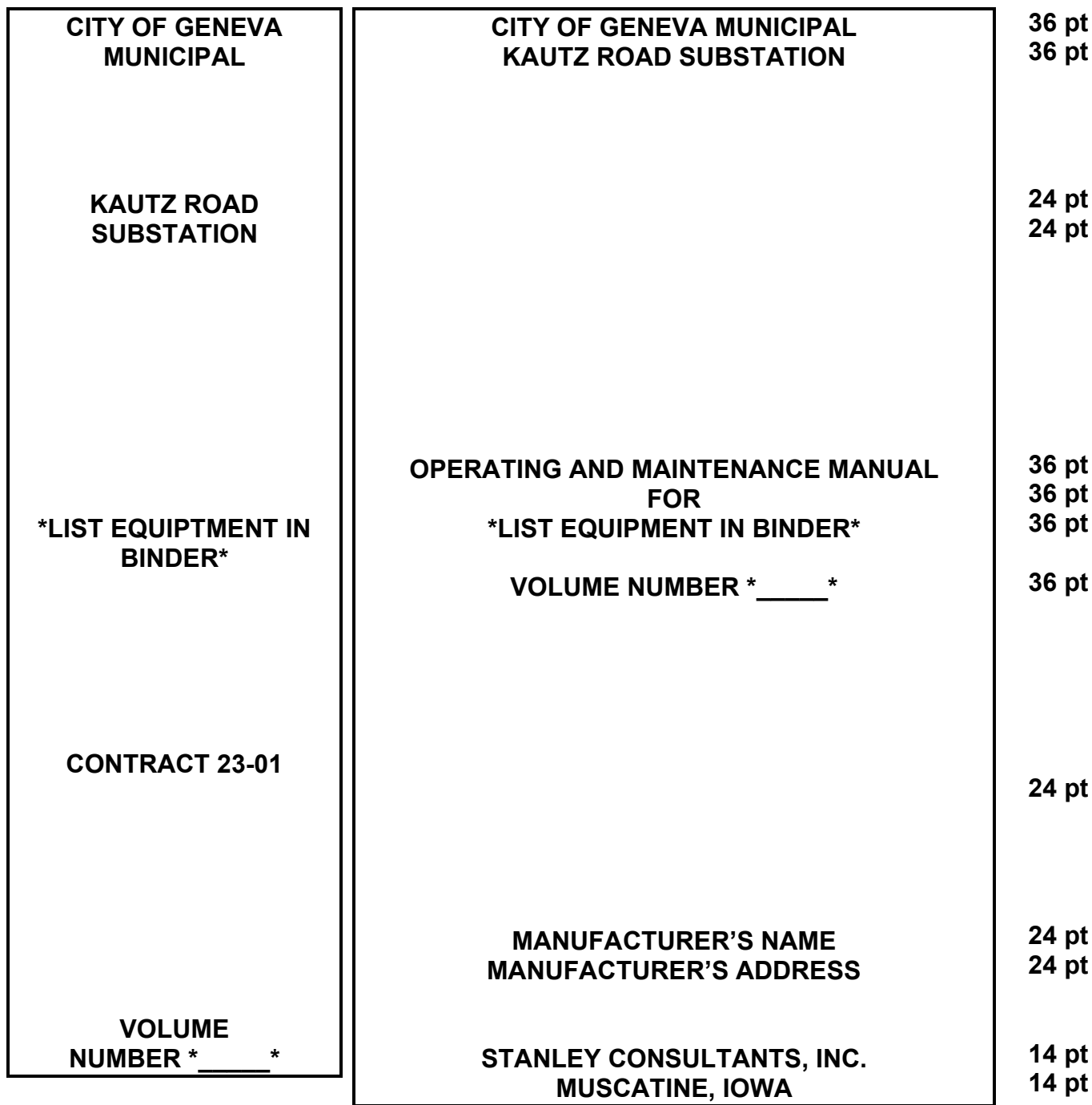
NOT USED

**PART 3 EXECUTION**

NOT USED

END OF SECTION

# OPERATING AND MAINTENANCE MANUAL COVER DIAGRAM



**SPINE**

**COVER**

1. Imprinting shall be in Arial font.
  2. Spine printing shall be 12-point.
  3. Cover printing shall be in point sizes indicated.
- \* If more than one volume is necessary, imprint cover with volume numbers.

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Cast-in-place concrete including form work, reinforcing steel, and miscellaneous materials.

### **1.02 MEASUREMENT AND PAYMENT**

- A. If quantities of following items are changed from those required by Contract Documents, lump sum Contract Price will be adjusted on basis of unit adjustment prices set forth in Agreement.
  1. Concrete, cubic yard; (CY): Unit adjustment price includes labor, equipment, materials, tests, placing, forming, finishing, curing, installation of embedded items, and incidental work necessary for concrete construction. Unit adjustment price includes reinforcing steel.
  2. Cubic yards of concrete defined as volume contained within lines of foundation or structure shown on Drawings. No reductions will be made for openings or block-outs, etc., less than 1 cu ft in volume.

### **1.03 INFORMATIONAL SUBMITTALS**

- A. Quality assurance data:
  1. Tests, or certificates of compliance with standards specified in this Section at least 14 days prior to commencing concrete placement for:
    - a. Cement: From each car from which cement will be used.
    - b. Fly ash: From each separate shipment from which fly ash is being used.
    - c. Aggregates: For each size aggregate from each source of aggregate, for grading, deleterious substances and soundness.
  2. List of admixtures, curing compounds, and other manufactured materials proposed identifying manufacturer and type. Provide data on specific items when requested by Engineer.
  3. Testing laboratory reports required at least 14 days prior to commencing concrete placement for each class of concrete and each size aggregate:
    - a. Proposed concrete design mix.
    - b. Tests on concrete cylinders from trial batch of proposed mix.
  4. Testing laboratory reports for tests on concrete cylinders taken in field.
  5. Maintain drilled pier records. Daily logs shall show drilled pier placement including pier number, shaft diameter, casing placement and removal if necessary, water table, cleaning, inspection, reinforcing and anchor bolt placement, concrete placement, top and bottom elevation of shaft and casing, conditions encountered, and deviations from contract documents. Records shall be signed and dated by person performing work.
  6. Submit to Owner's Representative unless noted otherwise.

### **1.04 ACTION SUBMITTALS**

- A. Submit Shop Drawings on reinforcing steel to Owner's Representative unless noted otherwise.

### **1.05 QUALITY ASSURANCE**

- A. Contractor shall retain services of qualified independent testing laboratory to perform the following tests:
  1. Obtaining, making samples and trial batches, and performing laboratory testing specified.
  2. Establish proposed concrete design mix proportions on basis of either field experience and/or trial mixtures in accordance with ACI 318, Chapter 26, except specific requirements shall conform to requirement of these specifications. Determine and submit supporting data, standard deviation, trial batch tests, required average strength, proportions, air content, and slump range for each mix.
  3. Provide reports to Owner's Representative giving information on materials, concrete design mixes and testing performed.
- B. Perform Work in accordance with ACI 117 and 301.

- C. Contractor shall retain services of qualified independent testing laboratory to perform following tests:
1. Obtaining, making samples and performing laboratory and field testing specified.
  2. Provide reports to Owner's Representative giving information on materials and testing performed.
  3. Reports shall indicate whether or not materials meet specifications.
  4. Concrete strength tests:
    - a. Comply with ASTM C39 for testing and ASTM C31/C31M or C192/C192M for preparation of cylinders.
    - b. Field tests: Sample in accordance with ASTM C172; make and test 3 cylinders from each sample on basis of not less than:
      - 1) One sample from each day's placement for each class of concrete.
      - 2) One sample from each 50 cu yd (120 cu m).
      - 3) One sample for each 5,000 sq ft (460 sq m) of surface area for slabs or walls.
      - 4) For a given class of concrete, if frequency of testing specified above would provide less than 3 samples, sample at least 3 randomly selected batches or each batch if 3 batches or fewer are required.
    - c. Cylinders shall be laboratory cured. Test 1 laboratory cured cylinder at 7 days and other 2 at 28 days for average strength.
    - d. If tests indicate deficient strength as defined by ACI 318, immediately adjust mix to increase average of subsequent test results and, when directed, carry out drilled core testing, ASTM C42/C42M. Testing and remedial work shall be at no additional cost to Owner.
  5. Slump tests:
    - a. Test each batch as delivered; comply with ASTM C172 and C143/C143M.
    - b. If slump exceeds Specifications, promptly remove batch from Work and dispose of off-site at location selected by Contractor. Do not add water in excess of specified water-cement ratio to batch to achieve desired slump.
  6. Air content tests:
    - a. Sample on basis specified above for field strength tests.
    - b. Obtain samples from concrete at point of discharge.
    - c. Determine air content by pressure method; comply with ASTM C231.
    - d. If air content does not meet Specifications, remove deficient concrete from Work.
  7. Temperature tests:
    - a. Sample on basis specified above for field strength tests.
    - b. Comply with ASTM C1064/C1064M.
    - c. If temperature does not meet Specifications, remove deficient concrete from Work.

## 1.06 DELIVERY AND STORAGE OF MATERIALS

- A. Cement: Keep clean, dry, and free from weather damage.
- B. Aggregates: Stockpile each gradation separately on clean, noncontaminating surface.

## PART 2 PRODUCTS

### 2.01 CEMENT

- A. Portland cement: ASTM C150, Type I or Type II.
- B. High-early-strength portland cement: ASTM C150, Type III. May be used instead of Type I cement at Contractor's option, unless specified otherwise, to achieve 28-day strength at 7 days. Do not use in drilled caissons over 48" (1220 mm) in diameter or in other concrete work where least dimension of concrete section exceeds 3'-0" (900 mm).
- C. White cement: Nonstaining, ASTM C150, Type I.
- D. Use only 1 brand of each type of cement.

## 2.02 AGGREGATE

- A. Regular aggregate: Strong, durable, well-graded minerals conforming to ASTM C33 requirements for grading, deleterious substances, and soundness.
- B. Coarse aggregate nominal size:
  - 1. 1-1/2" to No. 4 (38 mm to 4.75 mm): Use for all concrete at Contractor's option unless specified otherwise.
  - 2. 3/4" to No. 4 (19 mm to 4.75 mm): Use for slabs and thin sections and areas where clear spacing between reinforcing bars is less than 3" (75 mm).
- C. Aggregates not conforming exactly to above specifications may be used provided:
  - 1. Special tests or actual service establish that such aggregates will produce concrete of quality specified.
  - 2. An Addendum to Specifications is issued prior to receipt of Bids; no deviations will be permitted after receipt of Bids.

## 2.03 FLY ASH

- A. Conform to ASTM C618.
- B. Fly ash (Type C or F) for total Project shall be obtained from single source.
- C. Design concrete mixes to include fly ash in amount of approximately 15% to 20% of cement by weight.
- D. May be used at Contractor's option for all concrete.

## 2.04 WATER

- A. Clean, fresh, free from injurious amounts of oil, alkali, acid, salts, organic materials, or other substances that may be deleterious to concrete or steel. Mix water shall comply with ASTM C1602.

## 2.05 ADMIXTURES

- A. Water-reducing and set-controlling admixture, ASTM C494/C494M, type as required. Use for all concrete.
- B. Air entraining agent, ASTM C260. Use in accordance with manufacturer's recommendations.

## 2.06 REINFORCING

- A. Bars: ASTM A615/A615M, Grade 60 (420) deformed bars.
- B. Bend bars cold to conform to required details.

## 2.07 FORMS

- A. Acceptable materials:
  - 1. Douglas fir, exterior type, concrete form plywood, 5/8" (15 mm) thick minimum, conforming to DOC PS 1, Grade B-B, Class I or II.
  - 2. Removable metal forms with surfaces equal to Douglas fir, exterior type, concrete form plywood.
  - 3. Fiber tube forms: Cylindrical fiber reinforced forms.
- B. Form ties: Type leaving no metal within 1" (25 mm) of finished surface after removal of forms.

- C. Form coating:
  - 1. Wood forms: Nonstaining mineral oil or commercially produced form-release agent that will not bond with, stain, or adversely affect concrete surfaces and curing, and will not impair bond or adhesion of subsequent treatment of concrete surfaces, "Nox-Crete Form Coating," by Nox-Crete Chemicals, or equal.
  - 2. Metal forms: Treat surfaces as recommended by manufacturer before placing reinforcing.
  - 3. Fiber tube forms: Treat surfaces as specified for wood forms or as recommended by manufacturer.

## 2.08 JOINT MATERIALS

- A. Sawed or tooled joint sealant:
  - 1. MasterSeal SL 1 one-component elastomeric, self-leveling polyurethane sealant, by BASF Construction Chemicals, or equal.
  - 2. Use for sawed or tooled joints.

## 2.09 CURING MATERIALS

- A. Liquid membrane-forming compound:
  - 1. ASTM C309, Type 1 with fugitive dye, except Type 2 with white pigment for surfaces exposed to direct rays of sun.
  - 2. Do not use compounds containing wax, oil, resin, varnish, or other bases that will prevent bonding of finishes.
  - 3. Use for curing at Contractor's option except where other products are specified for particular application.
- B. Plastic film:
  - 1. Polyethylene plastic film, white, nonstaining, conforming to ASTM D2103.
  - 2. Minimum 4-mil (0.1 mm) thickness.
  - 3. Use for curing at Contractor's option except where other products are specified for particular application.
- C. Absorptive mat:
  - 1. Cotton fabric, burlap fabric, or burlap-polyethylene material woven or bonded to prevent separation.
  - 2. Material shall be clean and nondetrimental to concrete or finish.
  - 3. Use for curing at Contractor's option except where other products are specified for particular application.

## 2.10 GROUT

- A. Type: Regular.
- B. One part portland cement to 3 parts fine aggregate with sufficient water to maintain adequate workability. Substitute white cement for normal portland cement to match color of adjacent concrete.
- C. Minimum strength: 4,000 psi (28 Mpa) at 28 days.
- D. Use for patching.

## 2.11 CONCRETE DESIGN AND USE

- A. Each concrete design mix shall be established in strict accordance with ACI 318 by proportioning on basis of either experience and/or trial mixtures.

## B. Strength classifications:

Class	Specified Compressive Strength, f <sub>c</sub>	Required Average Compressive Strength, f <sub>cr</sub>
A	2,500 psi	3,500 psi
B	4,500 psi	5,700 psi

- C. Required average compressive strengths: Produce concrete of average strengths noted above unless test results substantiate a lower permissible average strength based on standard deviation criteria set forth in ACI 318. Strengths listed above are 7-day strengths for concrete using high-early-strength cement and 28-day strengths for concrete using other type cements.
- D. Maximum water-cement ratio: 0.48 by weight. Where pozzolan fly ash is used, water-cement plus pozzolan ratio shall not exceed specified ratio.
- E. Air entrainment: Concrete shall contain entrained air within following limits.

Nominal Maximum Aggregate Size, in.	Total Air Content, Percent By Volume	
	Exposure Class F1	Exposure Classes F2 and F3
3/4	5	6
1-1/2	4.5	5.5

## F. Workability:

- Proportions of concrete shall produce a mixture, suited to placement methods, which will work readily into corners and angles of forms and around reinforcement and embedded items. Segregation of materials or presence of free water will not be permitted.
- Slump of concrete: Use minimum practical; vary within limits given to suit placement conditions; in no case is slump to be increased by addition of water in excess of design mix quantity:

Type of Construction	Slump, in.	
	Minimum	Maximum
All concrete unless noted otherwise	2	5
Caissons	5	7
Tremie placement	7	9

## G. Concrete use:

- Class B: Use for all concrete unless specified otherwise.
- Class A: Use for fill concrete.

## H. Water-soluble chloride ion content, maximum: Exposure Categories C0, C1, and C2 shall comply with requirements of Chapter 4 of ACI 318.

## I. Concrete subject to Exposure Class F3: Comply with requirements for maximum percent of total cementitious materials by weight as provided in Chapter 4 of ACI 318.

## J. Concrete Encased Duct Banks:

- All power raceway concrete, or where shown on drawings, shall use concrete as noted in this specification, except it shall be installed with an air content not to exceed 2%, have a slump of 7" to 9" (175 mm to 225 mm), have a design compressive strength no less than 4,000 psi at 28 days, and shall not have any air entrainment added.
- The concrete Supplier shall provide the thermal resistance properties with the mix design submittals; or provide test batches to determine the thermal resistance.

## 2.12 READY-MIX CONCRETE

- A. Provide concrete from an established, approved ready-mix plant. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC-3.
- B. Equipment and methods: Conform to ASTM C94/C94M.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Construct forms strong, straight, adequately braced and securely fastened.
- B. Remove laitance from previously placed or existing concrete; thoroughly clean surface before placing additional concrete.
- C. Apply form coating on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.
- D. Do not apply form coating where concrete surfaces are scheduled to receive special finishes which may be affected by agent.

### 3.02 CONCRETE CONSTRUCTION TOLERANCES

- A. Foundation location and dimension:
  1. Centerlines of slabs and drilled pier foundations shall be within  $\pm 1"$  ( $\pm 25$  mm) of location specified on foundation location plan.
  2. Horizontal distances between center to center of adjacent piers for same structure shall be within  $\pm 1"$  ( $\pm 25$  mm).
  3. Elevation of piers shall be within  $\pm 1/4"$  ( $\pm 6$  mm) of elevations shown on drawings.
  4. Elevation of piers within a group of piers, for an individual structure shall be within  $\pm 1/8"$  ( $\pm 3$  mm).
  5. Maximum deviation of axis of pier excavation from vertical shall not be greater than  $1-1/2"$  (38 mm) in 10' (3 m).
  6. Control building floor and transformer slabs shall be true planes within  $1/8"$  (3 mm) in 10' (3 m), as determined by a straight edge placed anywhere on slab in any direction.
  7. Other slabs shall be true planes within  $1/4"$  (6 mm) in 10' (3 m).
- B. Anchor bolt and bolt clusters:
  1. Horizontal distance between centers of adjacent anchor bolts shall be within  $\pm 1/16"$  ( $\pm 2$  mm).
  2. Horizontal distance between diagonally opposite anchor bolts shall be within  $\pm 1/8"$  ( $\pm 3$  mm).
  3. Horizontal distance between centers of adjacent clusters, for same structure, shall be within  $\pm 1/4"$  ( $\pm 6$  mm).
  4. Centers of individual anchor bolts shall not deviate from lines parallel with faces of structure by more than  $1/8"$  ( $\pm 3$  mm) in 12" (300 mm) due to rotation of set or from other causes.
  5. Elevation of top of lowest anchor bolt in a set shall not be less than specified, and that of highest bolt shall not exceed specified elevation by more than  $1/4"$  ( $\pm 6$  mm).
- C. Reinforcement:
  1. Spacing between adjacent bars and distance between layers of bars shall not vary from position shown on Drawings by more than tolerances specified in ACI 117.
  2. Concrete cover: Minimum concrete cover of main reinforcing shall be as shown or specified. Allowable variation for minimum cover shall be as specified in ACI 117.

### 3.03 PLACING CONCRETE

- A. Clean transporting equipment, reinforcing, and embedded items before placing concrete. Remove water and debris from places to be occupied by concrete.



- B. Place no concrete until forms, reinforcing, and embedded items have been verified as adequately supported and accurately placed. Place no concrete over water-covered, muddy, or frozen soil.
- C. Immediately remove concrete where water, soils, or other deleterious substances are permitted to mix with concrete, form or embedded item movement occurs, or inadequate consolidation is obtained.
- D. Hot weather concreting:
  - 1. Applies to concrete placed when ambient temperature exceeds 90°F (32°C).
  - 2. Conform to ACI 305R recommendations and requirements.
- E. Cold weather concreting:
  - 1. Applies to concrete placed when ambient temperature is below 40°F (4°C).
  - 2. Conform to ACI 306R recommendations and requirements.
  - 3. If temporary heating facilities used are of type which produce an atmospheric condition of high carbon dioxide content, seal off concrete in such manner that no damage will result to concrete surface.
- F. Employ best industry practices to prevent segregation during placing. Do not drop concrete more than 5' (1500 mm). Use tremied or pumped concrete to provide proper placement. Place in layers approximately 18" (450 mm) deep.
- G. Place concrete continuously in each section until completed. Permit not more than 30 minutes between depositing adjacent layers of concrete within each section, unless an acceptable set retarder is used in concrete mix.
- H. Thoroughly compact, puddle, and vibrate concrete into corners and around reinforcing and embedded items. Use internal vibration where size of section permits.
- I. Maintain concrete placing temperature between 50°F (11°C) and 90°F (32°C) except as specified for hot and cold weather concreting.
- J. Place sections of concrete in sequence that eliminates shrinkage effects to greatest extent practicable.
- K. Protect concrete from injury due to sun, cold weather, running water, construction operations, and other causes until properly cured.

#### 3.04 REINFORCEMENT PLACEMENT

- A. Remove scale, loose flaky rust, dirt, grease, curing compound, and other coatings which would impair bond.
- B. Install slab reinforcing bars in correct position by use of preformed bolsters and spacers, except concrete blocks may be used to position bars in concrete placed on grade. Concrete blocks shall have compressive strength equal to that of surrounding concrete.
- C. Space bars properly and tie securely in position before placing concrete. Tack welding to keep reinforcing in place is not permitted.
- D. Do not tack weld anchor bolts or other embeds to reinforcing bars.

#### 3.05 REINFORCEMENT TOLERANCES

- A. Spacing between adjacent bars and distance between layers of bars shall not vary from position shown on Drawings by more than tolerances specified in ACI 117.
- B. Concrete cover: Minimum concrete cover of main reinforcing shall be as shown or specified. Allowable variation for minimum cover shall be as specified in ACI 117.

### 3.06 DRILLED CAISSON INSTALLATION

- A. Following requirements shall be met before placing reinforcing and concrete:
  - 1. Drilled caisson excavation has been inspected by Owner's Representative.
  - 2. Foreign materials such as mud, sand, debris, or ice have been removed from hole. Water has been removed from hole or provisions have been made to place concrete seal under water by standard tremie or pumped concrete.
  - 3. Temporary steel casing, if required, has been installed.
  - 4. Accuracy of placement has been verified by Contractor.
- B. After inspection by Owner's Representative, place reinforcing immediately and place concrete without unnecessary delay. No hole shall be permitted to stand overnight after being prepared for concrete placement.
- C. Reinforcing cages shall be assembled above ground and inspected prior to being installed in holes. Exercise care to prevent deformation of reinforcing steel cage or dislodgement of material into hole. Promptly remove material "knocked" into hole.
- D. Support reinforcing steel away from sides of shaft by suitable means to assure concentric alignment in shaft.
- E. Place concrete in following manner:
  - 1. "Free-fall" method of concrete placement through a hopper with short downpipe will be permitted if concrete does not strike sides of shaft or reinforcing cage. Otherwise, place concrete by tremie or long downpipe to prevent segregation and to prevent disturbing reinforcing.
  - 2. It is anticipated that caissons will be in a completely dry condition when concrete is placed, and every effort shall be made to establish such a condition. If inflow of water from bottom or sides of excavation cannot be shut off, add additional fines and cement to mix and place concrete through still water by means of standard tremie or concrete pump to height sufficient to perfect seal. Remove water and place remainder of concrete in caisson using acceptable method. Under no circumstances shall concrete be allowed to drop directly on water. Notify Engineer of proposed method prior to placement of concrete under water.
  - 3. Concreting for any caisson shall be a continuous operation.
  - 4. Steel casing pipe may be withdrawn as concrete rises. Exercise extreme care that casing withdrawal does not cause disturbance of surrounding soil or lifting of concrete section. Maintain bottom elevation of casing pipe a minimum of 3'-0" (1 m) below top elevation of concrete or as required to prevent displacement of concrete by surrounding soil or ground water as withdrawal progresses.
  - 5. Extraction of casing shall be performed keeping casing continuously plumb and shall proceed to allow continuous observation of interior slumping of concrete.
  - 6. Vibrate concrete in top 5' (1.5 m) of each caisson but only after casing has been removed or when casing is permanent.
- F. Install forms to prevent unstable soil at top of shaft from contaminating upper concrete and to form top portion of piers which are above grade.

### 3.07 CONSTRUCTION JOINTS

- A. Install only where shown or where specifically permitted.
- B. Provide keyway 1-1/2" (38 mm) deep covering approximately 1/3 area of construction joint, unless shown otherwise.
- C. Install waterstop where shown or specified.

### 3.08 EXPANSION JOINTS

- A. Formed joints: Make exposed edge of concrete slightly rounded with edger at joints to contain joint sealant.

- B. Install materials in accordance with manufacturers' instructions. Set preformed material securely in place before placing concrete.
- C. Install joint filler to within joint width (1/2" [13 mm] minimum) of exposed surface. Fill remainder of joint with joint sealant.

### 3.09 EMBEDDED ITEMS

- A. Install items required under this Contract to be embedded in concrete. Install items required by others for embedding in concrete, if so instructed before placing concrete.
- B. Fasten embedded items securely in proper position before placing concrete.
- C. Conduit or pipe embedded in slabs or walls:
  1. Locate in center of slab or wall and space not closer than 3 diameters on center; locate to avoid impairing strength of concrete.
  2. Coordinate placing of reinforcing with conduit or pipe location. Do not cut reinforcing to clear conduit or pipe.
- D. Anchor bolt placement:
  1. If excavations are completed without casings installed, or if the soils will hold open the upper portions where the anchor bolts are to be set, the anchor bolts shall be installed prior to placement of concrete around them.
  2. If excavation require that temporary casings be removed when concrete has been poured past the lower level of the anchor bolts, some portion of the anchor bolt assembly is 'pushed' into the concrete to the required embedment depth. To ensure proper consolidation around the anchor bolts:
    - a. Height at which the concrete is poured before removing the last casing should be limited as much as possible, thereby minimizing how much of the anchor bolt assembly is pushed in.
    - b. Concrete inside the anchor bolt assembly should be vibrated to help re-consolidate around the bottom of the anchor bolts, prior to the final pour.
- E. Aluminum pipe shall not be embedded in concrete. Where aluminum projects into or rests against surface of concrete, coat surfaces of aluminum to prevent direct contact with concrete.

### 3.10 GROUTING

- A. Roughen concrete surfaces by light chipping to remove laitance to approximately 1/2" (13 mm). Do not expose reinforcing steel.
- B. Remove materials which might interfere with bond; prepare surfaces in strict conformance to manufacturer's instructions.
- C. Mix, place, and cure grout in strict accordance to manufacturer's instructions.

### 3.11 FINISHING

- A. Flatwork:
  1. Tamp concrete to force coarse aggregate down from surface.
  2. Screed with straightedge, eliminate high and low places, bring surface to required finish elevations; slope uniformly to drain.
  3. Dusting of surface with dry cement or sand during finishing operations is not permitted.
  4. Apply curing compounds and similar materials in strict accordance with manufacturer's instructions during or after finishing.
  5. Finish surfaces within following tolerances as measured with a 10' (3 m) straight edge:
    - a. Sidewalks: 5/16" (8 mm).
    - b. Other slabs: 3/16" (5 mm).
    - c. Top surfaces of structures other than slabs: In accordance with ACI 117.

6. Float finish:
  - a. Float surface to true, even plane.
  - b. Float second time to uniform finish with wood or cork float; use edger on exposed edges.
  - c. Use on equipment foundations and tops of structure foundations.
7. Roughened finish:
  - a. Roughen surface with rake or stiff broom to minimum depth of 1/4" (6 mm).
  - b. Use on surfaces to receive additional concrete or grout.

- B. Formed surfaces:
  1. Remove fins, projections, and loose material.
  2. Clean surfaces of form oil.
  3. Patch honeycomb, aggregate pockets, voids, and holes as follows:
    - a. Chip out until sound concrete is exposed to minimum depth of 1" (25 mm).
    - b. Saturate surfaces with water and fill cavities with patching mortar.
  4. Fill holes left by form ties with patching mortar.
  5. Cure patches as specified for concrete.

### 3.12 FORM REMOVAL

- A. Minimum time before removal after placing concrete, unless permitted otherwise:
  1. Footings: 24 hours.
  2. Walls, piers, and columns: 48 hours (24 hours for metal-lined forms).
  3. Time specified above represents cumulative time during which temperature of concrete is maintained above 50°F (11°C) and for concrete without set-controlling admixtures.
- B. Reduce removal time by half for high-early-strength cement concrete.
- C. In any event, do not remove supporting forms and shoring until concrete has acquired sufficient strength to safely support own weight plus construction loads.
- D. Take care when removing forms that concrete is not marred or gouged and that corners are true, sharp, and unbroken.

### 3.13 CURING

- A. Cure all concrete; begin curing as soon as possible after placement of concrete.
- B. Use of liquid membrane-forming curing compound permitted for all concrete except where product would impair bond of other applied materials to surface, where surface curing and sealing product is specified for use, or where other method of curing is specified for particular use.
- C. Plastic film curing:
  1. Dampen surface of concrete and lay plastic film with minimum 6" (150 mm) side laps and free of wrinkles; tape side laps.
  2. Hold film in place with lumber or use similar provisions to prevent exposure of concrete for 7 days after placing.
  3. Immediately repair tears in film.
- D. Water curing:
  1. Keep concrete continuously wet for 7 days after placing.
  2. Use on concrete surfaces not receiving compound or plastic film curing.
  3. Clean, nonstaining absorptive mat may be used with water curing.
  4. Do not use for curing cold weather concrete.

### 3.14 SITE CLEANUP

- A. All excavated materials from installation of foundations shall be removed to a suitable fill site obtained by the Contractor, in accordance with all environmental and permitting requirements.

- B. Excess concrete shall be disposed of in accordance with environmental and permitting requirements.
- C. Foundation work outside of the Company property shall be restored to original conditions or as defined by the Contract documents.

END OF SECTION

- 1) Hannah Henry
- 2) Jason L. Varone

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Precast concrete wall panels including design of panels and connections, casting, inserts, form liners, finishing, gates, transportation, and erection.

## 1.02 RELATED REQUIREMENTS

- A. Section 03 00 10 - Concrete Work for concrete for post footings below grade.

## 1.03 INFORMATIONAL SUBMITTALS

- A. Product Data:
  - 1. List of manufactured materials proposed, identifying manufacturer and type and manufacturer's technical information on lifting devices.
  - 2. Manufacturer's data for clear water repellent coating, including recommended coverage rates.
- B. Color Chart: Show full range of available colors.
- C. Submit to Engineer unless noted otherwise.

## 1.04 ACTION SUBMITTALS

- A. Shop Drawings:
  - 1. Prepare Shop Drawings and calculations under seal of a professional engineer registered in state of Illinois.
  - 2. Submit within 4 weeks after award of Contract:
    - a. Anchor bolt plans or precast wall column embedment requirements.
    - b. Assembly, installation, anchorage requirements, and minimum foundation dimensions.
    - c. Structural design computations.
    - d. Final foundation loading diagrams:
      - 1) Indicate simultaneous shear in each direction, simultaneous moment in each direction, and vertical load at each structure bearing plate or ground line for each specified basic load condition including dead load, live load, wind load, seismic, etc., and for each load combination.
      - 2) Foundation loads furnished shall be working loads not multiplied by an overload factor.
    - e. Shop fabrication detail drawings showing the shape and dimension of gates and precast components, the size, quantity, and details for the reinforcing steel; the quantity type, size, and details of connection and lifting hardware, details for attachments of other non-precast components to be attached to the wall panels or columns; and details for the pattern, texture, finish, and color of the wall system.
- B. Samples: Furnish samples of each type, texture and color of concrete wall panels required for Project.
- C. Submit to Engineer unless noted otherwise.

## 1.05 QUALITY ASSURANCE

- A. Fabricator's or erector's qualifications: Precast concrete members shall be plant produced in facilities that have been regularly and continuously engaged in the fabrication and erection of precast concrete members, similar to those indicated on Drawings, for minimum of 5 years.

- B. Fabrication drawings and calculations shall be stamped by a duly registered professional engineer under laws of state of Illinois accepting the responsibility for adequacy of these documents to meet criteria stipulated in Contract Documents.
- C. Installer qualifications: Engage an experienced Installer who has experience with architectural precast concrete screening wall or noise barrier projects with same material and of similar scope to that indicated for this Project with a successful construction record of in-service performance. Installer must submit names, location, phone number and of three references as well as description of project successfully completed for each reference.
- D. Precast concrete wall systems shall be designed and furnished by single manufacturer.
- E. Contractor shall be responsible for all coordination with the gates and fencing manufacturers.
- F. Contractor solely responsible for proper care, protection and handling of materials until final acceptance by Owner.
- G. Manufacturer qualifications: Manufacturer of precast concrete wall systems shall be subject to review of Engineer and shall have the following qualifications:
  1. Manufacturer shall be certified by National Precast Concrete Association (NPCA) or an equivalent organization such as Precast/Prestressed Concrete Institute's (PCI) Plant Certification Program and be designated a PCI Certified Plant for Group A1 – Architectural Concrete.
  2. Regularly engaged in design and fabrication of precast concrete wall systems.
  3. Previously designed and fabricated precast concrete walls of general types specified in this Contract and of custom pattern types required for this project.
  4. Qualified design staff regularly devoted to development of construction plans associated with the precast concrete wall system design, fabrication, and installation.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle and transport materials with care to prevent damage. Pieces damaged in handling may be used only if approved by Owner.
  1. Deliver in proper sequence in order that installation may commence upon delivery.
  2. Owner will not be responsible for storing architectural precast concrete in event delivery is prior to time it can be installed.

#### 1.07 PROJECT CONDITIONS

- A. Obtain and verify field measurements to assure proper installation of precast architectural concrete. No additional costs shall be charged to Owner for modifications to replacement to precast concrete required to provide proper installation.

#### 1.08 WARRANTY

- A. At completion of Work, submit warranty against water leakage and seepage through water-repellant coating, and peeling, cracking, discoloration and other defects of coating for 2 years after substantial completion.
- B. Warranty shall be cosigned by manufacturer, applicator, and Contractor, and shall include repair of any defects and failures in coating during warranty period, at no additional cost to Owner.

### **PART 2 PRODUCTS**

#### 2.01 DESIGN REQUIREMENT

- A. Materials shall be furnished in a fully engineered and coordinated design package.

- B. Coordinate mounting of other materials or products.
- C. Determine required quantities of materials from Drawings. Overall layout of the precast concrete wall may be adjusted to suit vendor's standard column spacing and wall panel sizes.
- D. Design and fabrication:
1. Loading:
    - a. Design concrete panels in accordance with procedures set forth in ACI 318 and PCI Manual for Structural Design of Architectural Precast Concrete.
    - b. Proper provisions shall be made for temporary stresses caused by erection or maintenance.
    - c. Design in accordance with the latest addition of the International Building Code.
    - d. Design wall system for site specific wind and seismic design loads.
    - e. Design wall system to support required fencing and gates loads.
  2. Manufacturing standards for steel structures, if required, shall conform to the following:
    - a. Material:
      - 1) Conform to AISC "Specification for Structural Steel Buildings." Minimum thickness of any metal shall be 3/16" (5 mm). Any metal in contact with or near ground surface or tops of concrete piers or slabs shall be not less than 1/4" (6 mm) thick. Except for equipment mounting bolts, minimum diameter of bolts shall be 5/8"(16 mm); where size of member will not permit, 1/2" (13 mm) bolts may be used.
      - 2) Structural steel: ASTM A36, A992, or A500, except use ASTM A572 or A871 for tapered multi-sided shapes.
      - 3) Anchor bolts: Anchor bolts shall be in accordance with ASTM F1554, Grade 36 or weldable 55 and shall be galvanized on the threaded end a minimum of 12" (300 mm) in accordance with ASTM A123, A153 and A385. Furnish anchor bolts with 2 washers, 1 heavy hex leveling nut, 1 heavy hex nut, and setting templates. Nuts and washers shall be fully galvanized. Nuts shall conform to ASTM F563. Washers shall conform to ASTM F436. Alternate anchor bolt material may be proposed for Engineer's review.
    - b. Base plates and anchor bolt layouts shall be designed to fit the foundation sizes shown on Drawings with adequate clearance to the reinforcing cages. Notify Engineer if this requirement results in uneconomical columns.
- E. Allowable tolerances: Manufacture, quality, and dimensional tolerances of precast-prestressed concrete shall be in general accordance with requirements of "Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products" published by PCI including the following tolerances:
1. Casting tolerances for overall height and width:
    - a. Panels 10' (3 m) or under:  $\pm 1/8"$  ( $\pm 3$  mm.)
    - b. Panels 10' (3 m) to 20' (6 m):  $+1/8"$  and  $-3/16"$  ( $+3$  mm and  $-5$  mm.)
    - c. Panels 20' (6 m) to 30' (9 m):  $+1/8"$  and  $-1/4"$  ( $+3$  mm and  $-6$  mm.)
    - d. Each additional 10' (3 m):  $\pm 1/16"$  per 10' ( $\pm 1.5$  mm per 3 m.)
    - e. Panel thickness:  $+1/4"$  and  $-1/8"$  ( $+6$  mm and  $-3$  mm.)
    - f. Openings (cast within one member):  $\pm 1/4"$  ( $\pm 6$  mm.)
    - g. Out of square (diagonal measure):  $1/8"$  per 10' or  $1/4"$  total (3 mm per 3 m or 6 mm total.)
    - h. Bowing of units: Length unit/360 or  $1/2"$  (13 mm) maximum.
  2. Location tolerances for cast-in items:
    - a. Inserts, pipe sleeves, bolts, and similar items:  $\pm 3/8"$  ( $\pm 10$  mm.)
    - b. Reglets shall be located to provide true alignment between each panel when installed.
- F. Method of support:
1. Design panel connections to permit independent movements of structural frame in plane of wall.
  2. Vertical loads and axial loads shall be transferred to foundations by panels and connections.
  3. Panel downward axial loads and lateral loads parallel to panel shall be supported at each column row.
  4. Design panels and connections to cantilever from foundations.



## 2.02 WALL SYSTEM (PRECAST CONCRETE PANELS AND COLUMNS)

- A. Wall shall be a minimum of 10'-0" (3 m) in height. Top of wall shall remain at a constant elevation, without steps. Bottom of wall may be stepped as needed or cut to match grade.
- B. Contractor shall be responsible for providing drainage through the wall panels, where required based on site conditions. No more than 4" (100 mm) of clear space below any wall panels will be permitted, to allow for a maximum of 4" (100 mm) of substation surface rock to be installed below the wall panels.
- C. Panels and posts shall have same texture/pattern.
- D. Wall panels and columns shall be monolithic, constructed of normal weight concrete and reinforcing steel per Section 03 00 10. Alternate concrete mix designs to suit vendor's standards may be submitted to Owner and Engineer for approval.
- E. Wall panels and columns shall be colored integrally with the concrete mix or colored after casting using a durable concrete stain. Coloring applied after installation, such as field painting, is not allowed without approval from Owner and Engineer. Wall coloring should allow for ease of cleaning by Owner after installation. Contractor shall provide vendor's standard color options for Owner's selection.
- F. Provide a minimum 2-year warranty on the wall panel and column finish.
- G. Column spacing shall be provided per vendor's standard panel sizes. Contractor shall adjust column spacing where required to provide adequate clearances to existing utilities and to maintain electrical clearances, with approval from Owner and Engineer.
- H. Columns for access gates shall be designed, fabricated, and installed as required for proper gate operation and support. Contractor shall be responsible for coordination of gate attachments to the precast concrete wall system.
- I. Use of mechanical/expansion anchors is not permitted. All attachments to the columns or wall panels shall be provided with adhesive anchors to reduce the risk of water infiltration and damage.

## 2.03 WALL SYSTEM FOUNDATIONS

- A. Provide attachment to concrete drilled pier type foundations. Attachment may be provided by embedding columns into the foundation or attaching the columns to anchor bolts installed in the foundations.
- B. Contractor shall provide attachment details and foundation loads to Engineer. Engineer is responsible for foundation design and installation details.

## 2.04 GATES

- A. All gates shall be black wrought iron type bars, or approved equal. Bars shall be a minimum of 1" x 1" (25 mm x 25 mm) square bars with no more than 4" (100 mm) of clear space between bars. Arch type bars or pikes shall be installed along the top of the gates. Ends of all pikes shall be pointed to deter climbing.
- B. Contractor shall be responsible for coordination of attachments of all gates to the precast concrete wall system, with no more than a 4" (100 mm) gap between the gates and the support columns.
- C. All metal pieces and other non-insulated metallic pieces shall have a NEMA 2-hole grounding pad installed near the bottom of each section, close to grade on the hinge side. Individual pieces not

connected directly to the ground grid shall have provisions to attach a 4/0 ground wire between pieces.

- D. Drive gates shall be double leaf swing gates and provide a minimum of 24'-0" (7.3 m) clear between columns when gate is fully open. Pedestrian gate shall be a single leaf swing gate and provide a minimum 3'-0" (75 mm) clear between columns when gate is fully open. All gates shall open out. Gate attachments to the precast columns shall be coordinated and installed by Contractor.
- E. Contractor shall provide means to lock all gates with an Owner provided padlock without the use of chains. Padlock should be accessible from both inside and outside of gates.
- F. All welding shall be performed by an AWS certified welder.

## 2.05 FABRICATION

- A. Tapering of concrete forms as required for removal of forms is acceptable.
- B. Welding members and embedded items, where indicated on Drawings, shall be incorporated into precast members at time of fabrication.
- C. Finish:
  1. Standard underside: Resulting from casting against approved forms using good industry practice in cleaning of forms, design of concrete mix, placing, and curing. Small surface holes caused by air bubbles, normal form joint marks, surface discoloration and minor chips and spalls will be tolerated, but no major or unsightly imperfections, honeycomb, or structural defects will be permitted. Sandblasting of exposed underside specified hereinafter.
  2. Standard top: Result of vibrating screed and additional hand finishing at projections. Normal color variations, minor indentations due to required covering, and minor chips and spalls will be permitted. No major imperfections, honeycomb, or structural defects permitted.
  3. Exposed vertical ends: Strands shall be recessed and ends of member shall receive sacked finish and light sandblasted.
  4. Exposed exterior surfaces:
    - a. Aggregate shall be exposed by means of light sandblasting. Sandblasting shall be done at precaster facility or in field at Contractor's option to match approved sample panel.
    - b. Sample panel shall be finished, and Owner's approval obtained prior to proceeding with work.
    - c. Final selection of actual type and color will be by Owner.
- D. Each piece or unit of precast concrete when delivered shall have setting number marked clearly on unexposed edge.
- E. Precast members shall be lifted and supported during transportation as required by design. Lifting points shall be shown on Shop Drawings and lifting devices shall be embedded in members by manufacturer.
- F. Lifting devices:
  1. Embedded lifting devices exposed to view in finished construction shall be removed to below concrete surface and grouted flush.
  2. Embedded items on interior surface shall be of flush-mount type and plastic caps shall be installed to seal against moisture. Flush-mount inserts shall be "Twist-lift" systems by Dayton Superior, or equal.

## **PART 3 EXECUTION**

### **3.01 GENERAL**

- A. Contact local utility locates and coordinate with Owner to locate existing below ground and above ground utilities. Provide adequate clearances to energized power lines.
  - 1. New oil drainpipe and feeder circuits are to be installed below ground, exiting the substation as shown on drawings. Contractor shall verify location of these pipes and any others in the vicinity of the precast wall foundations, and clearly mark before excavations begin.
- B. Install drilled piers in accordance with Drawings and Specifications 03 00 10 and 31 32 16-16. Install wall system columns in accordance with manufacturer's recommendations and installation procedures.
- C. Install precast wall system in accordance with manufacturer's recommendations, drawings, and installation procedures/manuals.
- D. All wall panels shall extend to or below elevation of finished grade on outside of wall, except where site drainage patterns require surface runoff to exit underneath the wall panels.
- E. Contractor shall be responsible for reseeding all disturbed areas outside the screen wall upon complete installation of the wall system, with an approved seed mix.
- F. Owner shall provide all surfacing, grounding, and security equipment after installation of the wall system.

### **3.02 ERECTION**

- A. Place, align, and level members in final position in structure on accepted bearing surfaces.
- B. Field weld of precast members to each other or to supporting structural members as shown on Drawings or Shop Drawings; welding shall be in accordance with requirements of AWS D1.1.
- C. Remove lifting hooks as required.
- D. Touch up abrasions and welds on anchoring devices or structural steel with one coat of rust inhibitive primer.
- E. Grout area between precast panels and foundation with regular grout for full uniform bearing between precast panel and foundation support when required by manufacturer.

### **3.03 WATER-REPELLENT COATING**

- A. Inspect precast concrete panels and make sure that conditions which would prevent proper and timely completion of Work are corrected before starting application.
- B. Surfaces shall be dry and free of dust, dirt, oil, grease, and other foreign material which would affect application and performance of coating. Comply with coating manufacturer's instructions for preparation of surfaces to receive coating.
- C. Water-repellent coating may be applied at precaster facility or in field, at Contractor's option. If water-repellent coating is field-applied protect adjacent construction and landscaping from overspray by covering with polyethylene sheeting securely taped in place until Work is completed.
- D. Application shall be by manufacturer's approved applicators using recommended methods and equipment.

- E. Comply with manufacturer's recommendations regarding environmental requirements and temperature of surfaces to receive coating. Do not exceed application rate recommended by manufacturer.

#### 3.04 PROTECTION

- A. Protect and keep panel clean at all times during manufacture and construction, until erected panels are accepted.
- B. Protect finish surfaces of building where architectural precast concrete is being installed. Finish surfaces damaged during installation shall be repaired at no additional cost to Owner. Special care shall be taken to protect completed roofing and other moisture protection. For any repairs necessary, employ persons trained and skilled for that trade.

#### 3.05 DAMAGED UNITS

- A. Replace panels and other components of work that have been damaged.

#### 3.06 CLEANING

- A. Remove rubbish and debris resulting from delivery and installation from site. Do not allow to accumulate.

END OF SECTION

- 1) Hannah Henry
- 2) Jason L. Varone

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Other steel, iron, and metal items.
- B. Miscellaneous metal.
- C. Welding materials.
- D. Anchor rods for installation of other steel, iron and metal items.
- E. Adhesive anchors.
- F. Welded studs.
- G. Grating.
- H. Stair Treads.
- I. Manhole steps and covers.

## 1.02 WORK BY OTHERS

- A. Structural steel installation.

## 1.03 MEASUREMENT AND PAYMENT

- A. If quantities of following items are changed by Contract Documents, lump sum Contract Price will be adjusted on basis of unit adjustment prices set forth in Agreement. Miscellaneous Metals, linear foot (LF). Unit Adjustment price includes labor, equipment, and materials for the fabrication, finishing, and installation of miscellaneous metals.

## 1.04 INFORMATIONAL SUBMITTALS

- A. Product Data: List of manufactured materials proposed, identifying manufacturer and type.
- B. Test Reports: ICC-ES evaluation reports for post-installed adhesive anchors, mechanical anchors, masonry anchors provided to verify conformance to specifications.

## 1.05 ACTION SUBMITTALS

- A. Shop Drawings for other steel, iron or metal items as defined in AISC Code of Standard Practice.
  - 1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - 2. Indicate welded connections using standard AWS A2.0 welding symbols.
  - 3. Indicate net weld lengths.

## 1.06 QUALITY ASSURANCE

- A. Perform welding in accordance with AWS D1.1 "Structural Welding Code".
- B. Perform fabrication in accordance with AISC 303-10 "Code of Standard Practice for Steel Buildings and Bridges".

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Adhere to product storage and handling requirements.
- B. Accept metal fabrications on site in labeled shipments. Inspect for damage.
- C. Protect metal fabrications from damage by exposure to weather.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Steel plates and shapes:
  1. Structural W-shapes: ASTM A992/A992M Grade 50.
  2. Channels and angles: ASTM A36/A36M.
  3. Round hollow structural sections: ASTM A500/A500M, Grade B.
  4. Rectangular hollow structural sections: ASTM A500/A500M, Grade B or C.
  5. Structural plates and bars: ASTM A36/A36M.
- B. Galvanizing: ASTM A123/A123M.
- C. Standard bolts: ASTM A307.
- D. High-strength bolts: Heavy hex, structural type. ASTM F3125 Grade 325.
- E. Threaded rods: ASTM A36
- F. Nuts:
  1. ASTM A563 (ASTM A563M) Heavy hex type.
  2. Finish: Hot-dipped galvanized.
- G. Washers:
  1. ASTM F436 (ASTM F436M); Type 1, Furnish clipped or beveled washers where required.
  2. Finish: Hot dipped galvanized

### 2.02 WELDING MATERIALS

- A. Steel: AWS D1.1; type as required for materials being welded.

### 2.03 ADHESIVE ANCHORS

- A. Threaded rods anchored in concrete with 2-component blend of resin and hardener. Filler material may be mixed with resin and hardener in accordance with manufacturer's directions.
- B. Anchor rod system shall have ICC approval for use in cracked concrete and for seismic conditions and shall have passed mandatory creep tests requirements of AC 308.
- C. Threaded rod type:
  1. All-threaded.
  2. Standard: ASTM A36/A36M, galvanized. Use unless indicated otherwise on Drawings.
  3. High-strength: ASTM A193/A193M, Grade B7, galvanized.
  4. Stainless steel: ASTM F593 (AISI 304).
- D. Manufacturer: "HIT-RE 500-SD System" by Hilti; "SET-XP" by Simpson Strong Tie, or equal.

#### 2.04 WELDED STUDS

- A. Material: ASTM A108.
- B. Automatically end weld in accordance with manufacturer's recommendations.
- C. Manufacturer: "Nelson Fluxed Headed Anchor Studs," by Nelson Stud Welding Division, or equal.

#### 2.05 STEEL GRATING

- A. Use welded rectangular grating conforming to standards of NAAMM.
- B. Size of bearing bars: 1-1/4" x 3/16" (32 mm x 4.8 mm) at 1-3/16" (30 mm) oc, unless shown otherwise.
- C. Cross bars: Rectangular cross-section, flush at top with bearing bars and spaced 4" (100 mm) oc.
- D. Make sections removable; limit weight of each section to not more than 100 lb (45 kg).
- E. Provide saddle clip fasteners for each removable section of floor bar grating supported on structural steel members.
- F. Provide edge binding at exposed edges and as required to stiffen irregular sections. Provide openings shown. Provide joints at center of openings where possible to permit removal of grating around items passing through.
- G. Openings not shown but required for piping and other items passing through grating will be cut and edge bound in field by Contractor.
- H. Grating, plates welded to grating, and grating saddle clips shall be galvanized.
- I. Paint grating using manufacturer's standard factory prime coats except that bituminous base paints shall not be used.
- J. Provide NEMA 2-hole ground tabs on the underside of all grating panels.

#### 2.06 STEEL STAIR GRATING TREADS

- A. Prefabricated standard galvanized steel grating; grating bar size: 1" x 3/16" (25 mm x 5 mm) unless indicated otherwise on Drawings.
- B. Provide abrasive nosing at head of each steel stairway at grating floor surface.
- C. Provide galvanized bolts for anchoring treads to stringers and adhesive anchors to attach to foundations.
- D. Provide 6" (152.4 mm) minimum to 9" (228.6 mm) maximum height between treads and 12" (304.8 mm) tread width.
- E. Provide NEMA 2-hole ground tabs on the underside of all stair treads.

## **PART 3 EXECUTION**

### **3.01 ERECTION**

- A. Fasten each section of grating to structural steel.
- B. Field weld studs to members if required by state or local regulations. In absence of regulations, Contractor may exercise option as to attachment of studs in shop or field.
- C. Install items plumb and level, accurately fitted, free from distortion or defects.
- D. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.
- E. Field weld components where indicated on Drawings.
- F. Perform field welding and inspect welds in accordance with AWS D1.1.

### **3.02 PREPARATION**

- A. Clean and strip primed steel and aluminum items to bare metal where site welding is required.
- B. Supply setting templates for metal items required to be cast into concrete or embedded in masonry.

### **3.03 ADHESIVE ANCHORS**

- A. Install in strict accordance with manufacturer's written instructions.
- B. Perform work using manufacturer's standard equipment including adhesive cartridges, dispensing guns, mixer tubes and extensions, brush, and air nozzle for compressed air cleaning of holes. Contractor shall possess equipment at site prior to start of installation and workers shall demonstrate knowledge of procedure for installing anchors prior to installation.
- C. Use hammer drill except where holes are within 6" (150 mm) of edge of concrete or masonry, core drill holes, unless noted otherwise on Drawings.
- D. Inspect existing concrete at anchor locations for soundness. Report to Engineer cracked, deteriorated or weak concrete detected from drilling operation or from inspection.

### **3.04 FIELD TOUCH-UP OF GALVANIZING**

- A. Galvanizing damaged after fabrication or installation shall be regalvanized in accordance with Section 33 72 26.
- B. Apply in accordance with manufacturer's recommendations.

END OF SECTION

- 1) Hannah Henry
- 2) Jason L. Varone



## **PART 1 GENERAL**

### 1.01 SECTION INCLUDES

- A. Furnishing, testing, and delivery of one prefabricated and/or prepackaged substation control building complete with equipment as shown, including:
  - 1. Medium voltage switchgear.
  - 2. Batteries and chargers.
  - 3. Dc and ac panels.
  - 4. Field wiring interface panels.
  - 5. Cable tray, conduit, wireway, lighting, wiring, HVAC and miscellaneous equipment.

### 1.02 SUBMITTALS

- A. Product Data:
  - 1. Catalog data and parts lists on equipment.
  - 2. Two bound sets of drawings, catalog data, and parts list. Ship with control buildings.
- B. Shop Drawings:
  - 1. Prepare Shop Drawings and calculations under seal of Professional Structural Engineer.
  - 2. Submit within 30 days after Notice to Proceed: Base frame and foundation and anchor bolt requirements.
  - 3. Submit within 45 days after Notice to Proceed:
    - a. Control building outline, plan, and elevations and equipment placement within control building. Provide detail outline and structural drawings of exterior terminal cabinet.
    - b. Wiring point schedule for terminal blocks in interior terminal cabinet.
    - c. Wiring diagrams of all equipment and panels.
- C. Quality assurance data:
  - 1. Factory testing plan demonstrating and documenting required factory test steps and operations.
  - 2. Test results:
    - a. Document "as-tested" condition.
    - b. Include printouts, oscillographs, event logs, and phasor diagrams downloaded from relays, meters, and controls.
    - c. Provide 6 certified copies of test data and reports for tests (5 hard copies and 1 electronic copy).
    - d. Provide typewritten test reports listing circuit or equipment tested, date, equipment used, person or persons performing and witnessing tests, and results of tests.
  - 3. Unloading and handling instructions.

### 1.03 QUALITY ASSURANCE

- A. Control building, except where specifically stated otherwise, shall conform to the latest applicable standards of AISC, ANSI, ASCE, ASTM, IEEE, NEC, and NEMA.
- B. Test equipment shall have recent calibration checks by equipment manufacturer or authorized facility to assure accuracy of commissioning process.
- C. Test shall be performed by qualified test engineer.

### 1.04 DELIVERY, STORAGE AND HANDLING

- A. Provide suitable crating, blocking, anchoring, and supports so equipment withstands normal domestic shipping and handling shocks and vibration.

## 1.05 EXISTING CONDITIONS

- A. Ambient temperatures: Not to exceed 42°C.
- B. Expected minimum temperature: -25°C.

## 1.06 WARRANTY

- A. Assembled control buildings shall be guaranteed completely weathertight under all weather conditions for a period of five years after acceptance of control building by Contractor.
- B. Leaks which occur during warranty period, whether through roofs, floors, walls, doors, windows, or accessory equipment shall be repaired at no cost to Owner.

## PART 2 PRODUCTS

### 2.01 DESIGN REQUIREMENTS

- A. Overall control building dimensions and layout indicated are nominal and may vary slightly to meet Contractor's standard sizes, subject to approval by Owner.
- B. Interior of control building shall be "clear span" structure with a minimum floor to ceiling height of 10'.
- C. Preferred location of doors shall be as indicated. Position of doors may be adjusted slightly to best fit Contractor's standard design, subject to approval by Owner.
- D. Design loads:
  - 1. Building shall be designed in accordance with AISC and result in a rigid structure that will maintain its shape and alignment against all design loads as specified by ASCE 7-10, "Minimum Design Loads for Buildings and Other Structures" for wind, snow, and earthquake loads and be classified as Risk Category II for determination of importance factors.
  - 2. Dead load:
    - a. Design ceiling to support four-foot LED light fixtures attached to lighting raceway channel and cable tray system loaded to 87 lb/ft.
    - b. Design base frame and floor to support a minimum uniform load of 250 lb/sq ft.
    - c. Floor and walls shall be capable of supporting equipment specified and/or shown on Drawings.
    - d. Snow loads:
      - 1) Ground snow load: 35 psf.
      - 2) Snow load exposure factor due to wind effects shall not be less than 0.9.
      - 3) Snow load thermal factor shall not be less than 1.05.
    - e. Wind loads:
      - 1) Basic strength level wind speed: 115 mph.
      - 2) Exposure category: C.
  - 3. Seismic:
    - a. Seismic peak acceleration coefficients (ASCE 7-10 Figure 22-1 and 22-2):  $S_s = 0.055$ ,  $S_1 = 0.039$ .
    - b. Site Class D.

### 2.02 MATERIALS AND CONSTRUCTION

- A. Base:
  - 1. All-welded construction of ASTM A36, A53, A500, or A992 structural steel members.
  - 2. Deflection during lifting shall not exceed 0.25" per 10'. Base shall be designed for mounting on concrete wall or piers.

3. Base shall have removable lifting devices to facilitate handling and installation. Lifting devices shall be placed symmetrically around center of gravity of control building. Center of gravity shall be figured with all internal and external equipment in place.
  4. Provide clip plates for anchoring base frame to foundation.
- B. Floor: Minimum of 3/16" steel plate welded to base frame.
- C. Frame:
1. Frame with minimum 3" square ASTM A500 tubular steel with all-welded connections to provide rigid moment-resisting frame.
  2. Openings shall be similarly framed with 3" square tubular steel.
- D. Walls:
1. Exterior and interior walls: 16-gage minimum, paint-quality galvanized steel.
  2. Design interior walls to support interior loads of 400 lb/lin ft of wall length.
- E. Roof and ceiling:
1. Exterior of roof: 16-gage minimum, paint-quality galvanized steel panels, rated for 85 psf plus 250 lb concentrated load at center of any panel. Roof shall be sloped a minimum of 2°.
  2. Ceiling: Formed 16-gage minimum paint quality galvanized steel panels.
- F. Doors:
1. Each 7'-0" (2 m) high x 3'-6" (1.1 m) wide clear opening.
  2. Equip door with nonlocking knob and latch both inside and outside.
  3. Equip with panic hardware.
  4. Provide doors with deadbolt lock keyed to Owner's master key. Information shall be provided after award of Contract.
  5. Provide door with door alarm providing hard contact status to RTU if door is open.
- G. Battery area:
1. Comply with requirements of NESC Section 14 and NEC Article 480 for battery rooms.
  2. Provide one exhaust fans in battery area with cycle timers. Cycle timer shall be adjustable from 2-55 minutes per hour. In addition, provide "On-Off-Auto" switch.
  3. Provide portable eye wash equipment.
- H. Wall louvers:
1. 25" high x 12" wide, adjustable.
  2. Cover outside of louvers with 1/4" x 1/4" wire mesh.
  3. Provide 2 air filters sized 25"H x 12"W x 1"D for each louver.
  4. Provide insulated covers with gaskets for each louver for use in cold weather. Covers shall have fasteners to secure them in place and also provide a weathertight seal.
- I. Wall seams and areas where metal-to-metal contact is made shall be calked with butyl rubber or equivalent. Roof seams shall be sealed to assure watertightness.
- J. Insulation:
1. Polyurethane insulation providing R-19 value shall be provided in roof and exterior walls.
  2. Install 3" of foam sprayed-on insulation on underside of floor providing R-19 value. Cover insulation with 1/16" galvanized steel panel.
  3. Insulation system shall be durable, weatherproof, insectproof, and rodentproof.
- K. Lighting:
1. Equip building with receptacles, LED lights, and 3-way switches at each entrance door. Provide minimum level of 50 foot candles horizontally at 30" above floor level and vertically at 5' from floor level on control panels.
  2. Emergency lighting will be powered from 125-volt dc system with a switch and timer to prevent inadvertent operation for more than 3 hours.

- L. Provide LED wall pack outside light with photocell at side of each entrance to building and 5' maximum from door. Provide switch inside door for each light.
- M. HVAC:
  - 1. Provide commercial-type, wall mounted HVAC unit(s) to maintain interior high temperature of 104°F and electric-type, wall-mounted heater(s) to maintain interior low temperature of 60°F, taking into consideration the site conditions, heat load present, and future conditions when operating at 100% capacity. Nominal temperature shall be 78°F.
  - 2. Equipment shall include wall-mount unit(s), lockable circuit breaker or disconnect switch, manual thermostat, and a one inch disposable air filter.
  - 3. HVAC system shall consist of 2 independent units each sized at 60%, when system is operating at 100%. Provide system with electronic automatic changeover thermostat.
  - 4. Controls:
    - a. High pressure control.
    - b. Low pressure control.
    - c. Low ambient control.
    - d. Compressor anti-cycle relay.
    - e. Alarm relay.
  - 5. Condenser and evaporator coils shall be phenolic coated.
- N. Provide 30" x 60" wall mounted fold down table and drawing storage rack.
- O. Paint:
  - 1. Prepare surfaces in accordance with SSPC.
  - 2. Coat interior wall and ceiling panels with minimum of 2-1/2 mil of white industrial epoxy paint.
  - 3. Coat exterior wall and roofing panels and base with a minimum of 1 mil of wash primer and finished with a minimum of 3 mil of Hi-Build aliphatic polyurethane paint.
  - 4. Floor shall be epoxy primed and coated with a gray nonskid, scuff-resistant urethane coating.
  - 5. Exterior color of building: Selected after award of contract from manufacturer's standard colors.

## 2.03 ELECTRICAL AUXILIARY SYSTEMS

- A. Circuit breaker panels:
  - 1. Panels: Dead-front with molded case breakers, mounting location as shown. Box shall be NEMA 1 galvanized steel with painted steel front, hinged door, catch, cardholder, nameplate, lock, and keys.
  - 2. Circuit breakers: Bolted-on thermal-magnetic protective, quick-make, trip free from handle, trip indicating type.
    - a. Molded-case, thermal-magnetic, bolt-in, individually front replaceable, and shall visibly indicate "On," "Off," and "Tripped" position.
    - b. Branch circuit breakers used for lighting circuits shall be switch duty rated, "SWD."
    - c. Breakers having multiple poles shall be manufactured as common trip type.
    - d. Interrupting rating shall be not less than interrupting rating of panelboards, and not series rated to achieve required short circuit interrupting rating.
    - e. Provide handle clips for 10%, or minimum of 2 whichever is greater, for breakers to prevent casual operation. If no breakers are indicated for installation, then provide on breakers labeled as spare.
    - f. Breakers, and provisions for future breakers, shall be provided in quantities, poles, and ampere ratings shown on Drawings.
    - g. Molded-case circuit breakers used in ac and dc panelboards and ac load centers shall be bolt-on type, G-frame size.
      - 1) Typed panel directory located inside door shall have panel and circuits function clearly identified. Handwritten panel schedules not allowed.
      - 2) Provide main and neutral buses insulated from cabinet with separate ground bus. Bus material shall be copper. Ground bus shall be similar to neutral bus in size and number of conductor terminating positions.

- a) Bond ground bus to panelboard enclosure by copper ground strap or copper conductor of appropriate size. Bond neutral bus to ground bus in accordance with requirements of NEC.
  - b) Grounding bus connection to enclosure by removable screws not allowed.
  - c) Bus shall be capable of terminating clamp type lugs for neutral cable in each supply conduit, and connections for neutral cable in each load circuit.
  - d) Neutral bus shall be fully rated, unless specified otherwise.
  - e) Isolated ground panelboards: As specified above, except isolated ground bus shall be bonded, by insulated ground conductor, back to source of separately derived system. Do not bond isolated ground bus to panelboard enclosure unless this is first point of grounding for separately derived system.
3. Manufacturer: Square-D, or equal.
- B. Battery and charger:
- 1. Battery:
    - a. Quantity: 1.
    - b. Type: Flooded lead-selenium.
    - c. Number of cells: 60.
    - d. Capacity: Size per load requirements.
    - e. Battery accessories:
      - 1) One complete set of cell numbers.
      - 2) Intercell connectors and cable connectors as required.
      - 3) Plastic trays and absorbent pillows for battery spill prevention.
    - f. Housing: 2 step rack Zone 2A seismic construction for each set of batteries.
    - g. Covers: Removable transparent safety shield to cover all electrical connections and live parts.
    - h. Battery Casing: Use multi-cell blocks when possible to reduce footprint.
    - i. Manufacturer: SBS, or equal.
  - 2. Battery charger, compatible with battery:
    - a. Type: Silicon diode, automatic, adjustable, self-regulating, with battery eliminator feature.
    - b. Quantity: 1
    - c. Ratings:
      - 1) Input: 240-volt, 60 Hz, single-phase.
      - 2) Output voltage: Variable, approximately 120 to 140-volts dc; filtered to limit ripple to 30 millivolts.
      - 3) Ac input breaker and dc output breaker shall be included integral to the charger.
    - d. Output current: Capacity as required to fully charge a totally discharged battery in 8 hours or less while simultaneously supplying continuous loads.
    - e. Voltage regulation: 1.0% maximum from 0 to 100% load.
    - f. Accessories:
      - 1) Output ammeter and voltmeter.
      - 2) Variable control for adjusting output voltage.
      - 3) 72-hour timer for controlling "equalizing" charge.
      - 4) Input ac circuit breaker
      - 5) Output dc circuit breaker.
      - 6) Low dc alarm relay and indicating light.
      - 7) Ac failure relay and indicating light.
      - 8) Ground detector relay to close alarm contacts upon occurrence of dc system ground.
      - 9) Ground detector indicating light.
      - 10) Contact shall start exhaust fan in battery room when charger is on equalize.
    - g. Manufacturer: LaMarche, or equal.
- C. Ac panels:
- 1. Rating: 120/240-volt, single-phase, 3-wire, 200-ampere mains minimum, 14,000 AIC.
  - 2. Size: 18-position minimum.
  - 3. Quantity: 1.

4. Circuit breakers: As required with spare positions filled with spare circuit breakers.
5. Manufacturer: Square-D, or equal.

D. Main disconnect:

1. Rating: 120/240 volts, single-phase, 200-ampere.
2. Quantity: 2.

E. Ac transfer switch:

1. Rating: 120/240 volts, single-phase, 200-ampere.
2. Quantity: 1.
3. Type: Manual.

F. DC panels:

1. Rating: 125-volts dc, 2-wire, 200-ampere main minimum.
2. Quantity: 1.
3. Circuit breakers: As required with spare positions filled with spare circuit breakers.
4. Manufacturer: Square-D, or equal.

G. High temperature alarm:

1. Provide hard contacts to provide status to RTU
2. Rating: 125-volts dc, 15A Contacts
3. Set at 85°F
4. Manufacturer: Dayton, or equal.

H. Low temperature alarm:

1. Provide hard contacts to provide status to RTU
2. Rating: 125-volts dc, 15A Contacts
3. Set at 50°F
4. Manufacturer: Dayton, or equal.

I. Grounding and bonding:

1. Provide ground bus, grounding facilities, and grounding and bonding connections in accordance with ANSI C37.20 and NEC.
2. Provide NEMA 2-hole ground pad at each corner of building.

## 2.04 SHOP ASSEMBLY

- A. Provide as shown on Drawings. Substitution of equipment shall be approved by Owner prior to installation.
- B. After assembly and installation of electrical equipment, perform tests as required to assure that equipment functions properly.
- C. Provide terminal cabinets mounted on interior of control buildings. Provide full length double doors with 3-point latch suitable for locking. Inside of box shall be painted white; exterior shall be painted same as control building exterior. Provide interconnecting wiring between switchgear, ac and dc panels, SCADA RTUs, and terminal cabinet.

## 2.05 WIRING

A. Indoor lighting and power:

1. NEC Type THW rated 600-volt, moisture and heat-resistant thermoplastic, 75°C operating temperature. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
2. Indoor building wiring shall be laid out such that there is no more than one wire on a terminal.
3. Splices shall only be permitted for receptacle and lighting circuits at designated junction boxes.
4. Provide separate grounding conductor.
5. Color code:

- a. Black - Phase (X).
  - b. White - Neutral (N).
  - c. Red - Phase (Y).
  - d. Green - Grounding conductor.
- B. Multiconductor control cable:
1. Use for wiring between termination cabinet and equipment located in building.
  2. Multi-conductor, rated 600-volt, cross-linked poly-ethylene insulation with overall copper shield and neoprene sheath.
  3. Conductors shall be annealed coated copper in accordance with ASTM B33 or B189 and shall be either 7-strand or 19-strand.
  4. Shall be designated Type TC for installation in cable trays.
  5. Color coding shall be compounded in insulation, not surface coated.
  6. Color coding to follow NEMA WC-57/IECA S-73532 Method 1, Table EI.
  7. Ac color code:
    - a. Black - Phase (X).
    - b. White - Neutral (N).
    - c. Green - Grounding conductor.
  8. Dc color code:
    - a. Black – Positive.
    - b. White – Negative.
  9. CT and VT color code:
    - a. Black – Phase A.
    - b. Red – Phase B.
    - c. Green – Phase C.
    - d. White – Neutral.
- C. Terminations:
1. Conductor terminal connectors shall be insulated, ring tongue, compression type connectors properly sized for conductor and terminal.
    - a. Connectors shall be constructed of copper and shall be tin-plated.
    - b. Interior surface of connector wire barrel shall be serrated; exterior surface of connector wire barrel shall be furnished with crimp guides.
  2. Insulated terminal connectors shall be used.
  3. Connections requiring disconnect plug and receptacle type devices shall be provided with factory-terminated conductors on each plug and receptacle.
    - a. Plugs and receptacles shall be factory wired into junction boxes containing terminal blocks for external connections.
    - b. Conductors on disconnect portion of plug-receptacle assemblies shall be in common jacket.
  4. Prior to shipment of equipment, remove temporary wiring installed in factory for equipment testing.
  5. Current transformers shall terminate on shorting type terminal blocks. Ship with shorting jumpers installed.
- D. Identification and labeling:
1. Provide conductor identification sleeve on each end of each internal conductor. Mark each sleeve with terminal end and opposite end destination identification with nonsmudging, permanent black ink. Sleeves shall be non-shrinking, not less than 1/2" long.
  2. Permanently label each terminal block, terminal, conductor, relay, breaker, fuse block, and other auxiliary devices to coincide with identification indicated on manufacturer's drawings.
- E. Category 6 communication cable circuited in tray, conduit or used for field wiring internal to cabinets.
1. Conductor: Solid, bare copper minimum No. 23 AWG.
  2. Insulation: Fluorinated ethylene propylene (FEP) insulated singles.
  3. Insulated conductors: Unshielded, twisted 4 pairs enclosed with spline fluorinated ethylene propylene shall be integrally installed to allow easy removal of jacket material.

4. Each communication cable shall be identified by means of surface ink printing indicating manufacturer, model, or catalog number. Cable shall meet TIA/EIA Draft 9A CAT6.
  5. Cables shall be capable filler material.
  6. Cable assembly shall be covered with clear "Flamearrest" jacket, sequentially marked at 2' (600 mm) intervals. Ripcord of passing UL flame test Type CMP.
  7. Manufacturer: Belden "DataTwist" 7852A.
- F. Twin-axial communication cable installed indoors in cable tray and conduit:
1. Voltage rating: 600-volt.
  2. Conductor: One pair, bare copper, No. 18 AWG with 7 x 26 stranding.
  3. Insulation: Flame-retardant polyolefin.
  4. Assembly: Aluminum foil-polyester tape shield with No. 20 AWG, 7 x 28 stranded tinned copper drain wire with 100% shield coverage, and tinned copper braid shield with minimum 55% coverage. Overall cable assembly shall be Type "PLTC."
  5. Jacket: Polyvinyl chloride (PVC).
  6. Cable shall be UL-listed 1581 for flame resistance.
  7. Temperature rating shall be 75°C in dry maximum operating temperatures in dry locations.
  8. Manufacturer: Belden, "DataTray" 600-volt, industrial twin-axial cable, Catalog Number 3072F.

## 2.06 SPLICES AND TERMINATIONS

- A. Splices, except as in lighting and general-purpose power circuits specified below, not allowed unless specifically indicated on Drawings or required for connection to equipment.
- B. Temperature rating of splices and terminations shall be rated no less than 75°C.
- C. Splices allowed shall be UL-listed for intended use, location, and voltage by manufacturer.
- D. Termination of conductors to equipment with bolted lighting and general-purpose power circuits.
  1. Provide wire and cable connectors of high-conductivity, corrosion-resistant material with contact area equal to at least current carrying capacity of wire or cable.
  2. General lighting and general-purpose building power circuits:
    - a. Twist-type, insulated spring connectors for splices on solid or stranded conductors smaller than No. 6 AWG.
    - b. Use indent, hex screw, or bolt clamp-type connectors, with or without tongue for splices on solid or stranded conductors No. 6 AWG and larger.
    - c. Apply insulating 600-volt tape.
- E. Insulating tapes and compounds for terminations connections:
  1. Use compression type lugs:
  2. Compression lugs for cables 250 kcmil and larger shall have at least 2 clamping elements of compression indents, and provision for at least 2 bolts for joining to apparatus terminals.
  3. Crimping hand tools used for securing conductors in compression type connectors or terminal lugs shall be made for purpose and conductor sizes involved.
  4. Crimping tools shall be ratchet-type preventing tool from opening until crimp action is completed.
  5. Tools shall be product approved by connector manufacturer.
- F. Terminals:
  1. Conductors No. 10 AWG and smaller: Marathon 1500 Series.
  2. Conductors larger than No. 4/0 AWG: Terminate to tinned copper bus bar drilled and tapped with standard NEMA sized and spaced holes.
- G. Coordinate sizes and types of conductor terminals for 600-volt power cable terminations in equipment with furnished conductor and terminal connector data.
- H. Provide 600-volt rated terminal blocks for instrumentation and control conductors for connection to circuits external to specified equipment, and for internal circuits crossing shipping splits.



1. Use crimp-on terminals matching termination point terminations in manufacturer-furnished panels. Splices not allowed.
  2. Terminal blocks for thermocouple extension wire: Buchanan "Medium Duty" with thermocouple contacts or Marathon 200 Series with Omega Engineering, Inc. Type TL terminal lugs.
  3. Furnish with white marking strips.
  4. Where permitted by safety codes and standards, provide without covers. Neither step-type terminal blocks nor angle mounting of terminal blocks allowed.
  5. Fuses may be mounted on terminal blocks.
  6. Maximum 2 conductors in accordance with termination point.
- I. Terminal blocks for external connections shall leave from centrally mounted location, not from individual devices in enclosure.
1. Group-in instrument and control compartment for easy accessibility.
  2. Provide sufficient space on each side of each terminal block to allow orderly arrangement of leads to be terminated on block.
  3. Locate auxiliary equipment in compartments, enclosures, or junction boxes so service personnel will have direct access without interference from structural members and instruments without removal of barriers, cover plates, or wiring.
  4. Do not mount terminal blocks in compartments containing cables or buses operating at voltages above 600 volts.
  5. Size for wire sizes of incoming conductors as necessary.
- J. Install shorting-type terminal blocks nearest current transformer in accessible location for each set of CTs supplied with equipment furnished, no other shorting-type terminal blocks allowed, unless specified otherwise.
- K. Install din-rail mounted miniature circuit breakers (MCB) for protection of VT circuits on line and load side. Breakers shall have alarm contacts wired to terminal blocks.
- L. Terminate each conductor in multiconductor control cable. Provide 10% spare terminals for circuit modifications.
- M. Each control switch and lockout relay shall have minimum of 4 spare normally open and 4 spare normally closed contacts wired out to terminal blocks.
- N. Circuit identification number listed on either circuit schedule or panel schedule shall be used to identify circuit, positioned as near as possible to end of each conductor on multiple single wire circuits and on cable jacket for multiconductor cables.
- O. Cable designations shall be visible after installation without requiring physical movement of cable.

## 2.07 CABLE TRAY

- A. Provide cable tray with arrangement shown on Drawings. Size as required.
- B. Construction:
1. Material: Roll-form structural steel in accordance with ASTM A570 or ASTM A611; hot-dip galvanized after fabrication in accordance with ASTM A386.
  2. Ladder-type with solid longitudinal side rails.
  3. Side rails: Nominally 4" high of either channel or I-beam shape.
  4. Edges: Finished smooth to prevent injury to cables.
- C. Tray shall meet NEMA 8C load/span designation (minimum).
- D. Internal bend radius 30" wide tray: 36".

- E. Provide supports, couplings, elbows, tees, dropouts, and other fittings required. Support assemblies shall support at least 200% of tray system allowable load.
- F. Supports: Trapeze-type, galvanized.
- G. Provide bolts, clamps, and other required mounting hardware.
- H. Standard: NEMA VE1.
- I. Manufacturer: Husky/Burndy, T.J. Cope, B-Line Systems.

## 2.08 CONDUIT

- A. Conduit within control buildings shall be Type EMT or rigid galvanized steel (RGS).
- B. Conduit shall be neatly installed in accordance with NEC Article 348.
- C. Rigid galvanized conduit terminating in a wireway shall have plastic bushings installed on threaded ends.

## 2.09 WIREWAY

- A. Provide wireways with hinged covers. Wireway shall extend around building perimeter and shall be mounted at junction of walls and ceiling. Wireway shall contain interior building wiring.
- B. Description: NEMA 1; minimum 16-gage steel with baked enamel finish, screw-fastened hinged cover with captive screws.
- C. Provide supports, closure plates, and other fittings required.
- D. Standard: UL 870.
- E. Manufacturer: Square D, Hoffman Engineering Co.

## 2.10 ELECTRICAL ENCLOSURES

- A. Size junction boxes, pull boxes, and enclosures in accordance with requirements of NEC. Junction boxes and pull boxes 4" (100 mm) trade size or smaller in any dimension shall be galvanized malleable iron, or cast ferrous metal NEMA rated for installed location. Do not use concentric knockouts.
- B. Junction boxes, pull boxes, and electrical enclosures 4" (100 mm) trade size and larger in any dimension shall be as follows, unless required otherwise.
  1. NEMA rating for electrical enclosures installed in nonhazardous locations:
    - a. Indoor:
      - 1) Dry environmentally controlled area: NEMA 12.
      - 2) Noncorrosive wet or hose-down area: NEMA 4.
      - 3) Corrosive wet or hose-down area: NEMA 4X
    - b. Outdoor:
      - 1) Corrosive area: NEMA 4X.
      - 2) Noncorrosive area hose-down or spray area: NEMA 4.
      - 3) Noncorrosive area nonhose-down area NEMA 3R.
  2. Construct noncast-metal electrical enclosures from reinforced steel plate capable of supporting devices mounted on or within enclosure without deflection. Steel plate thickness shall conform to UL requirements.
  3. Enclosures shall be of adequate strength to support mounted components during shipment and installation.

4. Conduit entrances shall be field drilled.
5. Electrical enclosures located in outdoor, wet, or hose down areas shall be provided with space heaters. Provide space heaters completely wired within enclosure. Provide following:
  - a. Space heater.
  - b. Adjustable thermostat with set point temperature indicator.
  - c. One miniature circuit breaker protective device.
  - d. Space heaters, thermostat, and protection shall not interfere with cable into or out of enclosure, or with maintenance or replacement of devices within enclosure.
  - e. Use of space heaters shall not change or discolor any painted surface.
  - f. Space heater capacity shall maintain enclosure internal temperature above dew point under specified service conditions.
  - g. Space heaters shall be rated for 240 volts ac minimum, and shall be sized for operation on applied voltage of 120 volts ac.

C. Outdoor electrical enclosures with ventilating openings:

1. Louver on outdoor electrical equipment and protect in accordance with NEMA type.
2. Equip openings on outdoor electrical equipment with fine mesh filters and stainless steel bug screens.

## 2.11 OUTLET BOXES

- A. Outlet boxes for concealed wiring systems shall be sheet metal, galvanized or cadmium plated.
- B. Boxes shall be minimum 4" (100 mm) square, 1-1/2" (38 mm) deep, sized to accommodate devices and number of conductors in accordance with NEC. Equip with plaster ring or cover as necessary for flush finish.
- C. Exposed conduit systems shall have surface-mounted boxes unless specified otherwise. Boxes for exposed wiring in nonhazardous, noncorrosive, and nonweatherproof locations shall be malleable iron, cadmium finish or cast aluminum alloy, minimum 4" (100 mm) square, 1-1/2" (38 mm) deep.
- D. Enclosures shall be as required for areas in which they are installed and as specified.
  1. Boxes shall be installed flush in masonry construction and be designed for intended use.
  2. Recessed boxes where fixture will be mounted shall be minimum 4" (100 mm) and octagonal in shape or 4" (100 mm) square by 1-1/2" (38 mm) deep with round plaster ring. Where used as junction box, boxes shall be minimum 4" (100 mm) square by 2-1/8" (53 mm) deep.
  3. Outlet boxes for wall concealed telephone and signaling systems shall be 4" (100 mm) square by 1-1/2" (38 mm) deep, minimum. Furnish with plaster ring and cover plate.
  4. Floor boxes for floor outlets shall be cast-metal with threaded conduit entrances, brass flange ring and brass duplex flap cover plate. Boxes shall be watertight and have leveling and adjustment screws for adjusting cover plate to finished floor. Boxes shall be minimum 4" (100 mm) diameter and 3-1/2" (88 mm) deep with approved gasket or seal between adjusting ring and box.
  5. Floor outlets for combination signaling, data, and power outlets shall be constructed of steel base, PVC housing, and steel bracket to allow feed through wiring as well as activation load-bearing support. Box construction shall meet UL 514A requirements.
    - a. Entire housing shall be removable for unrestricted access.
    - b. Once assembled, PVC housing shall be capable of carrying 6,000 lb load.
    - c. Coordinate outlet requirements with communication system requirements.
  6. Floor boxes in 2-hour rated floors shall be secured in cored hole and shall be UL classified and listed for 2-hour rated floors.

## 2.12 PULL AND JUNCTION BOXES

- A. Furnish junction boxes and pull boxes where shown on Drawings, and where necessary to facilitate pulling wires and cables without damage.

- B. Above ground boxes shall be formed from sheet steel, with corners folded in and securely welded with inward flange on each of 4 edges.
- C. Drill box for mounting and attachment of cover; galvanize after fabrication.
- D. Cover shall be made of one-piece galvanized steel and provided with stainless steel round head machine screws.
- E. Box and cover shall be made of code gage steel, or heavier if shown on Drawings.
- F. Boxes shall be minimum 4-1/2" (100 mm) deep. Size shall be in accordance with NEC. Use next larger standard size when necessary in accordance with manufacturer standard sizes.
- G. Pull and junction boxes shall be furnished without knockouts for field drilling.
- H. Enclosures shall be as required for areas in which installed and in accordance with requirements specified.
- I. Underground boxes shall be specifically designed and constructed for intended installed location, and shall be either pre-formed concrete or PVC. Covers shall be capable of withstanding, without failure, type of traffic in general area.
- J. If pull and junction boxes are exposed in and around architecturally finished surfaces, paint box to match finish of nearby surfaces, unless indicated otherwise.
- K. Bolt-on junction box covers 3'-0" square or larger, or heavier than 25 lb. shall have permanent rigid handles. Covers larger than 3'-0" x 4'-0" shall be split.

#### 2.13 EQUIPMENT SAFETY GROUNDING

- A. Install exposed raceway electrically continuous. Conduit and tray shall not be considered to be the only ground conductor.
- B. Furnish equipment that is part of integral shipping unit or assembly with bare copper ground conductor extending to central ground connection lug. Lug shall be suitable for field connection to local ground. Electrical equipment shall be considered any device that is energized.
- C. Single-point ground connections required for proper operation of electronic equipment shall be insulated from equipment safety ground. Such connections shall be extended, using insulated cable, to single insulated termination point suitable for field connection to appropriate ground system.
- D. Conduits that contain power circuits shall have ground conductor installed inside conduit. Ground conductor shall be bonded to equipment or tray or duct ground at both ends.
- E. Provide ground bushing on each conduit containing power circuit. Connect ground bushings together inside enclosure and to enclosure ground lug or ground bus.
  - 1. Use No. 8 AWG conductor for ground bushings trade size 1-1/2" (38 mm) and smaller.
  - 2. Ground bushings larger than 1-1/2" (38 mm) shall be sized in accordance with requirements of NEC, but in no case shall they be smaller than No. 8 AWG.
- F. Ground conductor: Uninsulated, Class B standard, round soft drawn uncoated copper as defined in ICEA S-19-81, unless specified otherwise.
- G. Hardware: Clamps, bolts, washers, nuts, and other hardware used with grounding conductor shall be copper, copper alloy, high copper alloy, or silicon bronze.

## 2.14 PIN AND SOCKET CONNECTORS

- A. Unless shown on Drawings, not allowed.

## 2.15 LOCAL SEPARATE DISCONNECT SWITCHES

- A. Three-pole, nonfuseable, heavy-duty, rated 600-volt with continuous current rating as shown on Drawings and as required by load.
  - 1. Type: Either molded-case or blade.
  - 2. Switches shall use high-conductivity copper for current carrying parts.
- B. Switches shall be positive, quick-make, and quick-break mechanisms.
  - 1. Switch assembly plus operating handle shall be integral part of enclosure base.
  - 2. Each switch shall have handle whose position is easily recognizable and which can be locked in "On" and "Off" position with 3 padlocks. "On" and "Off" positions shall be clearly marked.
- C. Switches shall be UL-listed and horsepower rated. Where applicable, switches shall have defeatable door interlocks that prevent door from being opened while operating handle is in "On" position.

## 2.16 PLATES AND COVERS

- A. Provide finish plates and covers of appropriate type and size for wiring and control devices, signal, and communication outlets.
- B. Mark each plate and cover to show circuit and panel designation. Unless indicated to be engraved plate, use self-sticking, clear membrane, UV-resistant labels with typed black letters. Handwritten labels not allowed.
- C. Coordinate color with adjacent surfaces.
- D. Raised cover galvanized steel plates shall be acceptable for use on surface-mounted outlet boxes in unfinished areas where weatherproof plates are not required.
- E. For weatherproof installations, cover plates shall be gasketed and rated for NEMA Type 4 installation.
- F. Device plate mounting hardware shall be countersunk and finished to match plate.

## 2.17 WIRING DEVICES

- A. Where more than one flush device is indicated in same location, mount devices in gangs under common plate.
- B. Switches for control of ac lighting panel load circuits, single-pole, 3-way, and 4-way, shall be premium, heavy-duty specification-grade, and meet FS W-S-896E. Switches shall be rated for use at 120 or 277 volts and 20 amperes minimum.
- C. Device color, if not shown on Drawings, shall be coordinated to match adjacent finishes.
- D. Wall switches requiring pilot light indication shall have red LED pilot light when toggled "On."
- E. Pulse control of lighting contactors shall be 20 amperes, 120/277 volts, momentary, double-throw, and center "Off."
- F. Standard convenience outlets: Premium, heavy-duty, specification-grade, duplex, 3-wire, grounding, 20-ampere, 125-volt for 120-volt circuits, and rated 250-volts for 240 or 208-volt circuits.

- G. Ground fault circuit interrupter (GFI) receptacles: Duplex, 20-ampere, and 125 volts, feed-through type.
- H. Isolated ground (IG) outlets: Duplex, 3-wire, with isolated grounding terminal, 20-ampere, and 125 volts. Outlets shall be orange in color, unless specified otherwise.

## 2.18 WELDING

- A. If special welding requirements are required for any piece of equipment during installation, requirements shall be stated on manufacturer's shop drawing of affected part.
- B. Furnish detailed welding requirements with equipment shipment.

## 2.19 WIRING INTERFACE PANELS

- A. Provide wiring interface panels as shown on control building layout drawings to provide an interface point for external cable connections including power, control, and fiber optics.
- B. Wiring interface panels shall be 12" minimum depth and shall extend upward to include cable tray.
- C. Cables entering wiring interface panels from the field will enter from the bottom from a manhole or cable vault. Cable trays shall extend upward to terminal blocks to support cables entering building.
- D. Wiring interface panels shall be provided with doors that provide full access to the interior of the panel.
- E. Wiring interface panels shall be the same color as the control building.
- F. Terminal blocks:
  - 1. Terminal blocks for connection of control cables shall be readily accessible. Terminal blocks should face the doors of individual panel to provide ease of connection of control cables in field.
  - 2. Washer-head connecting screw type; Marathon 1500 Series, or equal; mount terminal blocks on vertical surfaces; provide legible, permanent marking on terminals; plug-in or stab-type terminal blocks not acceptable. Current transformer secondary leads shall be terminated on short-circuiting type terminal blocks.
- G. Final size of wiring interface panels and quantity of terminal blocks will be provided by Engineer during the detailed design phase. Minimum terminations equal to one-half of Contractor's listed field terminations plus a minimum of 20% spare terminals interspersed with wire terminals and out-going terminal blocks.

## 2.20 NAMEPLATES

- A. Nameplates shall meet the following requirements.
- B. Material: Black plastic engraving stock, 1/16" thick with white core.
- C. Lettering: Engraved approximately 3/16" high.
- D. Wording:
  - 1. Furnished by manufacturer after award of Contract for Engineer review.
  - 2. Test switch nameplates to specify each switch designation.
- E. Locations. Unique nameplates shall be furnished for all equipment, panels, and devices at each of the following locations as a minimum (not all-inclusive list):
  - 1. Front and rear each unit.
  - 2. Each exterior door.

3. Each piece of equipment.
4. Each panel.
5. Each wiring interface panel.

## 2.21 SOURCE QUALITY CONTROL

- A. After assembly of building, perform following tests, as applicable, to ensure proper functioning assemblies will be shipped to construction site:
  1. Wet spray test at joints, doors, etc., for water leaks.
  2. Continuity and/or functional checks of electrical devices and wiring installed.
  3. Check conduit and/or cable tray installation.
  4. Check ac and dc panels to ensure circuits are appropriately identified and operational.
  5. Ensure raceway covers are tightly secured in place.
  6. Check to lighting fixtures and photocell are firmly mounted and operational.
  7. Verify operation of HVAC system installed.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Verify site conditions.

### 3.02 PREPARATION

- A. Interior and exterior of equipment shall be cleaned prior to placing into service. Debris shall be removed and appropriately discarded.

### 3.03 INSTALLATION

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

END OF SECTION

- 1) Grant P. Askren
- 2) Philip E. Schulz

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

- A. General electrical requirements for equipment and services including, but not limited to:
  1. Factory wiring.
  2. Low voltage cabinets and electrical enclosures.
  3. Equipment safety grounding.
  4. Low voltage fuses and fuse blocks.
  5. Control relays and switches.
  6. Pushbuttons.
  7. Indicating lights.
  8. Alarm and trip contacts.
  9. Packaging, identification, and tagging.
  10. Nameplates.
  11. Grounding and bonding.

### 1.02 INFORMATIONALSUBMITTALS

- A. Submit with Bid: Description of manufacturer's standard factory test procedure for logic systems.
- B. Product Data:
  1. List of proposed material identifying manufacturer, type and model number for equipment to be provided for complete job.
  2. Manufacturer's catalog sheets marked to indicate specific type, model or catalog number of equipment to be provided.
  3. Equipment drawings, elementary diagrams, schematics, wiring, performance curves, instruction manuals, and all other documentation necessary for complete description of material being supplied and as required to support installation, commissioning and maintenance of equipment. Manufacturer's standard connection diagram or schematic showing more than one scheme of connection will not be accepted.
  4. Manufacturer's technical descriptions, product data sheets, and applicable manuals for use in protective device system coordination including:
    - a. Fuse manufacturer, type, ratings, and protection curves.
    - b. Circuit breaker manufacturer, type, trip setting ranges, and protection curves.
    - c. Relay trip device ranges, curves, and setting manuals.
    - d. Transformer damage curves.
    - e. CT ratios and saturation curves.
    - f. VT ratings.
  5. List of recommended spare parts required for equipment start-up, commissioning and operation.
  6. List of special maintenance tools required for installation and operation of equipment.
  7. If necessary, provide additional data to clearly demonstrate that proposed alternate equipment meets or exceeds equipment as specified.
  8. When requested by Engineer, submit system information, including but not limited to, utility feeders, existing relays, circuit breakers, fuses, and transformers.

### 1.03 CLOSEOUT SUBMITTALS

- A. Operation and maintenance manuals. Provide at minimum:
  1. Itemized equipment list.
  2. General description and technical data.
  3. Receiving, storage, installation, and testing instructions.
  4. Operating and maintenance procedures.
  5. Complete set of final drawings requiring no further action.
  6. Complete documentation of inspections and tests performed, including logs, curves, and certificates. Documentation shall note any replacement of equipment or components that failed during testing.
  7. Spare parts list.



8. Lubrication recommendations.
9. Warranty information.

#### 1.04 MAINTENANCE MATERIALS

- A. Extra materials: Provide touchup paint in same type and color to repair at least 25% of finish-painted equipment surface. Paint shall be sufficient to perform touch-up painting in accordance with shop-applied material instructions for repair painting.
- B. Each piece of equipment shall be furnished with special tools as required for installation, maintenance, and dismantling of equipment.
  1. Furnish in quantities as necessary to complete work on schedule.
  2. Tools shall be new and shall become property of Owner.
  3. Tools and intended use shall be identified in assembly instructions. Tools shall only be used for their intended purpose.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer qualifications:
  1. Manufacturer of equipment specified shall be recognized in industry for normally supplying this type of equipment.
  2. Manufacturer shall be ISO certified.
  3. When requested by Engineer, provide list of similar equipment installations that have employed identical equipment from manufacturer.
- B. Installer qualifications:
  1. Installer shall be skilled in trade and shall have thorough knowledge of products and equipment specified.
  2. Cutting, drilling, trenching, or channeling necessary to properly install equipment shall be performed by competent skilled crafts people in safe, professional manner.
- C. Regulatory requirements: Perform electrical construction in accordance with NEC, local and state codes as applicable to job site.
- D. Materials and equipment furnished for permanent installation shall be new, unused, and undamaged.
- E. Asbestos not allowed.
- F. Parts shall be manufactured to American industry standard sizes and gages to facilitate maintenance and interchangeability. Metric sized components not allowed unless specifically requested and approved.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Pack, ship, handle, and store in accordance with manufacturer's requirements.
- B. Ship equipment completely factory assembled unless physical size, arrangement, configuration, or shipping and handling limitations make this impracticable. Shipping splits and required field assembly shall be identified with equipment submittals.
- C. Costs associated with sections, accessories, or appurtenances requiring field assembly shall be Contractor's responsibility.
- D. Separately packaged parts and accessories shall be consolidated and shipped together with equipment. Mark each container clearly to identify contents and as belonging with main equipment.
  1. Provide individual weatherproof itemized packing slips attached to outside of each container for contents included. Provide duplicate inside each container.

2. Attach master packing list, covering accessory items for equipment, to main piece of equipment.
  3. Mark each container with project identification number for equipment and container number followed by total number of containers.
- E. Equipment shall be suitably protected during shipment, handling, and storage. Damage incurred during shipment shall be repaired at no cost to Owner.
- F. Protect coated surfaces against impact, abrasion, and discoloration.
- G. Electrical equipment and insulation systems shall be protected against ingress of moisture. Use space heaters if necessary to protect against moisture.
- H. Exposed threads shall be greased and protected.
- I. Pipe, tube, and conduit connections shall be closed with rough usage plugs. Seal and tape open ends of piping, tubing, and conduit.
- J. Equipment openings shall have covers, and taped to seal equipment.
- K. Store materials in clean, dry place. Protect from weather, dirt, water, construction debris, and physical damage in accordance with manufacturer's instructions.

#### 1.07 SCHEDULING

- A. Coordinate with Owner early and late shipping and delivery schedules for items requiring storage and handling at Site.

#### 1.08 WARRANTY

- A. Electrical equipment and components shall be provided with the same duration of warranty, as the overall equipment warranty.

### **PART 2 PRODUCTS**

#### 2.01 DESIGN CRITERIA

- A. Service conditions: Provide equipment and material suitable for intended service and installation at location indicated.
- B. Low-voltage auxiliary and control power.
1. Electrical power for ac control and instrumentation equipment:
    - a. Provide devices necessary for proper operation and protection of equipment during electrical power supply and ambient temperature fluctuations specified.
    - b. Design for continuous operation at any voltage from 85% to 110% of nominal voltage. Dropout voltage shall be 60% of nominal for relays and 75% for contactors and starters.
  2. Electrical power for dc devices:
    - a. Design for continuous operation on ungrounded station battery system, capable of maintaining operation at any voltage from 80% to 112% of nominal voltage.
    - b. Electrical devices served shall not impose ground connection on supply.
- C. Auxiliary power: Design auxiliary equipment for low voltage service, with electrical power designed to operate from one of nominal electrical power sources as follows and as indicated on Drawings:

Volts	Phase	Frequency
120/240	1	60
125	1	dc

## 2.02 FACTORY WIRING

- A. Select cable for electrical and environmental conditions of installation, and suitable for unusual service conditions where encountered.
  - 1. Proper temperature application cable shall be used throughout, but shall be not less than 90°C rated.
  - 2. Conductors routed over hinges shall use extra-flexible stranding.
  - 3. Cable insulation shall be rated for maximum service voltage used, but not less than 600 volts.
  - 4. Splices not allowed.
  
- B. Panel, control cabinet, switchboard, motor control center, and switchgear wiring shall use flame retardant cross-linked polyethylene (XLP) or flame retardant ethylene-propylene rubber (EPR) insulation that meet or exceed requirements of UL 44 for Types SIS, and XHHW.
  - 1. Minimum size: No. 12 AWG.
  - 2. Request tinned copper if used in certain corrosive type environments.
  - 3. Conductors: Annealed bare copper with fine stranding passing IEEE 1202 and UL VW-1 flame test.
  
- C. Instrumentation, thermocouple, and thermocouple extension wire shall use twisted shielded pairs/triads having flame retardant cross-linked polyethylene (XLPE) insulation, and chlorinated polyethylene (CPE) jacket.
  - 1. Minimum size: No. 16 AWG (1.0 mm<sup>2</sup>).
  - 2. Conductor type:
    - a. Instrument: Annealed copper Class B stranding.
    - b. Thermocouple: Solid alloy, ANSI MC 96.1.
  - 3. Provide each pair/triad with shield.
  - 4. Shielding shall consist of aluminum-polyester tape and flexible strand tin-coated No.18 AWG (0.75 mm<sup>2</sup>) copper drain wire.
  - 5. Drain wire for each instrument cable shall be insulated with spaghetti sleeve. One end of shield wire shall be terminated on grounded terminal.
  - 6. Cables shall pass IEEE 1202 and ICEA 70,000 Btu/hr vertical tray flame test, and each conductor shall pass UL VW-1 flame test.
  
- D. Terminations:
  - 1. Conductor terminal connectors shall be insulated, ring tongue, compression type connectors properly sized for conductor and terminal.
    - a. Connectors shall be constructed of copper and shall be tin-plated.
    - b. Interior surface of connector wire barrel shall be serrated; exterior surface of connector wire barrel shall be furnished with crimp guides.
    - c. Connectors shall be Panduit brand terminal connectors, no substitutions permitted.
  - 2. Uninsulated terminal connectors shall be used for conductors terminated on devices equipped with individual fitted covers, such as, but not limited to, control switches and lockout relays.
  - 3. Connections requiring disconnect plug and receptacle type devices shall be provided with factory-terminated conductors on each plug and receptacle.
    - a. Plugs and receptacles shall be factory wired into junction boxes containing terminal blocks for external connections.
    - b. Conductors on disconnect portion of plug-receptacle assemblies shall be in common jacket.
  - 4. Prior to shipment of equipment, remove temporary wiring installed in factory for equipment testing.
  - 5. Current transformers shall terminate on shorting type terminal blocks. Ship with shorting jumpers installed.
  
- E. Identification and labeling:
  - 1. Provide conductor identification sleeve on each end of each internal conductor. Mark each sleeve with opposite end destination identification with nonsmudging, permanent black ink. Sleeves shall be UV-resistant self-adhesive type or PVC, not less than 1/2" long.
  - 2. Permanently label each terminal block, terminal, conductor, relay, breaker, fuse block, and other auxiliary devices to coincide with identification indicated on manufacturer's drawings.

## 2.03 FIELD WIRING

- A. Nationally or internationally recognized cable manufacturer shall produce cable provided.
  - 1. Metal-clad cable, NEC Type MC, may not be substituted in place of cable and conduit unless specified otherwise, or unless approved in writing.
  - 2. Comply with code and Project requirements directly associated with use of each cable type.
- B. Cables specified are for voltages 600 volts and below.
- C. Wiring shall be annealed, bare copper with not less than 98% conductivity, unless specified otherwise.
- D. General-purpose building conductor used on interior lighting circuits and general-purpose branch circuits routed entirely in conduit shall be single conductor.
  - 1. Voltage rating: 600-volt.
  - 2. Conductor: Class B, solid or stranded, annealed, uncoated copper, minimum size No. 12 AWG (4.0mm<sup>2</sup>).
  - 3. Insulation: Polyvinyl chloride (PVC) complying with NEC for type THHN or THWN.
  - 4. Jacket: Overall clear nylon jacket applied over conductor insulation, UL-listed as gasoline and oil resistant.
  - 5. Cables shall pass IEEE 383 70,000 Btu/hr, UL Standard 83 for Type THHN or THWN wire.
  - 6. Color coding:
    - a. Provide conductor sizes No. 8 AWG and smaller in following colors:
      - 1) Source voltage of 120/240 volts:
        - a) Phase A: Black.
        - b) Phase B: Red.
        - c) Neutral: White.
      - b. Sizes No. 6 AWG and larger shall be black and color-coded with field-applied tape.
    - 7. Installations in dry or damp locations shall utilize THHN and installations in wet locations shall utilize THWN.
- E. Single-conductor, low-voltage power cable for motors, feeders, branch circuits, and dc circuits routed in conduit, duct bank, or cable tray:
  - 1. Voltage rating: 600-volt.
  - 2. Conductor: Annealed, bare copper, Class B, stranded, minimum size No. 12 AWG (4.0mm<sup>2</sup>).
  - 3. Insulation: Cross-linked polyethylene (XLPE), complying with NEC Type XHHW-2. Insulation shall be sunlight resistant and cable tray (CT) rated.
  - 4. Jacket: None.
  - 5. Color coding: Black.
  - 6. Wire shall be identified by surface marking indicating manufacturer, conductor size, conductor material, voltage rating, UL symbol, and listed type.
  - 7. Cables shall pass IEEE 383 70,000 Btu/hr, ICEA T-29-520, 210,000 Btu/hr vertical tray flame tests, and UL 1581, VW-1 vertical flame test.
  - 8. Temperature rating: 90° C for normal operation in wet or dry locations.
- F. Multiconductor, low-voltage power cables for motors, feeders, and branch circuits routed in cable tray, conduit or duct bank:
  - 1. Voltage rating: 600-volt.
  - 2. Conductors: Annealed, bare copper, Class B, stranded, minimum size No. 12 AWG (4.0mm<sup>2</sup>).
  - 3. Insulation: Cross-linked polyethylene (XLPE) complying with NEC Type XHHW-2.
  - 4. Jacket: Flame-retardant, heat, moisture, and sunlight-resistant; polyvinyl chloride (PVC).
  - 5. Color coding: Insulated phase conductors shall be black and shall have printed numbers in accordance with ICEA Method 4. Each cable shall be identified by means of surface ink printing indicating manufacturer, number of conductors, size, metal, voltage rating, and UL listing as suitable for cable tray use.
  - 6. Phase conductors shall be cabled together with Class B stranded, bare copper grounding conductor and fillers. Ground wire size shall comply with requirements of UL 1277.
  - 7. Cover cable assembly with helically applied polyester binder tape with minimum 10% overlap.

8. Cables shall pass IEEE 383 70,000 Btu/hr, and ICEA T-29-520, 210,000 Btu/hr vertical tray flame test.
  9. Temperature rating: 90° C for normal operation in wet or dry locations.
- G. Multiconductor cable for control, interlocks, current transformers (CTs), voltage transformers (VTs), routed in cable tray and conduit:
1. Voltage rating: 600-volt.
  2. Conductors: Annealed, bare copper, Class B, stranded, CT minimum size No. 10 AWG (6.0mm<sup>2</sup>), VT minimum size No. 12 AWG (4.0mm<sup>2</sup>).
  3. Insulation: Flame-retardant, cross-linked polyethylene (XLPE) or complying with NEC Type XHHW-2.
  4. Jacket: Flame-retardant, heat, moisture, and sunlight-resistant; polyvinyl chloride (PVC).
  5. Conductors shall be cabled together with nonhygroscopic fillers.
  6. Cover cable assembly with helically applied binding tape with minimum 10% overlap.
  7. Color coding: Insulated conductors shall have colored insulation meeting ICEA Method 1, Table E-2 color code (K2 color code).
  8. Each cable shall be identified by means of surface ink printing indicating manufacturer, number of conductors, size, voltage rating, and UL listing as rated for cable tray.
  9. Cables shall pass IEEE 383 70,000 Btu/hr, and ICEA T-29-520, 210,000 Btu/hr vertical tray flame tests.
  10. Temperature rating: 90° C for normal operation in wet or dry locations.
- H. Instrumentation cable installed indoor or outdoor routed in cable tray, conduit, and ducts:
1. Voltage rating: 300-volt.
  2. Conductors: Annealed, bare copper, Class B, stranded, minimum size No. 16 AWG (1.0 mm<sup>2</sup>).
  3. Insulation: Flame-retardant polyvinyl chloride (PVC).
  4. Jacket: Flame-retardant, heat, moisture, and sunlight resistant; polyvinyl chloride (PVC).
  5. Pairs/triads: Each twisted with lay not exceeding 2" (50 mm).
  6. Color code: Insulated conductors shall have colored insulation meeting ICEA Method 1, Table E-2 color code (K2 color code): Pairs black/red; Triads black/red/blue.
  7. Assembly:
    - a. Each pair or triad shall be cabled together with aluminum/polyester tape shield helically wrapped with minimum lap of 15% of tape width and isolation tape. Entire cable assembly shall have overall aluminum/polyester tape shield helically wrapped.
    - b. Flexible strand tin-coated No.18 AWG (0.75 mm<sup>2</sup>) copper drain wire shall be helically wound between twisted conductors and tape shield.
  8. Each instrumentation cable shall be identified by means of surface ink printing indicating manufacturer, conductor size, and quantity, UL listing.
  9. Cables shall pass UL 1581, 70,000 Btu/hr flame test.

## 2.04 ELECTRICAL ENCLOSURES

- A. Size junction boxes, pull boxes, and enclosures in accordance with requirements of NEC.
- B. Junction boxes and pull boxes 4" (100 mm) trade size or smaller in any dimension shall be galvanized malleable iron, or cast ferrous metal NEMA rated for installed location. Do not use concentric knockouts.
- C. Junction boxes, pull boxes, and electrical enclosures larger than 4" (100 mm) trade size in any dimension shall be as follows, unless required otherwise.
  1. NEMA rating for electrical enclosures installed in nonhazardous locations:
    - a. Indoor:
      - 1) Dry environmentally controlled area: NEMA 12.
      - 2) Noncorrosive wet or hose-down area: NEMA 4.
      - 3) Corrosive wet or hose-down area: NEMA 4X
    - b. Outdoor:
      - 1) Corrosive area: NEMA 4X.
      - 2) Noncorrosive area hose-down or spray area: NEMA 4.
      - 3) Noncorrosive area nonhose-down area NEMA 3R.

2. Construct noncast-metal electrical enclosures from reinforced steel plate capable of supporting devices mounted on or within enclosure without deflection. Steel plate thickness shall conform to UL requirements.
  3. Enclosures shall be of adequate strength to support mounted components during shipment and installation.
  4. Conduit entrances: Field drilled.
  5. Electrical enclosures located in outdoor, wet, or hose down areas shall be provided with space heaters. Provide space heaters completely wired within enclosure. Provide following:
    - a. Space heater.
    - b. Adjustable thermostat with set point temperature indicator.
    - c. One miniature circuit breaker protective device.
    - d. Space heaters, thermostat, and protection shall not interfere with cable into or out of enclosure, or with maintenance or replacement of devices within enclosure.
    - e. Use of space heaters shall not change or discolor any painted surface.
    - f. Space heater capacity shall maintain enclosure internal temperature above dew point under specified service conditions.
    - g. Space heaters: Rate for 240 volts ac minimum, and size for operation on applied voltage of 120 volts ac.
- D. Outdoor electrical enclosures with ventilating openings:
1. Louver on outdoor electrical equipment and protect in accordance with NEMA type.
  2. Equip openings on outdoor electrical equipment with fine mesh filters and stainless steel bug screens.

## 2.05 EQUIPMENT SAFETY GROUNDING

- A. Install exposed raceway electrically continuous. Conduit and tray shall not be considered to be only ground conductor.
- B. Furnish equipment that is part of integral shipping unit or assembly with bare copper ground conductor extending to central ground connection lug. Lug shall be suitable for field connection to local ground. Electrical equipment shall be considered any device that is energized.
- C. Single-point ground connections required for proper operation of electronic equipment shall be insulated from equipment safety ground. Such connections shall be extended, using insulated cable, to single insulated termination point suitable for field connection to appropriate ground system.
- D. Conduits containing power circuits shall have ground conductor installed inside conduit. Ground conductor shall be bonded to equipment or tray or duct ground at both ends.
- E. Provide ground bushing on each conduit containing power circuit. Connect ground bushings together inside enclosure and to enclosure ground lug or ground bus.
  1. Use No. 8 AWG conductor for ground bushings trade size 1-1/2" (38 mm) and smaller.
  2. Ground bushings larger than 1-1/2" (38 mm) shall be sized in accordance with requirements of NEC, but in no case shall bushings be smaller than No. 8 AWG.
- F. Ground conductor: Uninsulated, Class B standard, round soft drawn uncoated copper as defined in ICEA S-19-81, unless specified otherwise.
- G. Hardware: Clamps, bolts, washers, nuts, and other hardware used with grounding conductor shall be copper, copper alloy, high copper alloy, or silicon bronze.

## 2.06 PIN AND SOCKET CONNECTORS

- A. Unless shown on Drawings, not allowed.

## 2.07 FUSES AND FUSE BLOCKS

- A. Modular-type, Class H screw terminal fuse blocks with Bakelite frame and reinforced retaining clips. Blocks shall be similar in construction and by same manufacturer.
- B. Slow blow fuses: Bussmann Type MDL or Gould Shawmut Type GDL with ampere ratings of 1/4, 1/2, 1, or 2.
- C. Fast acting fuses: Bussmann Type NON or Gould Shawmut Type OT with ampere ratings of 1, 3, 6, 10, 15, 20, or 30.
- D. Extremely fast acting fuses: Bussmann Type KAB with ampere ratings of 1, 3, 6, 10, 15, 20, or 30.

## 2.08 CONTROL RELAYS

- A. General service, industrial grade auxiliary relays rated 600-volt.
- B. Contacts: Reversible from N.O. to N.C. in field.
- C. Timing relays for critical service: Agastat Series 7000.

## 2.09 CONTROL SWITCHES

- A. Multistage, rotary-type rated 120 volts ac or 125 volts dc, 3 amperes, as required.
- B. Handles: Black, fixed, modern, pistol grip type. Provide engraved black plastic escutcheon plates with targets.
- C. Provide with colored LED lamps and nameplates as required.

## 2.10 PUSHBUTTONS

- A. Standard pushbuttons: Heavy, industrial-type rated 120 volts ac or 125 volts dc, 3 amperes, as required.
- B. Provide with colored LED lamps and nameplates as required.

## 2.11 INDICATING LIGHTS

- A. Status indicating lights: High-intensity, cluster, LED-type for panel mounting.
- B. Coordinate indicating light colors with indicated conditions as follows. Indicating lights shall be energized when condition exists and shall be de-energized when condition does not exist:
  - 1. Red: Equipment energized: such as motor running, valve open, or breaker closed.
  - 2. Green: Equipment de-energized: such as motor stopped, valve closed, or breaker open.
  - 3. Amber: Equipment abnormality: such as motor trip, breaker trip, or relay trip.
  - 4. White: Monitoring of control power or trip coil: such as lockout relay trip coil monitor or breaker trip coil monitor. Light is on during normal circuit operation and off during loss of power or loss of coil.
  - 5. Blue: Loss of control power.

## 2.12 ALARM AND TRIP CONTACTS

- A. Alarm contacts for remote annunciation: Suitable for operation at 120 volts ac and 125 volts dc. Contacts shall be rated at least 0.5-ampere make and break, minimum.
- B. Alarm contacts: Normally closed contacts that open to alarm condition.
- C. Trip contacts for remote trip: Suitable for operation at 125 volts dc and rated 5 amperes make or break, minimum.

## 2.13 WIRING DEVICES

- A. Standard convenience outlets: Premium, heavy-duty, specification-grade, duplex, 3-wire, grounding, 20-ampere, 125-volt for 120-volt circuits, and rated 250-volts for 240 or 208-volt circuits.
- B. Ground fault circuit interrupter (GFI) receptacles: Duplex, 20-ampere, and 125 volts, feed-through type.
- C. Isolated ground (IG) outlets: Duplex, 3-wire, with isolated grounding terminal, 20-ampere, and 125 volts. Outlets shall be orange in color, unless specified otherwise.

## 2.14 IDENTIFICATION AND TAGGING

- A. Provide power, control, and instrumentation cables with permanent type identification markers with typed cable numbers and from/to information at each point of termination. Cable numbers and from/to information will be provided for circuits not associated with low-voltage panelboards.
  - 1. Position cable markers to be readily visible for inspection.
  - 2. Cable numbers shall match those as shown on Drawings.
  - 3. Provide wire tags at each termination point for each conductor. Tags shall be permanent, non-shrinkable type with typewritten information.

## 2.15 EQUIPMENT NAMEPLATES

- A. Laminated white-over-black plastic such that face is white with black letters, with 1/8" (3 mm) engraved letters securely fastened with minimum of 2 self-tapping, stainless steel screws.
- B. Nameplates shall meet requirements of NFPA 70E

## 2.16 HARDWARE

- A. Provide hardware including, but not limited to, anchor bolts, nuts, washers, expansion anchors, wire nuts needed for installation.



- B. Hardware smaller than 3/4" (19 mm) shall match NEMA standard size bolt holes on electrical equipment.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION OF SITE**

- A. Contractor shall be responsible for familiarity with Project Site conditions. Equipment furnished and installed shall be capable of withstanding most severe conditions that will be encountered.

#### **3.02 PROTECTION OF WORK**

- A. Protect installed Work and provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- B. Damage occurring to building or equipment during installation shall be repaired or replaced to conditions existing prior to damage at no additional cost or delay to project or Owner.

#### **3.03 INSTALLATION**

- A. Install equipment and materials in accordance with manufacturer's recommendations and Drawings.
- B. Details for equipment and systems installed in accordance with industry standard techniques will not be furnished.
- C. Installation details furnished on Drawings shall be followed unless found to be unsafe, inappropriate for equipment specified, or unachievable due to site conditions.
- D. Except as otherwise specified or indicated on Drawings, equipment shall be installed plumb, square, and level.
- E. Sheet metal junction boxes, equipment enclosures, sheet metal raceways, and similar items mounted on earth-bearing walls shall be separated from wall not less than 1/4" (6 mm) by corrosion-resistant spacers.
- F. Substations, switchgear, motor control centers, and similar equipment located outdoors shall be permanently sealed at base. Openings into equipment shall be screened or sealed as to prevent entrance of birds, rodents, and insects the size of wasps and mud daubers.
  - 1. Sealing material at base shall be concrete grout.
  - 2. Small cracks and openings shall be sealed from inside with silicone sealant.
  - 3. Large openings shall use galvanized screen mesh.

#### **3.04 CABLE**

- A. Prior to installation of each cable or cable group into assigned raceway, verify that raceway has been correctly sized.
  - 1. Where raceway is not indicated in circuit schedule or on Drawings, size in accordance with requirements of NEC.
  - 2. If raceway size indicated on Contract Documents is inadequate, notify Engineer.
- B. Replace cables pulled into wrong raceway or cut too short to rack and train.
- C. Do not reinstall cables installed in wrong raceway and removed. Discard cables unless inspected and accepted by Owner's Representative in writing.
- D. Carefully lay or pull circuits in cable tray so neither cables nor tray is damaged.

- E. Protect cables from dirt, water, oil, damaging chemicals, and from physical injury prior to, and during installation.
- F. Cables shall be cut sufficiently long to conform to contour of trays, with particular attention paid to vertical inside bends.
- G. Remove excessive slack so cables lie parallel to sides of trays.
- H. Multiple single-conductor power cables No. 1/0 AWG (50 mm<sup>2</sup>) or larger installed in cable tray that constitute single power circuit shall be grouped together in triplexed or quadruplexed arrangement. Maintain cable spacing to be 2.15 x O.D. of largest conductor in group or adjacent group.
- I. Multiconductor power cables No. 4/0 AWG (120 mm<sup>2</sup>) or larger installed in cable tray shall be installed in single layer with maintained spacing of not less than 1 cable diameter of largest cable.
- J. Fasten cables to cable tray with rated nylon ties to hold cables in place.
- K. Perform fishing and pulling with flexible round metal tape, CO<sub>2</sub> propelled polyethylene cord, nylon rope, or manila rope.
- L. Cable damage caused by improper pulling tension and excessive sidewall pressures shall be considered for any cable pulls that require use of mechanized cable pulling machine, whether installed underground or overhead.
  - 1. NEC requirements shall be used as guideline. Calculations shall be performed for duct bank runs over 300' (90 m), and for installations in conduit over 100' (30 m).
  - 2. Monitor pulling tension during installation of cable. Tension shall not exceed maximum recommended by cable manufacturer.
  - 3. To avoid damage from excessive sidewall pressure at bends, pulling tension shall not exceed cable manufacturer's recommendation.
  - 4. Pulling mechanisms, manual or power type, shall have rated capacity in tons legibly marked on mechanism.
  - 5. During installation, observer shall constantly watch dynamometer and record maximum tension achieved during pull.
    - a. If excessive strain develops, stop pulling operation at once. Determine difficulty and correct.
    - b. Provide records of dynamometer readings to Engineer.
    - c. Inform Owner prior to cable pulls.
  - 6. Do not use woven wire cable grips. Only use pulling eyes for pulling cables.
  - 7. As soon as cable is pulled into place, remove pulling eyes and reseal cable.
- M. Insert reliable nonfreezing type of swivel or swivel connection between pulling rope and eye to prevent twisting under strain.
- N. Only use lubricants as recommended by cable manufacturer. Water-based lubricants not allowed.
- O. Outside of each cable reel shall be carefully inspected. Remove protruding nails, fastenings, or other objects that might damage cable.
  - 1. Perform visual inspection for flaws, breaks, or abrasions in cable sheath as cable leaves reel. Pulling speed shall be slow enough to permit inspection.
  - 2. Damage to sheath or finish of cable shall be sufficient cause for rejecting cable.
  - 3. Cable damaged during installation shall be replaced at no expense to Owner.
- P. Permanent radius of each bend after cable installation shall be in accordance with manufacturer's recommendations.
- Q. Cable supports and securing devices shall have bearing surfaces located parallel to surfaces of cable sheath. Install to provide adequate support without deformation of cable jackets or insulation.
- R. Provide adequate cable end lengths. Properly install in junction boxes and manholes to avoid longitudinal strains and distorting pressures on cable at conduit bushings and duct end bells.

- S. Final inspection shall be made after cables are in place. Where supports, bushings, and end bells deform cable jacket, provide additional supports.
- T. Splices, joints, and connections shall be made only in accessible junction boxes in accordance with methods specified and instructions of cable manufacturer. Splices not allowed unless shown on Drawings.
- U. Rough-in wiring terminated in junction boxes shall have at least 8" (200 mm) of free conductor coiled in box for connection to equipment and receptacles.
- V. Circuit information for circuits originating from panelboards is indicated on panel schedules. Other circuits are identified on circuit schedule.
  - 1. Do not combine receptacle loads with lighting loads.
  - 2. Circuits fed from panelboards shall not be combined with circuits from circuit schedule.
- W. Panelboard circuits are indicated as individual runs. Circuits may be combined into common conduits in accordance with rules of NEC. Perform work associated with combining of circuits at no additional cost to Owner.

### 3.05 WIRING DEVICES, BOXES, AND FITTINGS

- A. Install galvanized or cadmium plated, threaded, malleable iron boxes and fittings in:
  - 1. Embedded in concrete walls, ceiling, and floors.
  - 2. Outdoor exposed faces of masonry walls.
  - 3. Locations where weatherproof cover is required by code or this specification.
- B. Install galvanized or cadmium plated sheet steel boxes in:
  - 1. Indoor exposed faces of masonry walls.
  - 2. Interior partition walls.
  - 3. Joist supported ceilings.
- C. Rigid PVC device boxes shall be installed in exposed nonmetallic conduit systems.
- D. Finish openings so standard sized cover plates can be used. Oversized plates not allowed.
- E. Mount wall switches 3'-6" (1050 mm) above finished floor or grade unless specified otherwise. After circuits are energized, test wall switches for proper operation.
- F. Outlets:
  - 1. Standard mounting height: 18" (450 mm) above finished floor, unless specified otherwise.
  - 2. After circuits are energized, test each receptacle for correct polarity.
  - 3. Test GFCI receptacles for proper operation.
  - 4. Mount wall thermostats 5'-6" (1650 mm) above finished floor unless noted otherwise. Thermostats mounted shall be suitably insulated from wall temperatures.
- G. Communication outlets:
  - 1. 18" (450 mm) above finished floor unless required otherwise.
  - 2. Outlets outdoors, garages, basements, shops, storerooms, and rooms where equipment may be hosed down: 4'-0" (1200 mm) above floor.

### 3.06 GROUNDING AND BONDING

- A. Electrical system and equipment grounding shall be installed in accordance with NEC and shall conform to following, where applicable:
  - 1. Ground conductors shall be bare or green-insulated in accordance with NEC.
  - 2. Cable shall be soft-drawn copper or copper bar, sized in accordance with drawings and NEC, but not smaller than No. 12 AWG.

### 3.07 STARTUP AND TESTING

- A. Clean equipment interiors and exteriors prior to start-up and testing.
- B. Unless specified otherwise, tests performed shall be standard tests listed by ANSI/IEEE for intended equipment.
- C. Equipment shall be checked and placed in service ready for operation.
- D. Circuits shall be electrically tested after installation. Test power and motor circuits prior to final connection to equipment. Splices shall be complete prior to testing.
  - 1. Provide equipment and labor required for testing.
  - 2. Circuit failing to test satisfactorily shall be replaced or repaired, and retested at no additional cost to Owner.
  - 3. Check power and motor circuits, dc power, and control circuits for:
    - a. Correct terminations.
    - b. Continuity.
    - c. Unintentional shorts and grounds.
  - 4. Check power conductors for correct phasing.
  - 5. Motor circuits shall be checked for proper rotation and motors "bumped" to verify correct machine rotation.
  - 6. Control, instrumentation, and thermocouple wire shall be checked for correct termination, continuity, freedom from shorts or grounds, and identification.
  - 7. Current transformer wiring shall be loop checked by injecting current at one end of loop and checking with clip-on ammeter at each field termination point to assure continuity and phase identification.
  - 8. Voltage transformer wiring shall be tested by applying voltage at one point and checking with voltmeter phase rotation meter and phase angle meter at each field termination point to assure continuity, identification and phase shift.

### 3.08 DEMONSTRATION

- A. Final start-up and check out shall be completed prior to Owner acceptance of project.
- B. Electrical installation shall be complete in every detail and capable of normal operation in presence of Owner or Owner's Representative to verify its readiness.

END OF SECTION

- 1) Philip E. Schulz
- 2) Seth G. Weiss

## **PART 1 GENERAL**

### 1.01 SECTION INCLUDES

- A. Medium-voltage, metal-clad switchgear and accessories, rated 27 kV and below.

### 1.02 WORK BY OTHERS

- A. External power, control, and grounding terminations.

### 1.03 INFORMATIONAL SUBMITTALS

- A. Submit with Bid:
  - 1. Completed Data Sheets.
  - 2. Preliminary outline drawings of switchgear including, but not limited to:
    - a. Approximate dimensions of complete line-up.
    - b. Maximum achievable shipping split sections with dimensions.
    - c. Weight of complete line-up.
    - d. Weight of each shipping section.
  - 3. List of proposed equipment including model numbers, description of breakers, current transformers, voltage transformers, fuses, relays, control switches, and other devices.
  - 4. Information as defined in ANSI C37.12.
  - 5. List of special equipment required for operation and maintenance of switchgear.
  - 6. List of recommended "start-up" and "running" spare parts with prices.
  - 7. List of items requiring field assembly.
  - 8. Recommended long term and short-term storage requirements, and procedures.
  - 9. Copies of warranties.
  - 10. Geographical location of switchgear and breaker manufacturing facilities.
  - 11. Manufacturing schedule.
  - 12. Nearest geographical location of field service personnel.
  - 13. For arc-resistant switchgear, copies of type tests to meet IEEE C37.20.7.
  - 14. For arc-resistant switchgear typical information on size and type of arc relief ducting, including typical support information.
- B. Product Data: Complete instruction manuals and software for protective relays, metering equipment, instrumentation.
- C. Quality assurance data:
  - 1. Certified shop test reports.
  - 2. Proposed test schedules.

### 1.04 ACTION SUBMITTALS

- A. Shop Drawings:
  - 1. Complete and accurate Data Sheets.
  - 2. Certified outline and general arrangement drawing including front view, dimensions, floor plan, weight (shipping and installed), anchor locations, lifting points, center of gravity, enclosure construction, layout of accessories and shipping sections. For arc-resistant switchgear, provide certified drawings showing arc chute routing, type of material, supports, venting and signage.
  - 3. Certified drawings of cable termination compartments showing preferred locations for conduit entry/exit locations and indicating space available for cable terminations.
  - 4. Nameplate drawing.
  - 5. Nameplate schedule prior to fabricating nameplates.
  - 6. Mimic diagram prior to fabrication
  - 7. Support details.
  - 8. Equipment heat loss (Watts). Elementary 3-line diagrams for switchgear, showing voltage transformer and current transformer primary and secondary circuits. Terminal block terminations,

device terminal numbers, and internal diagrams shall be shown in detail. Typical drawings are not acceptable.

9. Breaker and relay schematic control diagrams. Provide specific schematic diagram for each breaker. Typical drawings not acceptable.
10. Complete wiring diagrams showing connections of component devices and equipment.

B. Product Data:

1. Complete Bill of Materials.
2. Interface coordination details.
3. Information to be furnished as defined in ANSI C37.12.

C. Quality assurance data:

1. Inspection and factory testing schedule.
2. Current transformer saturation, excitation and ratio correction factor curves.
3. Certified copies of factory final test reports.

#### 1.05 CLOSEOUT SUBMITTALS

A. Operation and maintenance manuals. Provide at a minimum:

1. General description and technical data, including actual weights and dimensions.
2. List of instruments and accessories supplied, listing manufacturer, model number, operating ranges, and equipment tag numbers.
3. Receiving, storage, installation, handling, and testing instructions.
4. Operating and maintenance procedures.
5. Complete set of reviewed drawings that require no further action.
6. Data Sheets modified to include field installation conditions.
7. Complete documentation of inspections and tests performed, including logs, curves, and certificates. Documentation shall note any replacement of equipment or components that failed during testing.
8. Recommended spare parts list, including circuit breakers.
9. Bill of Materials including nameplate information and shop order numbers for each item of equipment furnished.
10. Material Safety Data Sheets.
11. Instruction manuals including detailed erection sequence and procedures.

#### 1.06 MAINTENANCE MATERIALS

A. Provide complete set of special tools required for installation of equipment.

B. Tools and their intended use shall be detailed in manufacturer's assembly instructions.

#### 1.07 QUALITY ASSURANCE

A. Qualifications: Manufacturer shall have produced similar equipment for minimum period of 10 years.

B. Regulatory requirements:

1. Metal-clad switchgear and related components shall be designed, manufactured, and tested in accordance with latest applicable standards of NEMA SG-4, NEMA SG-5, ANSI/IEEE C37.09, ANSI/IEEE C37.12 and ANSI/IEEE C37.20.2.
2. For arc-resistant switchgear, standard ANSI/IEEE C37.20.7 applies in addition to above.
3. Equipment manufactured and tested to other standards shall not be used without written approval from Engineer.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with manufacturers' recommendations.

B. Coordinate transportation with requirements of pertinent authorities.

- C. Ship switchgear for installation as completely assembled as practicable. Where switchgear is installed in separate building ship enclosure as complete as practicable with switchgear and components installed inside for ease of installation in field. If shipping splits are required, connections between splits for enclosure circuits and switchgear splits shall be clearly identified; junction and terminal boxes shall be provided at each connection point.
- D. Prepare detailed packing lists and shipping notification.
- E. Cover equipment and accessories and protected from damage during shipment. Materials used for shipping shall be acceptable for protecting equipment when manufacturer's recommended storage procedures are maintained.
- F. Power circuit breakers shall be shipped and packaged separately from switchgear structure.

#### 1.09 TEMPORARY POWER

- A. Space heaters shall be connected to temporary source of power; capable of being monitored.
- B. Maintain temporary power until switchgear is installed and normal power source is permanently energized.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. ABB.
- B. AZZ.
- C. Eaton Cutler-Hammer.
- D. Powell Electric.
- E. Siemens.
- F. Square D.

#### 2.02 SYSTEM DESCRIPTION

- A. Switchgear shall be a complete, coordinated factory assembly ready for installation, connection, and designed for operation at site ambient temperatures and elevations. Switchgear shall include instruments and equipment as specified herein and detailed on Data Sheets and Drawings.
- B. Attached Data Sheets specify major components and accessories to be provided. Data Sheets do not provide complete parts list or Bill of Materials for scope of work.
- C. When one-line drawings, control schematics and layout drawings are furnished with specifications, drawings are preliminary and intended as an aid in understanding scope of equipment to be provided, unless specifically noted otherwise.
- D. If arc-resistant gear is specified, manufacturer will provide complete and coordinated arc chute plenum design including supports and vents. This shall include routing of arc chute to vent location as coordinated with Engineer.
- E. If arrangement has been furnished, and detailed engineering design by manufacturer requires rearrangement, coordinate new arrangement with Engineer prior to Bid or Drawing submittal.
- F. If arrangement changes after award of Contract, submit Drawings reflecting actual scope of work and configuration.

## 2.03 ENCLOSURE

- A. Switchgear assembly shall consist of individual free-standing vertical sections to form a rigid, metal-clad switchgear assembly.
- B. Vertical sections shall have metal side sheets of minimum 12-gage steel.
- C. Solid removable metal barriers shall isolate major primary sections.
- D. Provide safety shutter between bus compartment and breaker cubicle, which will close automatically when circuit breaker is disconnected from bus and removed from connected position.
- E. Metal work shall be free from burrs and sharp edges.
- F. Expandability:
  - 1. Switchgear shall be capable of future expansion as specified on Data Sheet without modification to existing switchgear structural members or bus work.
  - 2. Documentation shall provide adequate information for design of future extensions.
- G. Operating height for unit disconnects and other operable controls shall not be more than 6'-6" (2 m) above finished floor.
- H. Switchgear enclosure rating: As specified on Data Sheets.
- I. Gaskets shall be provided to seal doors, and filters shall be provided on all louvers to impede entrance of dust, and falling dirt. Filters shall be easily removable for maintenance.
- J. Cable entrances: Depth of finished equipment shall be sufficient to allow for entrance, bending, and termination of cables.
- K. Provide minimum clearance between terminal pads and cable entrance, as shown on Data Sheets for either top or bottom entrance. Provide minimum distance of 36" (0.9 m) for termination of cables between cable termination point and window-type current transformer, or cable termination point and cable entrance location if window-type current transformers are not used.

## 2.04 DOORS

- A. Switchgear doors shall open minimum of 110° to allow for breaker removal with door-mounted relays.
- B. Doorstops and brackets with detents shall hold doors in fully open position.
- C. Front doors shall not open so far as to allow damage to devices mounted on adjacent doors.
- D. Front and rear doors shall be made from 12-gage heavy-duty formed steel with hand-operated triple door latches, and triple-hinges with provisions for padlocking.
  - 1. Front doors for switchgear with 2-high construction shall have separate doors for each compartment.
  - 2. Rear doors of vertical sections for single-high and 2-high construction shall have single, full-height removable door.
  - 3. Rear doors shall have provision for paddle locks.
  - 4. Doors should have signs that read "Danger High Voltage".



## 2.05 CUBICLE SPACE HEATERS

- A. Each cubicle of switchgear shall be furnished with space heater to prevent condensation of moisture.
- B. Locate heater in interior of cubicle.
- C. Thermally insulate from metal enclosure so no painted surface will be damaged or discolored.
- D. Space heaters shall maintain compartment internal temperature at no less than 5° above dew point connected through an adjustable humidistat, factory set.
- E. Wire individual heaters to accessible common terminal blocks for connection to single external power source.
- F. Refer to Data Sheets for heater rating and power supply information.
- G. Protect heater circuits with fuses.
- H. When auxiliary power transformer is required by Data Sheets:
  - 1. Size transformer to accommodate cubicle space heater and cubicle lighting power requirements.
  - 2. External power source not required.

## 2.06 MOTOR SPACE HEATER POWER SUPPLY

- A. Where motor space heaters are specified on Data Sheets or Drawings, provide set of common, internally wired motor space heater bus and terminal blocks for connection to Contractor-furnished multiphase external power source.
  - 1. Provide main circuit breaker or fusing for external power source.
  - 2. Coordinate external power source requirements with Engineer.
  - 3. Incorporate requirements on manufacturer-furnished drawings.
  - 4. Manufacturer shall balance current loading on multiphase space heater buses.
- B. Each individual motor space heater circuit shall include:
  - 1. Switchgear breaker 'b' auxiliary contact (52) control wiring.
  - 2. Connections to terminal blocks for field external connections.
  - 3. Internally wired fuses.
- C. Wire such that motor space heater operates only when breaker is in open and connected position and disconnected when breaker is closed, drawn-out, or test positions.
- D. When auxiliary power transformer is required by Data Sheets:
  - 1. Size transformer to accommodate motor space heater power requirements.
  - 2. External power source not required.
- E. When specified on Data Sheets, a 3-pole 480 volt interposing relay shall be provided and wired to power circuit breaker a contact to close when breaker is closed.

## 2.07 AUXILIARY COMPARTMENTS

- A. Bus voltage and current transformer mounted devices shall be wired to terminal blocks located in compartment. Overall switchgear-indicating instruments shall be mounted on door of compartment.
- B. Provide wiring required to termination points for outgoing supervisory connections.

## 2.08 CIRCUIT BREAKER COMPARTMENTS

- A. Each compartment shall have screw-type racking mechanism capable of manual operation by field-engaged crank. Each breaker shall have 3 defined stop positions in enclosure: "Connected," "Test," and "Withdrawn."
  1. Racking mechanism shall have mechanical interlocks to prevent insertion, or withdrawal, of circuit breaker with contacts closed.
  2. Provide interlocks to prevent breaker from closing between connected and test positions.
  3. If breaker contacts are closed, contacts shall be opened automatically and stored energy mechanism discharged prior to either inserting or removing breaker from connected position.
  4. Provisions shall be made for padlocking breaker in withdrawn position.
  5. Provisions shall be made to allow breaker-racking operation with compartment door closed.
  6. Each cubicle door shall be capable of being fully closed with breaker in withdrawn position.
  7. Breaker frame shall maintain ground connection in any position.
- B. Secondary control circuit contacts shall be stationary mounted within breaker compartment to mate with control circuit contacts on circuit breaker. Contacts shall remain engaged when breaker is racked into test position.
- C. Provide remote racking device(s) if specified on Data Sheets.

## 2.09 CIRCUIT BREAKERS

- A. Circuit breakers shall be vacuum interrupting horizontal draw-out type capable of being withdrawn. Ratings shall be as specified on Data Sheets. Breakers shall not be forced cooled in order to achieve maximum rating. Comply with latest version of ANSI C37.04 and C37.06. MVA rated breakers not acceptable.
- B. Operating mechanism:
  1. Operating voltage shall be in accordance with Data Sheets.
  2. Mechanically and electrically trip free.
  3. Mechanical operations counter: Visible at front of breaker assembly.
  4. Mechanism shall be capable of manual charging by use of handle.
- C. Mechanical indicator shall show breaker position and condition of stored-energy mechanism.
- D. Each breaker shall contain 3 vacuum interrupters, separately mounted in self-contained and self-aligning unit, which can easily be removed. Breaker shall be hermetically sealed in high-vacuum and be maintenance free.
  1. Mount unit on either glass polyester or epoxy supports.
  2. Provide contact wear gap indicator for each vacuum interrupter requiring no tools to indicate available contact life. Indicator shall be easily visible.
- E. Contacts:
  1. Contact surfaces shall be silver-to-silver, designed and fabricated to be self-aligning and to resist burning and deterioration.
  2. Breaker main contacts shall not touch or arc across into faulted circuit when breaker close signal is received while trip signal is being applied.
  3. Closing speed of moving contacts shall be independent of both control voltage and operator.
  4. Contacts shall have low current chopping characteristics.
  5. Primary disconnect contacts shall be "fingers" engaging cubicle stationary contacts when breaker is moved into operating position.
  6. Secondary control circuit contacts on breaker shall engage stationary control circuit contacts when breaker is moved into connected position.
- F. Breaker units of same type and ampere capacity shall be wired alike and shall be mechanically and electrically interchangeable.

- G. Grounding:
1. Provide breaker frame grounding facility for grounding in connected and test positions.
  2. Power circuit breaker ground connection shall be capable of carrying short-circuit rating of circuit breaker for minimum of 2 seconds and also be capable of withstanding peak current value or 2.7 times rated short circuit current of circuit breaker.
- H. Provisions on breaker shall be made for operating mechanism-operated auxiliary switch contacts (MOC) (Device 52) and stationary truck-operated cell switch contacts (TOC) (Device 33).
- I. Testing:
1. Provide testing station to permit checking of breaker controls and operation with breakers high-voltage side de-energized and isolated from switchgear bus.
  2. Testing shall be done in fully withdrawn position. Control station shall be wall-mounted.

## 2.10 AUXILIARY CONTACTS

- A. Each breaker shall be furnished with circuit breaker auxiliary contacts, MOCs, and TOCs as required to provide interlocking or control of auxiliary devices. In addition, provide spare contacts in quantities as specified on Data Sheets.
1. All spare contacts shall be wired to terminal blocks for ease of maintenance and access to external connection.
  2. Furnish no less than 2 Type "a" and 2 Type "b" spare electrically separate auxiliary contacts mounted on breaker for remote interlocking service.
- B. Auxiliary contacts shall be electrically separate. Each contact shall have 125VDC, 20-ampere minimum continuous current rating.
- C. MOC contacts shall be activated by circuit breaker mechanism when circuit breaker is in "connected" position only. A minimum of 4 Type "a" and 4 Type "b" spare MOC contacts shall be provided unless larger quantity is specified on Data Sheets.
- D. TOC contacts shall be activated by circuit breaker mechanism when circuit breaker is in "connected," "test," or "disconnected" position. A minimum of 4 Type "a" and 4 Type "b" spare TOC contacts shall be provided unless larger quantity is specified on Data Sheets.

## 2.11 BREAKER CONTROL

- A. Location:
1. When specified on Data Sheet, a separate breaker control cubicle section shall be provided with all breaker control switches for that switchgear lineup; otherwise, provide breaker control switch on breaker cubicle.
  2. For arc-resistant switchgear, breaker control switches, CT and VT test switches shall be mounted on instrument compartment associated with that breaker cubicle.
  3. When provided as part of this specification control shall be in accordance with typical schematic diagrams in regards to local trip, close, alarms, remote/local control switches etc.
- B. Breaker control switches:
1. Provide each breaker with local control switch and breaker truck position switches arranged to provide following control of breaker operation.

Breaker Position	Remote		Local	
	Close	Trip	Close	Trip
Connected	Yes	Yes	Yes	Yes
Test	Yes	Yes	Yes	Yes

2. Each circuit breaker local control switch shall have trip-close escutcheon, center normal position, and spring return to normal from close and trip. Furnish with red and green indication lights as shown on Data Sheets. Circuit breaker control switches shall have pistol-grip handles.
3. Manufacturer: Electroswitch Series 24 or equal with indication as shown on Data Sheet.

- C. Trip and close circuits:
  1. Provide terminal pairs wired in trip and close circuits of each breaker for Owner furnished remote trip and close contacts.
  2. Terminals shall be grouped adjacent to each other.
  3. Unless specified otherwise, quantities shall be:
    - a. Trip circuit: 2 pairs.
    - b. Close circuit: 2 pairs.

## 2.12 CONTROL POWER

- A. Furnish internal switchgear wiring to distribute single source of control power to each switchgear unit.
- B. Control power voltage: As specified on Data Sheets.
- C. For ac control power:
  1. When required by Data Sheets, provide control power transformer integral to switchgear line-up capable of providing required power.
  2. Provide each breaker with capacitive trip device that stores a minimum of two breaker operations in event of loss of ac control power.
  3. Each breaker shall be furnished with 1- or 2-pole, as required, DIN rail-mounted, miniature circuit breakers (MCB) as control power disconnecting and protective device.
  4. Provide one for closing circuit and one for tripping circuit.
  5. MCBs shall have contacts wired to I/O blocks for common external alarm indication of tripped MCB.
- D. For dc control power:
  1. Each breaker shall be furnished with 1- or 2-pole, as required, DIN rail-mounted, miniature circuit breakers (MCB) as control power disconnecting and protective device. Provide one set for closing circuit and one set for tripping circuit.
  2. MCBs shall have contacts wired to I/O blocks for common external alarm indication of tripped MCB.
- E. Power source for closing circuit shall be derived from load side of tripping circuit, such that open trip circuit will render closing circuit inoperable.
- F. Provide loss of voltage relay for breaker closing control voltage.
  1. Form C contact shall be wired to terminal blocks.
  2. Contact shall be used for remote indication.
- G. If required on Data Sheets provide self-contained dc control power system within line-up:
  1. Provide with voltage as indicated on Data Sheets.
  2. Batteries:
    - a. Use sealed-type, maintenance-free, lead-acid, gel cell type batteries.
    - b. Batteries furnished with minimum 10-year, pro-rated warranty.
  3. Battery charger: Size to fully recharge batteries within 8 hours with batteries fully discharged, while simultaneously providing rated power for dc loads.
  4. Provide separate, full-height switchgear section for dc control power system.
  5. Dc distribution panel with required number of dc rated breakers.
  6. Provide required interface between breaker circuitry and relaying for compatibility with dc voltage supply.
  7. Provide ventilation or air conditioning for batteries in accordance with code requirements and to meet battery manufacturer's recommendations.

8. Alarms:
  - a. Provide Form C contact for remote indication common alarm.
  - b. Common alarm shall, at a minimum, include charger malfunction, overload on battery, low-battery voltage, and loss of dc power output.

## 2.13 MAIN BUS

- A. Switchgear main bus shall be copper bar, designed to continuously carry current as specified on Data Sheets without exceeding temperature rise requirements
- B. Bus shall meet requirements of latest version of ANSI C37.04, C37.06, and C37.09.
- C. Install with rigid, nontracking, fire-resistant, and nonhygroscopic insulating supports capable of withstanding mechanical forces imposed by short-circuit currents greater than or equal to momentary current rating of switchgear.
- D. To prevent destructive mechanical strains in bus supports and connections throughout full ambient temperature range as stated on Data Sheets, furnish expansion joints where necessary.
- E. Current-carrying connections shall be flat bar and completed by bolting together.
- F. Unless otherwise stated on Data Sheets joints shall have silver-to-silver contact surfaces with minimum contact resistance.
- G. Design instrument transformer connections to permit removal and replacement of transformers without damage to connections.
- H. Insulation:
  1. Except at bolted terminations and connection points, coat bus with fluidized bed epoxy-type insulating material molded around and bonded to bus.
  2. Voltage rating of insulation shall be greater than or equal to highest voltage rating of switchgear.
  3. Bolted joints, expansion joints, external bus connections, terminals for external power cable connectors, and instrument transformer connections shall be insulated with removable boots.
  4. Design removable boots to overlap permanent bus or cable insulation minimum of 1" upon each conductor in connection insulated by boot.
  5. Furnish materials required to complete field connections, insulation of switchgear bus, and terminals.
- I. Orientation of bus when viewed from front of switchgear shall be A-B-C top-to-bottom, front-to-back, and left-to-right.
- J. Provide molded epoxy inserts for bus passing through barriers.

## 2.14 GROUND BUS

- A. Provide uninsulated copper ground bus with momentary rating at least equal to momentary rating of Switchgear.
- B. Connect switchgear equipment grounds to ground bus.
- C. Location of ground bus shall be as indicated on Data Sheets.
- D. Provide 2 ground cable connectors for attachment of stranded copper cable to each end of ground bus for external connection to grounding system in copper cable size as specified on Data Sheet.
- E. Each switchgear unit containing terminals for connection of metal-enclosed bus duct shall have provision for connecting bus duct ground bus to switchgear ground bus.

- F. Each feeder exit shall have provisions for connection between ground bus and feeder exit with owner supplied grounding cables. Cable connections in rear compartment shall have grounding lugs installed for Owner to connect safety grounds for maintenance purposes.

## 2.15 FACTORY WIRING

- A. Low-voltage control and instrument wiring shall be installed and tested at factory.
- B. Provide manufactured wiring harnesses to complete interconnection of switchgear groups in field for wiring across shipping splits.
- C. Contractor shall furnish and install, at own expense, missing wires or termination points, wiring not matching interconnection diagrams, or other deficiencies.
- D. Cable shall be selected for electrical and environmental conditions of installation, and suitable for unusual service conditions where encountered.
  - 1. Proper temperature application cable shall be used throughout, but shall not be less than 90°C rated.
  - 2. Conductors routed over hinges shall utilize extra flexible stranding.
  - 3. Cable insulation shall be rated for maximum service voltage utilized, but not less than 600 volts.
  - 4. Splices not acceptable.
- E. Panel, control cabinet, switchboard, motor control center, and switchgear wiring shall use flame-retardant, cross-linked polyethylene (XLP) or flame-retardant ethylene-propylene rubber (EPR) insulation meeting or exceeding requirements of UL 44 for Types SIS, and XHHW.
  - 1. Minimum size: No. 14 AWG.
  - 2. Conductors: Annealed bare copper Class B stranding passing IEEE 1202 and UL VW-1 flame test.
- F. Instrumentation wire shall use twisted shielded pairs/triads having flame-retardant, cross-linked polyethylene (XLPE) insulation, and chlorinated polyethylene (CPE) jacket.
  - 1. Minimum size: No. 16 AWG
  - 2. Conductor type: Annealed copper Class B stranding.
  - 3. Provide each pair/triad with shield.
  - 4. Shielding shall consist of aluminum-polyester tape and a flexible strand tin-coated No.18 AWG copper drain wire.
  - 5. Drain wire for each instrument cable shall be insulated with spaghetti sleeve. Terminate one end of shield wire on grounded terminal.
  - 6. Cables shall pass IEEE 1202 and ICEA 70,000 Btu/hr vertical tray flame test. Each conductor shall pass UL VW-1 flame test.
- G. Terminations:
  - 1. Conductor terminal connectors: Insulated, ring tongue, compression type connectors properly sized for conductor and terminal.
    - a. Construct connectors of copper and tin-plate.
    - b. Interior surface of connector wire barrel shall be serrated; exterior surface of connector wire barrel shall be furnished with crimp guides.
  - 2. Use noninsulated terminal connectors for conductors terminated on devices equipped with individual fitted covers, such as, but not limited to, control switches and lockout relays.
  - 3. Provide connections requiring disconnect plug and receptacle type devices with factory-terminated conductors on each plug and receptacle.
    - a. Plugs and receptacles shall be factory-wired into junction boxes containing terminal blocks for external connections.
    - b. Conductors on disconnect portion of plug-receptacle assemblies shall be in common jacket.
  - 4. Temporary wiring installed in factory for equipment testing shall be removed prior to shipment of equipment.
  - 5. Current transformers shall terminate on shorting type terminal blocks and shall be shipped with shorting jumpers installed.
  - 6. Terminal blocks: General Electric EB-25, or equal.

7. Spare auxiliary contacts, meter outputs, multifunction relay outputs and inputs, and spare control switch contacts shall be connected to terminal points to facilitate external connection.
- H. If indicated on Data Sheets wire all internal wiring designated for connection to external control wiring to a terminal box located on top of switchgear or on side as designated.
- I. Identification and labeling.
  1. Provide preprinted conductor identification sleeve on each end of each internal conductor.
  2. Mark each sleeve with terminal end and opposite end destination identification.
  3. Conductor identification sleeves shall be UV-resistant, non-shrinking type, not less than 1/2" long.
  4. Conductor identification shall be computer printed on sleeve with nonsmudging, permanent black ink. Hand written identification is not acceptable.
  5. Each terminal block, terminal, conductor, relay, breaker, fuse block, and other auxiliary devices shall be permanently labeled to coincide with identification indicated on manufacturer's drawings.
- J. Cable supports shall be bolted or welded to switchgear frame or doors. Stick on cable supports are not acceptable.

#### 2.16 CURRENT TRANSFORMERS (CT)

- A. In accordance with requirements of ANSI C57.13.
- B. CT mechanical and thermal limits shall withstand without damage momentary and short time ratings of circuit breakers with which used.
- C. Multi-ratio type, unless specified otherwise.
- D. Wire secondary leads out to shorting terminal blocks including leads from spare CTs and unused multiratio CT leads.
- E. Ground in accordance with C57.13.3.
- F. CT secondary circuits identified for metering or relaying devices not located in switchgear shall be grounded in switchgear using easily removable secondary ground straps.
- G. Manufacturer's drawings shall specifically state ground straps that should be removed if circuit will be grounded remotely.
- H. Unless indicated otherwise, CT polarity markings shall be toward circuit breaker.
- I. Separate CTs shall provide metering and protection functions, unless specified otherwise.

#### 2.17 VOLTAGE TRANSFORMERS (VT)

- A. In accordance with requirements of ANSI C57.13.
- B. Each set shall be draw-out type and removable with 4-stage cell interlock switch.
- C. Where physical size restrictions do not allow VTs to be mounted as draw-out assembly, VTs may be stationary mounted with primary fuses mounted as draw-out unit.
- D. Provide appropriate interlocks in accordance with ANSI standards for operator safety.
  1. Provide continuously maintained ground for transformer primary windings and fuses that is clearly visible when assembly is moved to "withdrawn" position.
  2. Disconnect and ground secondary circuit in "draw-out" position.

- E. Protect each transformer primary and secondary.
  - 1. Primary circuit:
    - a. Current-limiting fuses mounted on draw-out type removable carriage unit designed to isolate and ground potential circuits when unit is in fully withdrawn position.
    - b. Fuses shall meet requirements of NEMA SG2.
  - 2. Secondary circuit:
    - a. Relays and meters shall be kept on separate circuits, unless specified otherwise.
    - b. Each secondary circuit shall be protected by use of separate DIN rail-mounted miniature circuit breaker (MCB).
    - c. Each MCB shall be furnished with dry contact that changes state when breaker is tripped.
    - d. Contacts shall be wired to terminal blocks for use as alarm signal.
    - e. Wire contacts in parallel at terminal blocks to allow single external connection for common alarm condition.
- F. Ground in accordance with C57.13.3.
- G. Voltage transformers shall have accuracy rating as indicated on Data Sheets.

## 2.18 LOCKOUT RELAYS

- A. Mount lockout relays on breaker or breaker auxiliary compartment door.
- B. Wire to trip breaker and simultaneously block closing of breaker.
- C. Rated operating trip voltage shall be capable of allowing coil operation at 75% of rated voltage.
- D. Furnish with required number of contacts to perform functions and with additional spare contacts for customer use in quantities as indicated on Data Sheets.
- E. Wire normal and spare contacts to terminal blocks.
- F. Provide all used and spare contacts with test switches wired in series to facilitate relay testing.
- G. Provide with local tripped indication and pistol-grip handle.
- H. Lockout relays shall be manually reset.
- I. Manufacturer: Electros witch Series 24 LOR with lighted target nameplate, or equal.

## 2.19 PROTECTIVE RELAYS

- A. Provide relays as shown on one-line diagrams. Relays shall be solid-state microprocessor-type; flush panel mounted self-contained units; operable from designated control power source.
- B. Relay functions, type and manufacturer: In accordance with Data Sheet.
- C. Programming of relay shall be from face of unit without requiring additional equipment. Programming of relay shall also be possible from lap top computer.
- D. Provide all software required for relay settings, communications, and oscillography as a Corporate perpetual license.
- E. Operation, troubleshooting, and trip indication information shall be displayed on unit face.
- F. Relays shall have built-in self-test functions with Form C relay failure alarm contact for remote indication. Separate Form C trip alarm contact shall also be furnished for remote trip indication.



- G. Auxiliary relays shall be surface-mounted inside same switchgear cubicle in which it is used. Provide with following ratings:
  - 1. Relay: 300-volt minimum.
  - 2. Coil: 115-volt.
  - 3. Continuous duty.
  - 4. Number of poles as required or as indicated on Drawings.
- H. Contacts shall be universal or convertible type for connection as either normally open or normally closed, rated NEMA B150, minimum.

## 2.20 COMMUNICATIONS EQUIPMENT

- A. Provide equipment as shown on communication one-line diagram and as indicated on Data Sheet. Communications equipment shall be microprocessor-based.
- B. NTX-20 shall be located in separate RTU enclosure as shown on the Equipment Layout drawing.
  - 1. RTU enclosure shall have front and rear door access.

## 2.21 METERS

- A. Provide meter as shown on one-line diagrams and as indicated on Data Sheets. Meters shall be microprocessor-based, multifunction type.
- B. Metering unit shall provide local indication and be capable of remote communication for all functions.
- C. Programming of meters shall be from face of unit without requiring additional equipment.
- D. Provide all software required for meter settings or setup, communications, and oscillography as a Corporate perpetual license.
- E. Revenue quality meters shall have accuracy guaranteed by testing traceable to NBS. Revenue power meters shall meet requirements of ANSI C12.20.

## 2.22 INDICATING LIGHTS

- A. Provide LED-colored indicating lights as manufactured by Data Display Products, or equal. Clear LEDs with colored caps are not acceptable. Provide each breaker control switch with at least the following LEDs
  - 1. Red LED: Illuminated when breaker is closed. Wire red light to monitor trip coil such that light will be out if trip coil continuity is lost.
  - 2. Green LED: Illuminated when breaker is open.
- B. Provide each lockout relay with an amber monitoring light.
  - 1. LEDs may be optionally integrated into LOR faceplate.
  - 2. Wire as follows:
    - a. Continuity light shall be illuminated to indicate LOR is ready to respond and coil continuity is intact. If coil fails, light shall go out and contact shall close to initiate alarm.
    - b. Trip indicator light shall illuminate when LOR has tripped, and shall stay lit until relay is reset regardless of whether trip signal is maintained or not.

## 2.23 TEST SWITCHES

- A. Provide test switches for all relay and meter VT, CT, and trip circuits.
- B. Relay and meter switches shall be industrial grade, manually operated, knife-blade type, 10-pole with voltage and current elements with screw-on cover for personnel protection. Switches shall be ABB FT-1, or equal.

- C. Identify each voltage and current switch by group and phase. Orientation shall be Phase A-B-C, left-to-right when looking at test switch from front. Extend voltage and current wiring for each relay and meter for incorporation into single test block.
- D. Lockout relay test switches shall be 10 single-pole voltage elements wired in series with coils and normally open contacts of relays. Provide screw-on cover for protection when not in use.
- E. Back-wire, unless installed in location requiring front-wired type.

#### 2.24 SURGE ARRESTERS

- A. Provide station class, metal oxide surge arresters in quantities, and ratings as indicated on Data Sheets.
- B. Manufacturer: Ohio Brass, Cooper Power Systems, or equal.

#### 2.25 SWITCHGEAR ACCESSORY SET

- A. Provide accessories for test, inspection, maintenance, and operation.
- B. Minimum one hand-crank or racking handle per switchgear line-up for moving breakers into "Connected," "Test," or "Disconnected" position.
- C. Wall-mounted test cabinet for testing electrically operated breakers complete with connecting cables and secondary couplers. Provide quantity as specified on Data Sheets.
- D. Tool for manually charging breaker closing spring and manually opening shutter.
- E. Test jumper for electrically operating breaker while out of compartment.
- F. One breaker maintenance closing device per switchgear line-up.
- G. One test plug for draw-out relays per switchgear line-up.
- H. Provide dolly for circuit breaker transport for switchgear as indicated on Data Sheets. Dolly shall be combination cart and lifting device capable of removing and inserting breakers in both single- and 2-high switchgear. Dolly shall be suitable for transporting vacuum contactors or switchgear circuit breakers; portable, floor-supported with roller base.

#### 2.26 NAMEPLATES

- A. Laminated black letters on white background, with 1/8" (3 mm) engraved letters securely fastened with minimum of 2 self-tapping, stainless steel screws. Coordinate nameplate information with Engineer after award of Contract.
- B. Provide nameplates to identify:
  - 1. Each externally visible devices including, but not limited to, protective relays, lockout relays, meters, switches, instruments, and indicating lights shall have nameplate on outside of switchgear and on inside of switchgear.
  - 2. Each externally invisible device shall have nameplate identifying device.
  - 3. Each vertical section shall have nameplate located on front and rear of switchgear. Nameplates shall include equipment description and identification number of equipment being served.
  - 4. Each switchgear line-up shall have main nameplate located on front and rear of switchgear with switchgear name and identification number.
- C. Caution nameplates: Yellow with black letters.
- D. Warning nameplates: Red with white letters.

- E. Provide nameplates for terminal blocks. Mark in accordance with manufacturer's instructions.
- F. Each internal device or component shall have identification marking in accordance with manufacturer's instructions.
- G. Nameplates and placards including warning signs and safety placards shall meet NFPA 70E requirements.

#### 2.27 BREAKER BUS TEST TERMINALS

- A. If specified on Data Sheets, provide means for connecting test equipment directly to bus, located on load side of each breaker. Terminal shall be accessible without having to remove conductor insulation material.
- B. Protect connection point with removable insulating boot material rated same voltage class as switchgear main bus.
- C. Provide same connection point on ground bus so phase conductors may be grounded for protection of personnel during maintenance.

#### 2.28 MIMIC DIAGRAMS

- A. If specified on Data Sheets, provide mimic diagrams on front of each switchgear door that depicts interconnection of switchgear and associated equipment.
- B. Mimic diagrams shall be acceptable to Engineer prior to fabrication.

#### 2.29 SOURCE QUALITY CONTROL

- A. Manufacturer shall submit proposed testing plan for complete switchgear and accessories for review and approval prior to performing testing.
- B. Switchgear shall be electrically and mechanically assembled into single line-up, installed in prefab building, inspected, and tested as single unit with actual project breakers installed in switchgear at factory prior to shipment. Notify Owner at least 30 days prior to final testing so arrangements can be made for Owner to witness tests.
- C. Perform following tests on equipment specified in accordance with latest edition of ANSI standards.
  1. Manufacturer's standard production inspections and testing on switchgear assemblies.
  2. Complete wiring check including function operation. Provide Engineer with certified copies of test data and reports.
  3. Polarity verification of phase-sensitive circuits including VT and CT circuitry.
  4. Test communications of devices including control devices, relays and meters.
  5. High-potential insulation check of main bus.
  6. Control wiring insulation check.
  7. Install in relays and test Owner provided relay settings for proper operation an function.
  8. Install Owner provided communications settings and test communications for proper operation.
- D. Test breakers in accordance with ANSI C37.09.
- E. Arc-resistant design testing shall be performed in accordance with IEEE C37.20.7 using maximum short circuit current available for system or device rating as perspective current available at incoming bus terminals of test sample.
- F. Relays shall have latest software/firmware installed and tested for functionality. Relays shall be programmed with protective function settings furnished by Engineer. Information needed from manufacturer by Engineer to set protection functions shall be furnished at least 4 weeks prior to factory testing of line-up.

- G. Relay and meter communications settings shall be selected and set according to equipment furnished. Coordinate with Engineer. Communications shall be shown to be fully functional prior to shipment.
- H. Test results shall indicate equipment meets specified standards before shipment can be made.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify building conditions are acceptable for switchgear installation.

#### **3.02 INSTALLATION**

- A. Install in premanufactured building in accordance with manufacturer's requirements.

#### **3.03 MANUFACTURER'S FIELD SERVICES**

- A. Provide manufacturer's field service representative to perform wiring interconnections between shipping splits.
- B. Provide manufacturer's field service representative for field commissioning services Relays shall be programmed in the factory using settings furnished by Engineer or Owner.

#### **3.04 TRAINING**

- A. If specified on Data Sheet, provide authorized representative of switchgear manufacturer to train Owner's maintenance personnel on procedures for startup and shutdown, troubleshooting, servicing, and preventive maintenance as follows:
  1. Duration: 2 days minimum.
  2. Review data in operating and maintenance manuals.
  3. Review normal maintenance and operating procedures.
- B. Instruction shall be provided on site and include all training documents.

<b>DATA SHEETS MV METAL- CLAD SWITCHGEAR</b>		<b>Equipment Name: Kautz Road 12.5kV Switchgear</b>	
<b>DESCRIPTION</b>		<b>QTY/UNITS</b>	<b>SPEC DATA</b>
Switchgear Manufacturer	-	By Manufacturer	
Switchgear Catalog No.	-	By Manufacturer	
<b>ENVIRONMENTAL CONDITIONS:</b>			
Maximum Design Ambient Temperature	°C	40	
Minimum Design Ambient Temperature	°C	-30	
Site Altitude	ft	Less than 3,300	
High Humidity	Y/N	N	
Corrosive	Y/N	N	
Salt-Laden	Y/N	N	
Seismic Condition			
<b>CHARACTERISTICS:</b>			
Rated Maximum Voltage	kV	15	
Nominal System Operating Voltage	kV	12.47	
Voltage Range Factor, K	n/a	K=1.0	
System Configuration	Delta/Wye	WYE	
Phase, Wire	Phase/Wire	3 Phase/3 Wire	
System Grounding Method		Solidly Grounded	
Frequency	Hz	60	
Rated Basic Impulse Lightning Level	kV BIL	95	
<b>Main and Load Side Bus:</b>			
Continuous Current Rating	A	1200	
Short-Circuit Current – Sym	kA (rms)	31.5	
Momentary Current Withstand Capability	kA, (peak)	85	
Arc-Resistant Switchgear:	Y/N	N	
Arc-Resistant Construction in accordance with IEEE C37.20.7 (Type 2 or 2C)	-	-	
Site visit required for field measurements to support ductwork design.	Y/N	-	
Provide terminal box for termination of all external wiring.	Y/N	-	
<b>BUS BAR:</b>			
Phase and Ground Bus Material	-	Copper	
Phase Connection Plating Material	-	Silver	
Ground Bus Location	-	Bottom/Rear	
Phase Bus Dimensions	In.	By Manufacturer	
Ground Bus Dimensions	In.	By Manufacturer	
Ground cable lug size	AWG	4/0	
<b>STRUCTURE:</b>			
Arrangement	-	Two-high	
Enclosure Rating	NEMA	12	
Enclosure Type	-	Indoor	
Number of Vertical Sections	Qty.	5	
Vertical Section Dimension (L x W x H)	In.	By Manufacturer	
Fully Assembled Structure Dimension (L x W x H)	In.	By Manufacturer	
External Control Wiring Terminal Box Required	Y/N	Y	
Total Installed Weight	Lb.	By Manufacturer	

<b>DATA SHEETS MV METAL- CLAD SWITCHGEAR</b>		<b>Equipment Name: Kautz Road 12.5kV Switchgear</b>	
<b>DESCRIPTION</b>		<b>QTY/UNITS</b>	<b>SPEC DATA</b>
<b>VENDOR DATA</b>		<b>Tag No.:</b>	
Color	-	Standard Gray	
Expansion Capability (Right, Left, Right and Left, Neither)	-	Neither	
Incoming Section	Bus/Cable	Cable	
<b>DOORS:</b>			
Dimension (L x W x H)	In.	By Manufacturer	
Hinged and Removable	Y/N	Y	
Lockable	Y/N	Y	
<b>AUXILIARY COMPARTMENT:</b>			
Terminals Wired in Close Circuit For Owner Use	Pairs	2	
Terminals Wired in Trip Circuit For Owner Use	Pairs	2	
Control Power:			
Voltage	Vac or Vdc	125 Vdc	
External Control Power Source	Y/N	Y	
Self-Contained DC Control Power System	Y/N	N	
Control Power Transformer-	Y/N	N	
Rating	kVA	N/A	
Secondary Voltage	V	N/A	
<b>MOTOR AND SPACE HEATER POWER</b>			
Voltage	Vac	120/240 Vac	
External Heater Power Source	Y/N	Y	
Internal Heater Power Source	Y/N	N	
Estimated Motor Space Heater Load	KW	N/A	
480V interposing relay required for space heater circuits.	Y/N	N	
<b>RELAYS – MAIN/TIE/FEEDER</b>			
Manufacturer and Model Number		SEL-751401A1A0A7085BFA0	
Quantity		6	
Test Switches	Qty	2 per relay	
Manufacturer/Model	-	ABB FT-1	
Application	-	All current and voltage inputs as well as all digital inputs and outputs	
<b>RELAYS – 34.5KV LINE</b>			
Manufacturer and Model Number		SEL-0311C213H3E54X1	
Quantity		1	
Test Switches	Qty	2 per relay	
Manufacturer/Model	-	ABB FT-1	
Application	-	All current and voltage inputs as well as all digital inputs and outputs	
<b>RELAYS – TRANSFORMER</b>			
Manufacturer and Model Number		SEL-0387503X55XX4XX	
Quantity		1	
Test Switches	Qty	3 per relay	
Manufacturer/Model	-	ABB FT-1	

<b>DATA SHEETS MV METAL- CLAD SWITCHGEAR</b>		<b>Equipment Name: Kautz Road 12.5kV Switchgear</b>	
<b>DESCRIPTION</b>		<b>QTY/UNITS</b>	<b>SPEC DATA</b>
<b>VENDOR DATA</b>		<b>Tag No.:</b>	
Application	-	All current and voltage inputs as well as all digital inputs and outputs	
<b>RELAYS – BUS</b>			
Manufacturer and Model Number		SEL-0587Z0X325312XX	
Quantity		1	
Test Switches	Qty	2 per relay	
Manufacturer/Model	-	ABB FT-1	
Application	-	All current and voltage inputs as well as all digital inputs and outputs	
<b>INDICATION METERS</b>			
Manufacturer and Model Number	-		
Quantity	-	NONE	
Installation Locations	-		
Revenue Metering Quality	Y/N		
Mounting	-		
Drawout	Y/N		
Data Communication	-		
Quantity of Analog Outputs	-		
Test Switches	Qty		
Manufacturer/Model	-		
Application	-		
<b>METERING</b>			
Manufacturer and Model Number	-		
Quantity	-	NONE	
Revenue Metering Quality	Y/N		
Mounting	-		
Drawout	Y/N		
Data Communication	-		
Quantity of Analog Outputs	-		
Test Switches	Qty		
Manufacturer/Model	-		
Application	-		
<b>CONTROL SWITCHES:</b>			
Manufacturer and Model Number	-	Electroswitch Series 24 with lighted nameplates	
<b>LOCAL/REMOTE SWITCHES:</b>			
Manufacturer and Model Number	-	Electroswitch 24203B with Escutcheon Code 010D-2L24	
<b>RECLOSE CUTOUT SWITCHES:</b>			
Manufacturer and Model Number	-	24203B with Escutcheon Code 010D-2R14AE	
<b>LOCKOUT RELAYS:</b>			
Manufacturer and Model Number	-	Electroswitch Series 24 with lighted nameplates	

<b>DATA SHEETS MV METAL- CLAD SWITCHGEAR</b>		<b>Equipment Name: Kautz Road 12.5kV Switchgear</b>	
<b>DESCRIPTION</b>		<b>QTY/UNITS</b>	<b>SPEC DATA</b>
Quantity			3
Test Switches		Qty	1 per lockout
Manufacturer/Model		-	ABB FT-1
Application		-	All used NO contacts
<b>VOLTAGE TRANSFORMERS:</b>			
Manufacturer and Model Number		-	By Manufacturer
Voltage Ratio		-	7200-155/67
Accuracy Rating		-	0.3WXYZ, 1.2ZZ
VT Quantity		-	6
<b>COMMUNICATIONS EQUIPMENT</b>			
ACS NTX-20 Controller (Located in separate cabinet)		Qty	1
Relay Communications Processor			Y
AXION 2240 Backplane			SEL-2242R1X0
AXION 2240 RTAC			SEL- 2241X0X211X0XXXXXX
AXION 2240 Power Coupler			SEL-224311X0
AXION 2240 Input Card			SEL-22442424X0
AXION 2240 Output Card			SEL-22443131X0
Managed Ethernet Switch			SEL- 2730M0ARAX1111AAAA X
Relay Connection Interface			Ethernet
Provide Cables between Processor and Relays		Y/N	Y
Metering Communications Multiplexer			N/A
Control Processor			N/A
Fiber Optic Transceivers (NTX Communication)			H&L Instruments 560/561
I/O Blocks			N/A
Spare Terminal Blocks		Qty	10%
<b>ACCESSORIES:</b>			
Wall Mounted Test Cabinets		Qty	0
Test Harness for Breakers		Qty	1
Breaker Racking Crank		Qty	1
Breaker Dolly		Qty	1
Remote Racking Device		Y/N	Y
Length of Cord		ft	50
<b>BREAKER CUBICLE: MAIN BREAKER (52-M1)</b>			
Model Number		-	By Manufacturer
Continuous Current Rating		A	1200
Voltage Range Factor, K		n/a	K=1.0
Short Circuit Interrupting Current		kA, sym	20
Closing and Latching Capability		kA, peak	52
Current Transformers -			
Bus Side:		Qty	2
Ratio			1200/5 MR
Accuracy			C400



DATA SHEETS MV METAL- CLAD SWITCHGEAR		Equipment Name: Kautz Road 12.5kV Switchgear	
DESCRIPTION		QTY/UNITS	SPEC DATA
Source Side:	Qty	2	
Ratio		1200/5 SR 1200/5 MR	
Accuracy		C400	
Trip Coil Monitor	Y/N	Y	
Spare MOC contacts	Qty	8 N.C and 8 N.O.	
Spare TOC contacts	Qty	4 N.C and 4 N.O.	
Breaker Test Terminals	n/a	N	
Cable or Bus Entry Location		Below	
Surge Protection:	Y/N	Y	
Surge Arrester Class	Type	Station	
Surge Arrester Duty Cycle Voltage	kV rms	9	
Surge Arrester MCOV	kV rms	7.65	
Surge Arrester TOV	kV rms		
Surge Capacitors	Qty/Type	NONE	
Cable Lug Size/Qty Per Phase		2-1000 kcmil Cu/PH	
Minimum Clearance Between Terminal Pads and Cable Entrance	in	33	
<b>BREAKER CUBICLE: FEEDER BREAKERS (52-F11, 52-F12, 52-F13, 52-F14)</b>			
Model Number	-	By Manufacturer	
Continuous Current Rating	A	1200	
Voltage Range Factor, K	n/a	K=1.0	
Short Circuit Interrupting Current	kA, sym	20	
Closing and Latching Capability	kA, peak	52	
Current Transformers -			
Bus Side:	Qty	1	
Ratio		1200/5 MR	
Accuracy		C400	
Load Side:	Qty	1	
Ratio		1200/5 SR	
Accuracy		C400	
Trip Coil Monitor	Y/N	Y	
Spare MOC contacts	Qty	8 N.C and 8 N.O.	
Spare TOC contacts	Qty	4 N.C and 4 N.O.	
Breaker Test Terminals	n/a	N	
Cable or Bus Entry Location		Below	
Surge Protection:	Y/N	Y	
Surge Arrester Class	Type	Station	
Surge Arrester Duty Cycle Voltage	kV rms	9	
Surge Arrester MCOV	kV rms	7.65	
Surge Arrester TOV	kV rms		
Surge Capacitors	Qty/Type	NONE	
Cable Lug Size/Qty Per Phase		1-750 kcmil Cu/PH	
Minimum Clearance Between Terminal Pads and Cable Entrance	in	33	
<b>SPECIAL REQUIREMENTS</b>			

<b>DATA SHEETS MV METAL- CLAD SWITCHGEAR</b>		<b>Equipment Name: Kautz Road 12.5kV Switchgear</b>	
		<b>Tag No.:</b>	
<b>DESCRIPTION</b>	<b>QTY/UNITS</b>	<b>SPEC DATA</b>	<b>VENDOR DATA</b>
Provide Spare 1200A Circuit Breaker	Qty	1	

END OF SECTION

- 1) Grant P. Askren
- 2) Phillip E. Schulz

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Embankments materials.
- B. Stripping.
- C. Earth and borrow excavation.
- D. Embankment construction.
- E. Finish grading and protection.

## 1.02 QUALITY ASSURANCE

- A. Provide testing of materials and field compaction.
- B. Refer to Section 01 45 29.

**PART 2 PRODUCTS**

## 2.01 EMBANKMENT MATERIAL

- A. Obtain embankment material from excavated areas or from an approved borrow area.
- B. Embankment materials shall be free from debris, roots, organic, or other unstable or unsuitable materials.

**PART 3 EXECUTION**

## 3.01 STRIPPING

- A. Prior to grading and/or borrow excavation, strip topsoil, vegetation and other objectionable material from construction areas. Average depth assumed to be 9" to 12" (225 mm to 300 mm). Stockpile clean topsoil at job site. Dispose of vegetation and other objectionable material at off-site location selected by Contractor.

## 3.02 EARTH EXCAVATION

- A. Grading shall consist of excavation, removal and satisfactory disposal of excess excavated materials taken from within Project area, construction of embankments, subgrades, ditches, and incidental work; and removal and satisfactory disposal of unstable and unsuitable materials and their replacement with satisfactory materials where needed.
- B. In cuts for driveways proof-roll subgrade with fully loaded tandem-axle dump truck to detect localized zones of unstable material.
- C. Remove unstable material encountered and replace with suitable material.
- D. Dispose of unstable material within embankments not to be used under structures, driveways, and substation pad.

### 3.03 BORROW EXCAVATION

- A. Borrow excavation shall consist of excavating, transporting, and placing of earth materials obtained from locations furnished by Contractor necessary for construction of embankments, subgrades and other parts of Work.
- B. Contractor shall furnish and pay for borrow sites, or other sources of borrow, and obtain from property owners necessary agreements for removal of excavated material. Borrow material shall have a Standard Dry Density of not less than 95 lb/cu ft (1525 kg/m<sup>3</sup>) when tested in accordance with AASHTO T99 and shall not possess an organic content greater than 10% when tested in accordance with AASHTO T194.
- C. Borrow pits shall not change general pattern of existing drainage and shall be well drained unless suitable for development as ponds or lakes. Borrow sites shall be seeded in accordance with Section 32 92 19. If proposed borrow site is to revert to agricultural purposes, Contractor shall submit to Engineer a written statement from property owner that seeding will not be required.

### 3.04 EMBANKMENT CONSTRUCTION

- A. Maintain embankments in satisfactory condition until final acceptance.
- B. Preparation of surfaces to receive fill:  
After stripping of organic material or foreign matter, proof-roll areas to receive fill as described in article "Earth Excavation."  
If unsuitable or unstable material is encountered under embankment area, remove material and replace with suitable material prior to placing embankment material.
- C. Moisture control:  
Moisture content of embankment materials prior to, and during compaction shall be uniform throughout each layer of material.  
Place earth materials at or within 2% of optimum moisture content as determined by ASTM D698; wet granular materials thoroughly during or immediately prior to compaction.  
Add supplementary water to materials on embankment by sprinkling and mixing uniformly throughout layer as required.  
Spread temporarily excavated materials too wet for placing until moisture content is acceptable.
- D. Placing:  
Place embankment materials in manner permitting drainage, and in continuous, approximately horizontal layers, not exceeding 8" (200 mm) loose thickness.  
Avoid abrupt changes in embankment levels.  
If surface of previously placed materials is too dry or smooth to provide satisfactory bonding surface with new material, moisten and/or scarify in manner and to depths required to avoid shear plane.  
If compacted surface of any layer of fill is too wet for proper compaction of next succeeding layer to be placed:
  - a. Allow materials to dry or work with suitable equipment.
  - b. Compact to provide satisfactory bonding surface for next succeeding layer of fill to be placed.
 When each layer of material has been conditioned to moisture content specified, compact as follows:
  - c. Compact following embankments to minimum of 95% of maximum dry density as determined by ASTM D698:
    - 1) Embankments for substation pad.
    - 2) Embankments for driveway.
  - d. Compact other embankments to minimum of 90% of maximum dry density as determined by ASTM D698.
- E. Grade areas disturbed by construction operations to smooth, uniformly sloping surfaces.

### 3.05 FINISH GRADING

- A. Finish fill, excavated areas, and other disturbed areas to uniform grade and section normally obtainable with blade grader.
- B. Allowable template tolerances: +/- 0.10' (30 mm).
- C. Finish grade to neat appearance and to provide positive drainage.

### 3.06 FIELD QUALITY CONTROL

- A. Moisture-density laboratory tests: Minimum of one test on each type of soil to be used in embankment construction; conform to ASTM D698. Perform tests prior to placement of embankment materials.
- B. In-place density tests for embankments: Perform tests on driveway embankments during course of work on subgrade for each successive 8" (200 mm) layer at approximate 50' (15 m) intervals conforming to ASTM D1556 or ASTM D2922.

### 3.07 PROTECTION

- A. Water shall be used as controlling agent to prevent operations from polluting air with dust.
- B. Regulations as set forth by OSHA and appropriate state and local agencies, shall govern.

END OF SECTION

- 1) Patrick M. Johnson
- 2) Greg S. Shuger

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Trench excavation.
- B. Pipe bedding and backfill requirements.
- C. Backfill for manholes, appurtenances and structures.
- D. Erosion control.
- E. Dewatering.
- F. Sheet piling, shoring and bracing.
- G. Surface restoration and cleanup.

## 1.02 RELATED REQUIREMENTS

- A. Section 01 45 29 - Testing Laboratory Services.

## 1.03 INFORMATIONAL SUBMITTALS

- A. Quality assurance data:
  - 1. Provide name, address, and telephone number of person who has access to equipment and is authorized to make emergency repairs to Contractor's Work, such as to correct trench cave-ins, moving excavated material, and correct other problems during weekends and off-work hours, so access can be maintained for fire fighting equipment, and to maintain barricades for public safety.

## 1.04 SCHEDULING

- A. Schedule Work to keep streets, sidewalks, and utilities in usable condition; avoid property owner inconvenience insofar as practicable.
- B. Do not trespass on private property. Maintain construction operations on existing right-of-way or easements provided by Owner.
- C. Maintain suitable means of access for property owners abutting streets and highways involved in construction, except as specifically permitted otherwise by Owner.
- D. Suitable access shall mean a roadway of sufficient width, free from ruts, potholes, and mud holes, and capable of carrying a passenger car without damage to car.
- E. When access must be denied due to construction, provide suitable access within 24 hours after responsible construction is completed.
- F. Whenever construction is stopped due to inclement weather, weekends, holidays, or other reasons, suitable access shall be provided for property owners.

**PART 2 PRODUCTS**

## 2.01 PIPE ENVELOPE

- A. See Civil Details on Drawings for definition.

- B. Rigid sewer pipe (reinforced concrete pipe):
  1. Bedding: Well graded, clean gravel, or crushed stone meeting following gradation: ASTM C33, Table 3, Size 67.
  2. Initial backfill: Excavated or imported material, both conforming to one of following ASTM D2487 (Unified Soil Classification System) classifications: GW, GP, SW, or SP with 100% passing 3/4" sieve. Excavated material shall be free of debris, organic and frozen materials.

## 2.02 REMAINING BACKFILL

- A. Applies to backfill above pipe envelope: See Civil Details on Drawings.
- B. Where pipe envelope is within limits of excavation for structures, remaining backfill shall be structure backfill as specified in Section 31 23 16-16.
- C. Job-excavated material:
  1. Material: Free from debris, stones larger than 1-1/2" (38 mm), organic matter, and frozen material.
  2. Use: All locations except where select backfill is required.
- D. Select backfill:
  1. Material: Well-graded mineral particles with 100% passing 1-1/2" (38 mm) sieve and not over 12% passing No. 200 sieve.
  2. Use:
    - a. Trenches with centerline beneath or closer than 10' (3 m) to paved streets and drives, sidewalks, or curb and gutter: Backfill with select backfill or suitable job excavated granular material meeting requirements of select backfill.
    - b. New pipe below existing water, sewer, or gas main: backfill under existing pipe with select backfill.

## 2.03 BACKFILL FOR MANHOLES AND APPURTENANCES

- A. Backfill material as required for adjacent trench.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Obtain from utility companies exact locations of buried utilities shown on Drawings.
- B. House services are not shown on Drawings. Obtain locations of house services from utility companies.
- C. Make arrangements with utility companies to temporarily support, brace or remove utility poles either adjacent to or in trench excavation at no cost to Owner.
- D. Utility mains shown on Drawings, in conflict with new facilities: Perform relocation or make arrangements with utility to perform Work at no additional cost to Owner.
- E. Utility mains not shown on Drawings, in conflict with trench excavation or new facilities:
  1. Notify Engineer immediately.
  2. Authorized relocation performed by Contractor or performed by others at Contractor's expense will be paid for under provisions of Article 11 of General Conditions.

### 3.02 TRENCH EXCAVATION – GENERAL

- A. Classification:
  - 1. Earth: Materials not classified as rock; includes clay, silt, sand and gravel, hardpan, disintegrated shale and rock, debris, and detached rock less than 1 cu yd in volume.
  - 2. Rock: Materials that cannot be excavated without use of pneumatic tools, drilling and blasting, or line drilling and wedging, and detached pieces of such materials larger than 1 cu yd in volume.
- B. Rock excavation is not anticipated.
- C. Excavation shall be open cut unless otherwise specified or shown.
- D. Trenches not requiring select backfill: Pile excavated material, suitable for backfill, in an orderly manner a sufficient distance back from edge of excavation to avoid slides or cave-ins; 2'-0" (600 mm) minimum clear distance.
- E. Trenches requiring "select" backfill: Place unsuitable excavated material directly on trucks and haul away. No spoil banks permitted.
- F. If granular material suitable for select backfill is encountered in trenches requiring select backfill: Pile in an orderly manner a sufficient distance back from edge of excavation to avoid slides or cave-ins; 2'-0" (600 mm) minimum clear distance.
- G. Excavate existing utilities sufficiently in advance of pipe laying to determine crossing arrangement. No payment will be allowed for down time due to utility relocation.
- H. Use caution when placing and compacting backfill to avoid placing construction loads on pipe which may damage or displace newly laid pipe.
- I. Limit amount of trench open at one time to minimum.

### 3.03 TRENCH EXCAVATION – EARTH

- A. Strip and stockpile topsoil for use in surface restoration.
- B. Keep trench width below top of pipe as narrow as practicable; provide adequate width for proper pipe jointing operations and for placing and compacting backfill.
- C. Slope walls of trench or provide trench shoring as required to comply with OSHA and safety requirements; maintain walls of excavation vertical below top of pipe. Use trench box or shield as required.
- D. Excavate to full depth by machine. Trench bottom shall be suitable for hand working of finely divided, loose, excavated material or for placement of pipe bedding material.
- E. If soft, spongy, or otherwise unstable material is encountered which may not provide suitable foundation for pipe:
  - 1. Notify Engineer immediately.
  - 2. Engineer will authorize remedial measures in writing as required.
  - 3. Removal and replacement of questionable material will be authorized only if dewatering methods are unsuccessful in stabilizing trench bottom.
  - 4. If removal of unsuitable material is authorized:
    - a. Replace with crushed rock or clean gravel having same gradation as pipe bedding material.
    - b. Compact replacement material with vibratory or pneumatic tampers.
    - c. Authorized overexcavation and backfill paid for as "Granular Fill Under Pipe."



5. Authorized remedial measures not covered by contract unit prices paid for under provisions of Article 11 in General Conditions.

- F. Excavate by hand:
  1. Under tree roots 3" (75 mm) and larger.
  2. Under and around structures and utilities.

### 3.04 EXCAVATION FOR APPURTENANCES

- A. Excavate as required for appurtenances.
- B. Carry excavation to firm, undisturbed soil.
- C. Unauthorized excavation carried below required depth: Backfill with concrete at no expense to Owner.

### 3.05 SHEETING, SHORING, AND BRACING

- A. Construct sheeting, shoring, and bracing where shown on Drawings and where required to hold walls of excavation to protect existing utilities, trees, structures, and other similar features and to provide protection of employees.
- B. Design of sheeting, shoring, and bracing shall be responsibility of Contractor and shall comply with OSHA requirements.
- C. Sheeting which may be removed, in opinion of Engineer, without endangering utilities or structures shall be considered incidental and shall not be paid for.
- D. When movable trench shield is used below centerline of pipe, it shall be lifted prior to any forward movement to avoid pipe displacement, unless moved by rearward thrusting jacks.

### 3.06 DEWATERING

- A. Execute Work in the dry.
- B. Provide equipment for handling water encountered.
- C. Do not lay pipe or pour concrete on excessively wet soil.
- D. Prevent surface water from flowing into excavation; promptly remove any water accumulated.
- E. Divert stream flow and/or sewage away from areas of construction.
- F. Do not discharge water pumped from excavations to existing sanitary sewers.
- G. Methods used shall not cause settlement or damage to adjacent property.

### 3.07 PIPE BEDDING

- A. Trench bottoms excavated below required elevation: Backfill to proper elevation with bedding material, at no additional expense to Owner.
- B. Bedding shall be placed with bucket or other similar means. Pushing material over edge of trench is prohibited.
- C. Level pipe bedding material to provide support for full length of pipe.

- D. Provide bell holes at each pipe joint; allow access completely around circumference of pipe for proper jointing operations.
- E. Shape pipe bedding with template before placing pipe for pipe sizes greater than 24" (600 mm) diameter. Minimum depth of shaping to be 10% of outside pipe diameter.
- F. Place in layers not to exceed 6" (150 mm) and hand work bedding with shovel to fill voids around underside of pipe. Compact by hand held tamping device to ensure material is compacted around entire pipe. Compact to 85% maximum density as determined by ASTM D698.
- G. Backfill simultaneously on both sides of pipe to prevent displacement.

### 3.08 INITIAL BACKFILL

- A. Backfill trench immediately after locations of connections and appurtenances have been recorded.
- B. Backfill shall be placed with bucket or other similar means. Pushing material over edge of trench is prohibited.
- C. Backfill and compact simultaneously on both sides of pipe to prevent displacement. Place in 6" (150 mm) maximum thick layers. Haunching material for flexible sewer pipe shall be hand worked to fill all voids around pipe and provide adequate side support.
- D. Compaction:
  - 1. Pressure pipe: 85% maximum density, ASTM D698.
  - 2. Rigid sewer pipe: 85% for Class C and 95% for Classes A and B, ASTM D698.
  - 3. Ductile iron gravity sewer pipe: 85% maximum density, ASTM D698.
  - 4. Flexible sewer pipe: 85% maximum density, ASTM D698.

### 3.09 REMAINING BACKFILL

- A. Trenches with center line beneath or closer than 10' (3 m) to paved streets and drives, sidewalks, or curb and gutter: Mechanically or hydraulically compact to 95% maximum density as determined by ASTM D698. Prepare upper portion of trench for surface restoration or pavement replacement.
- B. Trenches with center line beneath or closer than 10' (3 m) to seal coat or gravel surfaced streets and drives: Backfill in layers not to exceed 6" (150 mm); moisten if required; compact to 90% maximum density as determined by ASTM D698; prepare upper portion of trench for surface restoration or pavement replacement.
- C. Trenches with center line more than 10' (3 m) from sidewalks, streets, drives, or curb and gutter: Consolidate by mechanical compaction; fill upper portion of trench with topsoil and prepare for surface restoration; notify Engineer before mounding over trench or leveling off. Subsequent settlement: Refill, compact, and level.
- D. Trenches in specific locations shown or noted: Backfill with excavated material without compaction and mound over trench.
- E. Well-broken excavated rock may be placed in backfill from 2' (600 mm) over top of pipe to within 2' (600 mm) of top of trench.
- F. New pipe below existing water, sewer, or gas main: Backfill under existing water, sewer, or gas main with select backfill; mechanically compact to 95% maximum density as determined by ASTM D698; length of backfill at elevation of existing utility shall extend 5' (1.5 m) each side of existing utility.
- G. Check dams shall be installed during backfilling operations to prevent surface runoff from following trench alignment and causing erosion prior to re-establishment of ground cover.

1. Slopes less than 7.0%: No check dam required.
2. Slopes ranging from 7.0% to 12.0%: Type "B" check dams spaced at intervals of 50' (15 m).
3. Slope exceeding 12.0%: Type "B" check dams spaced at 25' (7.5 m) with Type "A" check dams installed every 100' (30 m).

### 3.10 BACKFILL FOR MANHOLES, APPURTENANCES AND STRUCTURES

- A. Notify Engineer prior to backfilling.
- B. Backfill and compact as required for adjacent trench.
- C. Backfill simultaneously on all sides; protect any waterproofing from damage.

### 3.11 REPAIR AND RESTORATION

- A. Repair, at no additional cost to Owner, existing fences, culverts, and drain tile disturbed by construction.
- B. Contractor fully responsible for liaison with utility companies and for repairing, at no expense to Owner, utilities damaged by Contractor. In event of break in existing water main, gas main, sewer, or electric or communication cable, immediately notify responsible official of organization operating utility affected.
- C. Restore obstructions removed to accommodate equipment or to facilitate excavation.
- D. Perform restoration work under favorable climatic conditions.

### 3.12 SOIL AND MATERIAL TESTING

- A. Moisture-density tests: ASTM D698; minimum of one determination of optimum moisture for each type of soil incorporated into Work.
- B. In-place density tests: ASTM D1556, D2167, or D2922.
  1. Perform tests in areas of backfill and where compaction requirements are specified.
  2. Provide equipment necessary and perform field density tests during course of Work.
  3. Perform tests for fill or backfill at following interval: One test per 500 yd<sup>3</sup> (380 m<sup>3</sup>) at random depths.
- C. Sieve analysis: ASTM C136; minimum of one test on each source of each material of specified gradation unless otherwise specified or provide certified copy of test report from material supplier.
- D. If tests indicate inadequate placement or compaction, Contractor shall correct inadequacies and perform additional tests in same area at no additional cost to Owner.

### 3.13 CLEANUP

- A. Remove brush, rubbish, spoil, excess excavated material, and material not suitable for backfill to off-site location of Contractor's choice.
- B. Remove waste material promptly as it is generated by construction operations; do not permit to accumulate. Cleanup each portion of construction as it is completed.
- C. Cleanup operations in public right-of-way shall be kept within 400' (120 m) of construction operations.
- D. Cleanup and remove rubbish, debris, and surplus material.

- E. Grade disposal areas periodically to reasonably neat surface to provide for drainage and access by others.
- F. Leave Site in neat condition.
- G. Reopen to traffic as soon as practicable.

### 3.14 EROSION CONTROL

- A. Take care to minimize soil erosion during and after construction.
- B. Cover existing storm water inlets adjacent to construction operations and take additional measures necessary to prevent sediment from entering storm sewers.
- C. Disturb only minimum area during construction. Pile excavated material in a manner as to prevent erosion of material. Restore surfaces to prevent erosion.
- D. Remove excess excavated material and debris and dispose of these materials in an acceptable manner to prevent erosion and sedimentation.
- E. Employ erosion control measures and surface restoration procedures, as appropriate, in borrow and waste disposal areas.
- F. Take measures necessary, in addition to those specified herein, to prevent erosion, prevent sediment from entering surface drainage courses, and prevent sediment from being washed onto adjacent areas.
- G. Take positive steps for erosion control. Applicable steps will depend upon site characteristics (soil, slope, drainage, etc.), and construction techniques. Following are offered as possible steps which may be taken:
  - 1. Relative to area drainage, excavated material shall be stored on upstream side of trenches.
  - 2. Straw or hay bales, sandbags, or silt fences placed in drainage channels or at toe of excavation storage piles to serve as sediment dams.
  - 3. Earthen dam with controlled discharge such as overflow pipe, used as a sedimentation pond.
  - 4. Route runoff around excavated areas and excavated storage piles.
  - 5. Mulching with straw and hay, and jute netting, or other mattings, blankets, and netting.
  - 6. Sod or riprap.
  - 7. Temporary seeding.

END OF SECTION

- 1) Patrick M Johnson
- 2) Greg S Shuger

## **PART 1 GENERAL**

### 1.01 SECTION INCLUDES

- A. Soil and material testing.
- B. Excavation, backfilling, and grading for structures.
- C. Excavation and backfilling for conduit and cable.
- D. Dewatering, sheeting, shoring and bracing, and associated work.
- E. Importing backfill and fill materials.
- F. Disposal of excess or unsatisfactory materials.
- G. Underground obstructions.

### 1.02 RELATED REQUIREMENTS

- A. Section 01 45 29 - Testing Laboratory Services.

### 1.03 DEFINITIONS

- A. Support system (per OSHA): Structure such as underpinning, bracing, or shoring, which provides support to adjacent structure, underground installation, or sides of an excavation.
- B. Protective system (per OSHA): Method of protecting employees from cave-ins, from materials that could fall or roll from an excavation face or into an excavation, or from collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, and other systems that provide necessary protection.

### 1.04 MEASUREMENT AND PAYMENT

- A. If quantities of following items are changed from those required by Contract Documents, lump sum Contract Price will be adjusted on basis of unit adjustment prices set forth in Agreement.
  - 1. Structural Earth Excavation, cubic yards (CY): Unit adjustment prices for structural earth excavation includes removal of material; obtaining, placing and compacting backfill as specified; dewatering; sheeting, shoring and bracing; disposal of excavated material as specified; grading; and all other incidental work. Cubic yards of structural earth excavation defined as volume of earth in its original space within neat lines of foundations and footing projections.
  - 2. Granular Fill, cubic yards (CY): Unit adjustment price for granular fill includes furnishing, placing, and compacting as specified. Cubic yards of granular fill defined as volume of material, in final place, as determined by calculation based on customary methods of computation of earthwork quantities within limits specified. Fill materials required by overexcavations or excavations made for Contractor's convenience will not be measured for payment.
  - 3. Structural Fill, cubic yards (CY): Unit adjustment price for structural fill includes furnishing, placing, and compacting as specified. Cubic yards of structural fill defined as volume of material in final place, as determined by calculation based on customary methods of computation of earthwork quantities within limits specified. Fill materials required by overexcavations or excavations made for Contractor's convenience will not be measure for payment.
  - 4. Flowable Fill, cubic yards (CY): Unit adjustment price for flowable fill includes furnishing and placing as specified. Cubic yards of flowable fill defined as volume of material, in final place, as determined by calculation based on customary methods of computation of earthwork quantities within limits specified. Fill materials required by overexcavations or excavations made for Contractor's convenience will not be measured for payment.

## 1.05 INFORMATIONAL SUBMITTALS

- A. Quality assurance data:
  - 1. Material test reports on samples of fill and backfill.
  - 2. Laboratory compaction test reports establishing moisture-density relationships and maximum densities for all fill and backfill.
  - 3. Field in-situ compaction test reports.
  - 4. Test reports and records used to determine adequacy of soils at bottom of excavations.
  - 5. Recommendations for corrections where deviations from Specifications occur or where conditions are considered undesirable.

## 1.06 QUALITY ASSURANCE

- A. Contractor shall retain services of qualified testing laboratory.
- B. Responsibilities of testing laboratory shall include:
  - 1. Sampling and testing of fill or backfill materials prior to and during placement.
  - 2. Sampling and testing to determine moisture-density and maximum density characteristics of materials in accordance with ASTM D1557.
  - 3. Observation of placement, selection of test locations, and testing of material during placement to determine that uniformity of compaction and specified compaction requirements are met. Determine in-place densities in accordance with ASTM D1556, D2167, or D2922.
    - a. Perform tests in areas of backfill and where compaction requirements are specified.
    - b. Provide equipment necessary and perform field density tests during course of Work.
    - c. Perform tests for fill or backfill at following interval: One test per 500 yd<sup>3</sup> (380 m<sup>3</sup>) at random depths.
  - 4. Inspection and approval of soil at bottom of excavation, under foundations, considering settlement and load-bearing characteristics of soil and design bearing capacity.
  - 5. Providing reports to Owner's Representative giving information on materials and testing performed.
  - 6. Making recommendations to Owner's Representative where deviation from Specifications occur or conditions are considered undesirable.
- C. Drilled caisson inspection:
  - 1. Each drilled caisson shall be inspected by Owner's Representative at completion of shaft, and completion of reinforcing steel placement before next stage of construction is continued.
  - 2. Furnish equipment and personnel and assist in inspection of bottoms of shaft.
  - 3. Drilled caissons will be inspected from surface.

## 1.07 EXISTING CONDITIONS

- A. Known underground piping, foundations, and other underground obstructions in vicinity of new construction are shown on Drawings.
- B. Protect underground facilities encountered during excavation until it is determined whether they are active or inactive. Repair, without compensation, existing active facilities damaged during operations.
- C. Notify Owner's Representative of unexpected subsurface conditions and discontinue Work in area until Owner's Representative provides notification to resume Work.

## PART 2 PRODUCTS

### 2.01 MATERIAL - GENERAL

- A. Use suitable material removed from excavations or obtained from off-site borrow areas unless shown or specified otherwise.
- B. Exclude debris, stones larger than 1" (25 mm), roots, organic or frozen material, expansive material and other deleterious materials.

C. Type: Excavated or imported material conforming to one of following ASTM D2487 (Unified Soil Classification System) classifications: GW, GP, SW, or SP.

D. Use for all backfill except where specified otherwise.

## 2.02 GRANULAR FILL

A. Type: Material conforming to one of the following ASTM D2487 (Unified Soil Classification System) classifications: SW or SP.

B. Material shall be free of earth, clay, or other foreign substances.

C. Use where shown on Drawings.

## 2.03 STRUCTURAL FILL

A. Type: Material conforming to one of the following ASTM D2487 (Unified Soil Classification System) classifications: GW, GP, SW, or SP.

B. Structural fill shall consist of non-frost susceptible material when used as backfill adjacent to or below foundations. Material that becomes unstable when wet shall not be used.

C. Submit material source and classification to Engineer for review. Use of expansive material is prohibited.

D. Borrow materials proposed shall be tested by Contractor's testing agency and approved by Engineer prior to use on site.

E. Use for all backfill except where specified otherwise.

## 2.04 FLOWABLE FILL

A. Controlled low strength grout mix using Portland cement, fly ash, fine aggregates, water, and specified admixture:

1. Water content of mix should be adjusted to obtain maximum 3" (75 mm) initial slump prior to incorporating admixture.
2. Slump after incorporating admixture: great than or equal to 8" (200 mm).
3. Air content: 15 – 35%.
4. 3-day age compressive strength: Not less than 70 psi.
5. 28-day age compressive strength: 100 to 200 psi.

B. Admixture: Rheocell Rheofill by Master Builders Technologies, or equal.

C. Use:

1. For oil/water separator drain pipe trench backfill or other locations noted on Drawings.
2. At Contractor's option, for pipe bedding material for all pipes, all locations.

D. Contractor shall prevent pipe from floating.

## 2.05 SUPPORT AND PROTECTION SYSTEMS

A. Provide support and protection systems where shown and where required to protect public, workers, and existing and new utilities, property and structures.

B. Design of support and protection systems shall be responsibility of Contractor and shall conform to OSHA requirements.

- C. Design of system shall include:
  - 1. Loading effects from:
    - a. Soil.
    - b. Ground water.
    - c. Surcharge loading (construction and public traffic on adjacent roadways).
    - d. Existing structures dead load and live load.
  - 2. Consideration of effects on existing structures including vibration and settlement. Installation and removal of support systems shall not cause damage to existing facilities.

### **PART 3 EXECUTION**

#### **3.01 EARTH EXCAVATION**

- A. Excavate as required for construction work.
- B. Use special care when excavating under and around existing facilities. Support existing facilities and earth under facilities to prevent settlement resulting from construction operations.
- C. Excavation for soil supported foundations:
  - 1. Excavate to elevations shown. Owner's Representative shall inspect and approve soil at foundation levels shown.
  - 2. Additional payment will be made to Contractor for excavation of unsuitable soils on basis of unit adjustment price set forth in Agreement.
  - 3. Fill with concrete, at no expense to Owner, unauthorized excavations carried below bottoms of foundation levels shown.
  - 4. Trim excavations by hand to remove material disturbed by machine excavation; produce neat, plane surface at elevation of bottom of footing.
- D. Excavation for conduit and cable:
  - 1. Excavate to depths indicated or specified.
  - 2. Use special care when excavating near existing foundations and utilities. Excavate by hand in such areas.
  - 3. After installation of conduit or cable, backfill with materials from excavation. Exclude large stones, organic material, rubbish, and frozen material from backfill.
  - 4. Compact to density of adjacent soil.

#### **3.02 DRILLED CAISSON EXCAVATION**

- A. Excavate drilled caissons in manner that will produce depths and diameters shown. Furnish and install temporary steel casing in hole as necessary for protection of personnel and adjacent construction, to prevent cave-ins and displacement of earth, and for exclusion of ground water. Casings shall be smooth steel cylinders having an outside diameter greater than or equal to required diameter of caisson shaft. Wall thickness shall be sufficient to withstand collapsing pressures.
- B. Diameter of drilled caissons at Contractor's option, may be larger diameter, provided there is no additional cost to Owner.
- C. Seal off groundwater by seating casing below bottom of wet strata into impervious material.
- D. Remove ground water and drilling debris to produce clean hole for determination of depth, examination of bearing material, and condition of casing.
- E. Should it be determined during inspection that hole drilled to estimated elevation has not reached suitable material, perform additional Work to provide required drilled caisson capacity.
- F. Holes shall be drilled in sequence to avoid damage to previously completed work and minimize delay or interruptions to work by others.



- G. Fill with concrete, at no additional expense to Owner, unauthorized excavations carried below required bottoms of drilled caisson.
- H. Provide cover for caisson shafts for protection of personnel and to prevent entrance of foreign materials.
- I. Dispose of excavated material as specified.
- J. Do not allow personnel to enter caisson excavation. Perform inspections from surface.

### 3.03 FILL AND BACKFILL

- A. Backfilling around structures:
  - 1. Backfill after concrete has attained sufficient strength to withstand backfill pressures without detrimental effects.
  - 2. Prevent displacement of construction during backfilling operations; backfill opposite sides simultaneously.
- B. Fill to elevations or grades shown on Drawings and required for drainage. Maintain surface and slopes for drainage during operations.
- C. Placement:
  - 1. Maintain surfaces free of water, debris and excessively wet, frozen, and other deleterious materials.
  - 2. Place backfill and fill materials in successive horizontal layers not more than 9" (225 mm) in loose depth.
  - 3. Place materials at proper moisture content for obtaining densities as specified. Generally maintain within 2% of optimum.
  - 4. Material too dry or too wet to compact properly shall be moistened or aerated to extent necessary to produce desired results.
- D. Compaction:
  - 1. Compact backfill and fill to at least 95% of maximum density as determined by ASTM D1557.
  - 2. Sampling and testing shall be performed in each layer of fill and backfill placed to confirm adequacy of compaction.
  - 3. Pneumatic tired rollers, sheepsfoot type heavy mechanical tamping rollers or heavy vibratory compactors shall not be used within 6' of structure, walls, pipes, or other construction which might be damaged by compaction equipment.

### 3.04 DEWATERING

- A. Furnish, install, and remove dewatering equipment necessary to drain and keep excavations free of water under all circumstances.
- B. Prevent surface water from flowing into excavations; promptly remove any water accumulated.
- C. Maintain dewatering operations until Work area is accepted as complete.

### 3.05 SHEETING, SHORING AND BRACING

- A. Provide sheeting, shoring and bracing where required to hold walls of excavation and to protect workers and property. Contractor shall be responsible for proper sizing and placement of Work.
- B. Remove sheeting, shoring and bracing in manner to avoid damage or disturbance to Work. Leave sheeting and shoring in place, where removal will endanger Work, adjacent construction or personnel.

### 3.06 SITE GRADING

- A. Grade areas disturbed by construction operations.
- B. Finish grade to smooth, uniformly sloping surfaces to elevations shown and required for drainage.
- C. Fill depressions and provide for positive drainage away from buildings and structures.

### 3.07 DISPOSAL OF MATERIAL

- A. Dispose of excess and unsuitable excavated material off site in disposal area obtained by Contractor.
- B. Dispose of debris, large stones, rocks, roots, and organic materials off site in disposal area obtained by Contractor.

END OF SECTION

- 1) Hannah Henry
- 2) Jason L. Varone

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Aggregate surfacing including subgrade preparation, hauling, spreading, compacting, and material tests.

## 1.02 QUALITY ASSURANCE

- A. Provide testing of materials and field compaction.
- B. Refer to Section 01 45 29.

**PART 2 PRODUCTS**

## 2.01 MATERIALS

- A. Surface aggregate shall be gravel, crushed gravel, crushed stone, or crushed slag, meeting Illinois Department of Transportation (DOT) gradation CA-7.
- B. Base aggregate shall be gravel, crushed gravel, crushed stone, or crushed slag, meeting Illinois DOT gradation CA-1.

**PART 3 EXECUTION**

## 3.01 CONSTRUCTION

- A. Prior to placing aggregate, prepare subgrade in accordance with Section 31 22 00.
- B. Deposit aggregate in its final position with spreader. Compact surface of aggregate with a pneumatic-tired roller. Surface shall be rolled at least four times and compacted to minimum of 95% of maximum dry density as determined by ASTM D698. If moisture content of aggregate is insufficient to permit specified compaction during rolling operations, add sufficient water to obtain specified compaction.
- C. Provide laboratory test results indicating conformance to article "Materials."
- D. Provide moisture density laboratory test conforming to ASTM D698.
- E. In-place density tests: Perform at least 10 tests conforming to ASTM D1556 on aggregate surfacing during course of work.

END OF SECTION

- 1) Patrick M. Johnson
- 2) Greg S. Shuger

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Finish grading.
- B. Seeding and fertilizing.
- C. Erosion control.
- D. Maintaining seeded areas until acceptance.

## 1.02 TEMPORARY FACILITIES

- A. Water supply:
  - 1. Make necessary arrangements, at own expense, to ensure an adequate supply of potable water.
  - 2. Owner will supply adequate supply of potable water on site.
  - 3. Furnish necessary hose, equipment, attachments, and accessories for adequate watering of turf areas, as needed.

## 1.03 QUALITY ASSURANCE

- A. Supply producer's guaranteed statement of analysis for percentages of mixtures, purity, germination, weed seed content, inert material, net weight, year of production, and date and location of packaging of seed.
- B. Supply manufacturer's guaranteed statement of analysis, types of nutrients, and weight of fertilizer.
- C. Test topsoil in accordance with Section 01 45 29.
- D. Supply written analysis stating N, P, and K requirements, organic matter content, and pH value of soil.

## 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed in original sealed packages bearing producer's guaranteed statement of analysis for percentages of mixtures, purity, germination, weed seed content, inert material, year of production, date and location of packaging, and net weight. Packages shall be labeled in conformance to U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act, and seed laws of the State of Illinois. Seed that has become wet, moldy, or otherwise damaged will be rejected.
- B. Fertilizer supplied in closed containers shall be delivered in waterproof bags showing weight, types of nutrients, and manufacturer's guaranteed statement of analysis.
- C. Fertilizer supplied in bulk shall be accompanied by bill-of-lading giving weight, types of nutrients, and certificate of manufacturer's guaranteed statement of analysis, for each shipment.

**PART 2 PRODUCTS**

## 2.01 GROWING MEDIA

- A. Fertilizer:
  - 1. Preplanting fertilizer: Dry commercial ready-mixed material, produced in pelleted or granular form; uniform in composition and free flowing. Fertilizer shall be applied at a rate of 270 lb per acre at a 1:1:1 ratio as follows: nitrogen fertilizer nutrients (90 lb/acre); phosphorus fertilizer nutrients (90 lb/acre); potassium fertilizer nutrients (90 lb/acre).

## 2.02 SEED

- A. Seed shall be seed of latest season's crop, State Certified by the State of Illinois.
- B. Seed mixture:

Percentage	Pure Seed	Germination (%)	Origin
39.80	Creeping Red Fescue	92	CAN
29.18	Accent Perennial Ryegrass	92	OR
19.81	Durar Hard Fescue	85	OR
9.91	Bluechip Kentucky Bluegrass	85	WA
0.96	Inert Matter		
0.29	Crop		
0.05	Weed		
None	Noxious Weeds		

## 2.03 ACCESSORIES

- A. Excelsior blanket: Mat of interlocking curled wood excelsior, with consistent thickness, and fiber evenly distributed. One side of blanket shall be covered with mesh of woven cotton cord, twisted paper cord, or biodegradable extruded plastic mesh, with openings not less than 5/8" x 5/8" (16 mm x 16 mm), and not exceeding 1" by 2" (25 mm by 50 mm). Minimum weight of blanket shall be 0.63 lb/sq yd. American Excelsior Co., or equal. Staples shall be 11-gage wire, "U" shaped, with minimum crown width of 1" (25 mm) and minimum leg length of 8" (200 mm).

## PART 3 EXECUTION

### 3.01 FINISH GRADING

- A. Grade to uniformly sloping surfaces and to elevations shown on Drawings.
- B. Slope finish grade to provide positive surface drainage away from buildings and other structures.
- C. Thoroughly till soil to a minimum depth of 4" (100 mm) by roto-tilling, disking, harrowing, or other method. Soil shall not be tilled when it is frozen, excessively wet or dry, or otherwise untillable.
- D. Remove from site, all rocks, clods, roots, or other foreign materials larger than 1" (25 mm) in any dimension.
- E. Finish grade shall be free of all holes, rills, or gullies caused by erosion or construction operations.
- F. Finished ground level shall be firm to prevent sinkage pockets when watered.

### 3.02 FERTILIZING

- A. Uniformly apply preplanting fertilizer at rate of 270 lb/acre.
- B. Incorporate amendments into soil to an average depth of 1" (25 mm) by raking, rototilling, disking, harrowing, or other method.
- C. Do not apply grass seed and fertilizer at same time, in same machine.

### 3.03 SEEDING

- A. Turfed area: Establish turf to limits of graded areas not to be covered by buildings or structures, planting areas, paving, or other surfacing; and on any original turf areas disturbed by new construction.

- B. Planting time:
1. Sow seed only at times of year when temperature, moisture, and climatic conditions will promote germination and plant growth.
  2. Sow seed during periods from April 1 to June 15 or from August 1 to November 1.
  3. No seed shall be sown during high winds, when soil is frozen or snow covered, or when soil is excessively wet or dry, or in any other condition unsatisfactory for planting.
  4. Sow seed immediately after preparation of seedbed. At time of seeding, soil shall be friable, and moist but not muddy, with top 2" (50 mm) cleaned of stones or debris over 1" (25 mm) in any dimension. Soil surface shall be smooth and free of irregularities.
- C. Sowing:
1. Sow seed at rate of 200 lb/acre.
  2. Method of sowing shall be Contractor's option.
  3. When broadcast seeder is used, seed shall be uniformly distributed and then covered to an average depth of 1/4" (6 mm) by means of light harrow, cultipacker, hand rake, or other device.
  4. When grass seed drill is used, drill shall be operated generally perpendicular to direction of surface drainage whenever practical. Seed shall be drilled uniformly to average depth of 1/4" (6 mm).
  5. When drop seeder is used, seed shall be uniformly distributed with no gaps. If seeder is not equipped with means to cover seed, seed shall be covered to average depth of 1/4" (6 mm) by means of light harrow, cultipacker, hand rake, or other device.
  6. When hydraulic planter/mulcher is used, it shall have continuous agitation action which keeps seed mixed in uniform distribution in water slurry until pumped from tank.
    - a. Apply slurry within one hour after seed is added to tank. Seed which is allowed to remain mixed in slurry for longer than one hour will not be accepted for use.
    - b. Application of prilled fertilizer with seed in single operation may be substituted for application of preplanting and postplanting fertilizer.
- D. Apply slurry at rate of 1,000 gal/acre evenly in 2 intersecting directions.

### 3.04 EROSION CONTROL

- A. Immediately after seeding has been performed, apply erosion control matting to areas designated on Drawings.
- B. Excelsior blanket:
1. Lay either parallel or perpendicular to slope, with netting on top and fibers in contact with soil.
  2. Stapling:
    - a. Strip ends: 1' (300 mm) centers.
    - b. Adjoining strip ends: Butted snugly, common row of staples on 1' (300 mm) centers.
    - c. Edges: 6' (1,800 mm) centers.
    - d. Adjoining edges: Butted snugly, common row of staples on 6' (1,800 mm) centers.
    - e. Strip centers: 6' (1,800 mm) centers.

### 3.05 CLEANUP

- A. Clean up daily during progress of Work and at completion.
- B. Remove from Project site surplus materials and any debris resulting from turfing Work.
- C. Turfed areas shall be neatly dressed and finished. Walks, paved areas, and adjacent walls and windows shall be flushed clean.

### 3.06 MAINTENANCE

- A. Remove excelsior blanket after the seed has germinated (approximately 4-6 weeks after installation), if it is not breaking down and disintegrating. If the seed has not germinated, contractor shall seed again, install new fertilizer, and blanket, and return in 4-6 weeks or as directed by Owner's Representative.

- B. Costs of reseeding or remulching required because of faulty operations or negligence on part of Contractor shall be borne by Contractor. Any areas reseeded shall have turf establishment period beginning upon reseeding or resodding and of duration as hereinbefore specified. Owner will assume risk for loss or damage due to beneficial occupancy of Project in any part, vandalism, damage by animals or fire, or losses due to curtailment of water by local authority, or due to "Acts of God" (floods, winds of 60 mph (100 kmph) or more, or heavy hail).
- C. Watering: Water turfed areas immediately after planting and thereafter as necessary to maintain adequate moisture for promotion of deep root growth. Water shall be applied in such a way that ruts will not be made in soil surface.
- D. Protection: Provide temporary protective fences, barriers, and signs where deemed necessary by Owner's Representative.
- E. Reseeding: When directed by Owner's Representative, reseed areas on which original seed has failed to grow. Reseeding shall be performed as specified herein for seeding, and in manner that will cause minimum disturbance to existing stand of grass.
- F. Remulching: When directed by Owner's Representative, remulch areas on which original mulch has eroded, washed, or blown off. Remulching shall be performed as specified herein for mulching, and in manner that will cause minimum disturbance to existing stand of grass.

### 3.07 ACCEPTANCE

- A. Final walkthrough acceptance of landscaping will be performed a minimum of 6 weeks after completion to ensure grass has taken.
- B. At time of inspection, turf shall exhibit healthy, vigorous growth, shall be uniform in color and quality, and shall be reasonably free of weeds, diseases, or other visible imperfections.
- C. At time of inspection, grassed area shall contain no bare spots greater than 2 sq ft (0.20 m<sup>2</sup>) in size.
- D. Any turf areas not accepted by Owner's Representative shall be replanted.
- E. Upon final acceptance of turf area, remove temporary fences, barriers, and signs installed for protection of that area. Contractor will be relieved of further responsibility for care and maintenance of accepted area.

END OF SECTION

- 1) Patrick M. Johnson
- 2) Greg S. Shuger

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Medium-voltage cable and related splices, terminations, and accessories for cables rated at or above 2001 volts and at or below 35 kV.

## 1.02 WORK BY OTHERS

- A. Receiving, unloading and storing of cable.
- B. Installation and termination of cable.
- C. Quality assurance data:
  - 1. Certified manufacturer test reports in accordance with AEIC and ICEA.
  - 2. Cable test data report in accordance with AEIC and ICEA for each lot and type of cable.
  - 3. Pulling tension and side wall pressure calculations if requested by Engineer.
  - 4. Submit documented installer experience if requested by Engineer.

## 1.03 INFORMATIONAL SUBMITTALS

- A. Submit with Bid for each cable type supplied:
  - 1. Completed Data Sheets.
  - 2. Cable damage curves.
  - 3. List of recommended cable pulling lubricants.

## 1.04 ACTION SUBMITTALS

- A. Shop Drawings:
  - 1. Completed and updated Data Sheets.
  - 2. Detailed drawings and manufacturer information for accessories.

## 1.05 CLOSEOUT SUBMITTALS

- A. Operation and maintenance manuals. Provide at a minimum:
  - 1. General description and technical data.
  - 2. List accessories supplied, listing manufacturer, model number and operating ranges.
  - 3. Receiving, storage, installation, and testing instructions.
  - 4. Complete documentation of inspections and tests performed, including logs, curves, and certificates.

## 1.06 QUALITY ASSURANCE

- A. Installer qualifications: Installer shall have minimum of 10 years documented experience as an installer of medium-voltage electrical systems, medium-voltage cable, and medium-voltage terminations and splices.
- B. Manufacturer's qualifications:
  - 1. Manufacturer of cable and any accessories shall be ISO certified.
  - 2. Manufacturer shall have produced similar equipment for a minimum period of 5 years.
  - 3. When requested by Engineer, provide acceptable list of similar equipment installations complying with requirements of this Section.
- C. Regulatory requirements:
  - 1. Cables and accessories shall be in accordance with applicable standards
    - a. Armored and unarmored shielded power cable ICEA S-93-639 and NEMA WC74.
    - b. IEEE 383, ASTM B3 and B8, UL 1072.



- c. NETA Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
  - d. AIEC CS6.
  - e. IEEE 48 and IEEE 386.
2. Standards of foreign organizations shall not be used without written approval from Engineer.
- D. Cable shall not have had more than 1 year elapse from date of manufacture to date of delivery to job Site.
- E. Testing services: Employ and pay for services of qualified independent testing agency to perform field quality control testing. Test equipment shall be calibrated within 3 months prior to cable test date. Certified test reports shall be furnished to Owner. Interpretation of test results with regards to compliance to this specification shall accompany test reports.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate transportation with requirements of pertinent authorities.
- B. Cover and protect cable and accessories from damage during shipment.
- C. Dispose of nonreturnable reels. Return recyclable reels to cable manufacturer.
- D. Ensure reel lengths accommodate continuous pull lengths required. Splicing not allowed unless specifically shown on Drawings.
- E. Cable ends on cable reels shall be available for testing. Cable ends, whether exposed or concealed, shall be sealed with heat shrinkable caps. Cap sizes shall be as recommended by cap manufacturer for cable OD and insulation. Caps shall contain sufficient adhesive so shrinkage of cap during application result in formation of positive water seal capable of withstanding complete immersion or totally exposed storage over a period of several months without permitting entrance of moisture.
- F. Prepare detailed packing lists and shipping notification for items shipped.

## **PART 2 PRODUCTS**

### 2.01 MANUFACTURERS

- A. Kerite.
- B. Okonite.

### 2.02 SYSTEM DESCRIPTION

- A. Components may include, but are not limited to:
  - 1. Tape.
  - 2. Break out boots.
  - 3. Lugs and termination kits.
  - 4. Strain relief devices.
  - 5. Splices.
- B. Asbestos in any form is prohibited from cable, including fillers and binding tapes even if encapsulated or if asbestos fibers are impregnated with binder material.

### 2.03 POWER CABLE

- A. Single-conductor and multi-conductor, unarmored:
  - 1. Conductor material: In accordance with Data Sheet.
  - 2. Stranding: Class B.

3. Cable sizes and types: In accordance with Data Sheet.
4. Insulation levels and voltage classes: in accordance with Data Sheet.
5. Temperature: 90°C continuous; 140°C emergency; and 250°C short circuit.
6. Conductor semi-conductor shield: Extruded semi-conducting, thermosetting polymeric layer over conductor applied in tandem with and firmly bonded to insulation, and shall be free stripping from conductor.
7. Conductor insulation: in accordance with Data Sheets. If specified on Data Sheets, provide ethylene propylene rubber (EPR) with minimum dielectric strength of 3.2 and minimum impulse strength of 1,500 V/mil.
8. Insulation semi-conductor shield: Cover insulation with extruded semi-conducting thermosetting material.
9. Metallic shield: In accordance with Data Sheet.
10. Jacket: Provide in accordance with Data Sheet.
11. Multiconductor cable shall be rounded with nonhygroscopic fillers. Solid, extruded fillers not permitted. Install grounding conductor in one outer filler interstice and cover with binder tape.
12. Cable shall be rated for use in cable tray, aerial, direct burial, conduit, and underground duct installations. Cables smaller than No. 1/0 AWG (70 mm<sup>2</sup>) shall be provided in multiconductor cable either 3/C or 4/C with ground.
13. Cable assemblies shall be tested and shall pass ICEA 70,000 Btu/hr and 210,000 Btu/hr vertical tray flame tests.

B. Multiconductor, armored:

1. Conductor material: In accordance with Data Sheet.
2. Stranding: Compact, Class B.
3. Cable size and type: In accordance with Data Sheets.
4. Ground conductor: Class B compressed concentric stranded bare copper.
5. Insulation level and voltage class: In accordance with Data Sheets.
6. Temperature: 105°C continuous, 140°C emergency and 250°C short circuit.
7. Conductor shield: Extruded semi-conducting, thermosetting polymeric layer over conductor applied in tandem with and firmly bonded to insulation, and shall be free stripping from conductor.
8. Conductor insulation: In accordance with Data Sheets. If specified on Data Sheets, provide ethylene propylene rubber (EPR) with minimum dielectric strength of 3.2 and minimum impulse strength of 1,500 V/mil.
9. Insulation shield: Cover insulation with extruded semi-conducting thermosetting material.
10. Metallic shield: Helically applied, minimum 5-mil, nonmagnetic, uncoated copper tape over insulation with minimum lap of 12.5 and a helically applied overall binder tape.
11. Armor: Single strip of interlocked or continuously welded and corrugated aluminum armor applied over cable assembly.
12. Armor jacket: Sunlight-resistant, red or yellow PVC conforming to IEEE 1202 and ICEA T-29-520 vertical cable tray flame tests.
13. Multiconductor cable shall be rounded with nonhygroscopic fillers. Solid, extruded fillers not permitted. Install grounding conductor in one outer filler interstice and cover with binder tape.
14. Cable shall be rated for installation in cable tray.

## 2.04 CABLE MARKING

A. Surface print each length of conductor or cable at least every 3' (1 m) with:

1. Voltage rating.
2. Conductor size.
3. Conductor quantity.
4. Conductor material.
5. Insulation type.
6. Manufacturer's identification.
7. Running length of cable.

B. Permanently attach metal tags to both sides of each cable reel displaying:

1. Manufacturer.
2. Date of manufacture.
3. Job order number.

4. Unique reel identification number.
5. Purchaser's name.
6. Voltage rating.
7. Conductor size.
8. Conductor quantity.
9. Feet on reel.
10. As shipped weight of cable and reel.

## 2.05 SPLICING

- A. Splices not allowed unless specifically shown on Drawings.
- B. Splice kits: 3M "Cold Shrink" for shielded cable or as recommended by manufacturer for specific application.
- C. Use compression-type, 2-hole lugs with corrosion-resistant bolting material or compression barrel connectors.
- D. Shield shall be appropriately connected at splice to provide continuous shield for complete cable installation.

## 2.06 TERMINATIONS

- A. Design terminations for shielded cables and include shield ground strap. Only Class 1 terminations acceptable.
- B. Termination kits: 3M "Cold Shrink" silicon rubber; compression-type connectors and lugs. Field-verify lug type and arrangement with equipment configurations.

## 2.07 UNDERGROUND WARNING TAPE

- A. Use: Underground installation including direct-buried cable, direct-buried conduit and concrete-encased duct banks.
- B. Type and size: Permanent, vinyl; not less than 6" wide x 4 mils thick (150 mm wide x 0.102 mm thick).
- C. Compounded for permanent direct-burial service.
- D. Embedded continuous metallic strip or core.
- E. Printed legend shall indicate type of underground line.

## 2.08 SOURCE QUALITY CONTROL

- A. Factory-test cables in accordance with AEIC CS6.
- B. Submit certificate of compliance and manufacturer's test reports showing results of tests required by AEIC CS6. Reports shall include reel numbers for tests performed on each length of completed cable.
- C. Include manufacturer's flame test data in test reports. Prototype data is acceptable instead of flame testing, as long as conductor size, insulating and jacketing materials, and insulation and jacket thickness are same as worst-case flame test configuration being provided.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's recommendations, IEEE 576 and Section 26 05 00.
- B. Perform pulling tension and side wall pressure calculations for each pull. If requested by Engineer, submit data verifying compliance with manufacturer's recommendations.
- C. Support cables in accordance with requirements of NEC.
- D. Install direct-buried cables in minimum 3" (80 mm) thick bed of clean sand. Separate multiple sets of 3-phase cables by minimum of 4" (105 mm).
- E. Place underground warning tape 6" to 12" (150 mm to 300 mm) above electrical lines.
- F. Install underground cables with minimum earth cover to final grade in accordance with NEC requirements.
- G. Cable installed underground in cable vaults, manholes, and hand holes shall have arc-proof taping installed for additional protection. Clean cable sheath and apply half-lap layer of tape. Secure with electrical tape in accordance with manufacturer's instructions.
- H. Unarmored cable installed in cable tray shall transition out of cable tray by use of conduit or wireway, or as allowed by the NEC. Armored cable may transition out of cable tray without use of conduit or wireway as long as it is supported by approved methods. Cable glands shall be used where conduit or wireway is not provided.
- I. Cable in cable tray:
  - 1. Install single conductor cables in triplexed or quadruplexed configuration. Maintain free air space minimum 2.15 x cable OD of largest conductor in group and adjacent conductor configurations or cable. Refer to corresponding sections of NEC for acceptable ampacity tables.
  - 2. Install multiconductor cables with maintained spacing of not less than one cable diameter of largest cable, between cables.
- J. Terminations and shields.
  - 1. Install terminations at ends of conductors with standard kits. Comply with kit manufacturer's written instructions and with classes of terminations indicated.
  - 2. Provide break out boots for multiconductor cables.
  - 3. Connect shield ground strap to cable shield after cable passes through ground sensors. Route ground shield strap back through ground sensor to cancel effect of circulating currents.
  - 4. Connect shields to ground on both ends of cable. Connection of shield to a shield ground strap shall be with solder and mechanical clamp.
- K. Provide cable tagging including phase indication and cable number identification in accordance with Section 26 05 00.
- L. In manholes, handholes, pull boxes, junction boxes, and cable vaults, train cable through walls by longest route from entry and exit. Support cables at intervals adequate to prevent sag.
- M. Install cable accessories in accordance with manufacturer's recommendations and as shown on Drawings.
- N. Use heat shrinkable caps for storing unused cable.

### 3.02 FIELD QUALITY CONTROL

- A. Cable insulation test: Conductors with insulation rated 5,000 volts and above shall be given high-voltage dc insulation test (Hi-Pot).
  - 1. Ampacity of direct current testing equipment shall be at least 2,500 microamperes.
  - 2. Final test voltages and duration of test shall be in accordance with cable manufacturer's recommendations.
  - 3. Test procedures shall conform to IEEE STD 400.
  - 4. Competent personnel specializing in electrical cable testing shall perform tests.
  - 5. Perform test on completed cable installation. Perform test done after installation of termination kits and splice kits. Cable shall be isolated from equipment.
  
- B. If equipment or system fails to function properly, make necessary corrections, including replacement, at no cost to Owner, and after such corrections are completed, demonstrate to Engineer that equipment or system functions properly.

<b>DATA SHEETS MEDIUM-VOLTAGE CABLE</b>		<b>Equipment Name:12.47kV Transformer – Swgr Tie</b>	
<b>DESCRIPTION</b>		<b>UNITS</b>	<b>SPEC DATA</b>
		<b>Tag No.:</b>	<b>Ref. No.:</b>
		<b>VENDOR DATA</b>	
Cable Manufacturer	-	By Manufacturer	
Cable Catalog No.	-	By Manufacturer	
Location of Manufacturer	-	By Manufacturer	
Voltage Class (5, 8, 15, 25, 35)	kV	15	
Temperature: MV-90 or MV-105	-	MV-90	
Voltage Insulation Level: 100% or 133%	%	133	
Conductor			
Conductor Size	kcmil or AWG	1000	
Conductor Material	Cu/Al/Tinned Cu	Cu	
Conductors per Cable: (1/C, 3/C or 4/C)	#/C	1	
Ground Conductor			
Conductor Size	kcmil or AWG	(2) 4/0	
Conductor material	Cu/Al/Tinned Cu	Cu	
Shield			
Shield material	Cu/Al/Tinned Cu	Cu	
Tape or wires	-	Wire	
Size	-	1/3 neutral	
Insulation type	-	EPR	
Jacket type	-	CSPE	
Armored	Y/N	N	
Rated for Installation in Cable Tray (CT Rated)	Y/N	Y	
Cable O.D.	in.	By Manufacturer	
Weight	lb/1000'	By Manufacturer	
Insulation thickness	in.	By Manufacturer	
Jacket thickness	in.	By Manufacturer	
Maximum pulling tension per cable	lb.	By Manufacturer	
Maximum sidewall bearing pressure	lb.	By Manufacturer	
Minimum bending radius	in.	By Manufacturer	
Maximum reel length available	ft.	By Manufacturer	
<b>Accessories:</b>			
Splice Kits			
Required	Y/N	N	
Manufacturer and Model Number	-		
Lugs			
Required	Y/N	Y	
Manufacturer and Model Number	-	By Manufacturer	
Termination Kits			
Required	Y/N	Y	
Manufacturer and Model Number	-	By Manufacturer	

<b>DATA SHEETS</b> <b>MEDIUM-VOLTAGE CABLE</b>	<b>Equipment Name:12.47kV Transformer – Swgr Tie</b> <b>Tag No.: Ref. No.:</b>		
<b>DESCRIPTION</b>	<b>UNITS</b>	<b>SPEC DATA</b>	<b>VENDOR DATA</b>
Special Requirements:			

END OF SECTION

- 1) Philip E. Schulz
- 2) Eric M. Cole

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- A. Substation equipment and hardware including switches, surge arresters, and transformers.

## 1.02 WORK BY OTHERS

- A. Receiving and storage of equipment.
- B. Final placement and assembly.
- C. Power, control and grounding connections.

## 1.03 INFORMATIONAL SUBMITTALS

- A. Submit with Bid:
  - 1. Completed Data Sheets.
  - 2. Manufacturer, rating, and type of each piece of equipment to be furnished.
  - 3. Maximum loads which can be supported by switch terminal pads.
  - 4. Complete data and listing of items requiring field assembly and installation.
- B. Product Data
  - 1. Detailed list of materials identifying manufacturer and type.
  - 2. Complete instruction manuals and parts list for all equipment furnished.
  - 3. Manufacturer's catalog numbers on all standard components and accessories. Submit additional data when requested.
  - 4. Maximum loads which can be supported by switch terminal pads.
  - 5. List of miscellaneous materials proposed, including conduit, conductor, and accessories, identifying manufacturer and type.
  - 6. Special construction techniques required.
  - 7. Component and accessories list.
  - 8. Ratings and nameplate information.
  - 9. Installation information.
- C. Quality assurance data:
  - 1. Current transformer excitation and ratio correction factor curves.
  - 2. Equipment performance data and operating characteristics.
  - 3. Certified production test data and reports.
  - 4. Test reports for previous design, and documentation showing previous design ratings and configurations.
  - 5. Certified copy of manufacturer's field representative report if field service provided.
- D. Manufacturer's instructions: Provide detailed manufacturer's installation instructions and drawings including, but not limited to:
  - 1. Interior and exterior of equipment cleaning and debris removal prior to placing into service.
  - 2. Group-operated disconnect switches: Installation and alignment requirements.
  - 3. Circuit switchers: Installation along with terminal and ground connections requirements.
  - 4. Power fuses: Installation and alignment for proper operation and contact wipe.
  - 5. Voltage transformers: Installation instructions and terminal and ground connections.
  - 6. Coupling capacitor voltage transformers. Installation instructions and terminal and ground connections.



#### 1.04 ACTION SUBMITTALS

- A. Product Data: Certified Data Sheets.
- B. Shop Drawings:
  - 1. Certified nameplate, outline, general arrangement, assembly, and installation details drawings for major items of equipment furnished.
  - 2. Complete "engineered layout" drawings for each type of group-operated switch, including mounting layout details of all operating mechanism components and accessories.
  - 3. Shop drawings on nonstandard components.
  - 4. Certified elevation and outline drawings with dimensions.
  - 5. Certified plan view drawings with dimensions.
  - 6. Interface coordination details.
  - 7. Wiring and termination drawings.
  - 8. Complete schematic and connection diagrams for motor operators if specified on Data Sheets.

#### 1.05 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data. Provide, at minimum:
  - 1. General description and technical data.
  - 2. Receiving, storage, installation, and testing instructions.
  - 3. Operating and maintenance procedures.
  - 4. Complete set of final drawings.
  - 5. Complete documentation of inspections and tests performed, including any logs, curves, and certificates. Documentation shall note any replacement of equipment or components that failed during testing.
  - 6. Spare parts lists.
  - 7. Installation field reports.
  - 8. Data sheets updated to reflect field installation conditions.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer qualifications:
  - 1. Manufacturer of equipment shall be manufacturer of major components within assembly.
  - 2. ISO 9000 certified.
  - 3. Manufacturer shall have produced similar electrical equipment for a minimum period of 5 years.
  - 4. When requested by Engineer, provide acceptable list of similar equipment installations complying with requirements of this specification.
- B. Regulatory requirements:
  - 1. Design, fabricate, and test equipment in accordance with applicable standards of ANSI, NEMA, NFPA 70, IEEE, and shall be in accordance with applicable requirements of OSHA.
  - 2. Where applicable, equipment and materials supplied shall be of type listed in "List of Materials Acceptable for Use on Systems of REA Electrification Borrowers," Bulletin 43-5.
  - 3. Design equipment in accordance with relevant sections of most recent local Building Code.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver f.o.b. job site, unloaded.
- B. Ship equipment as completely assembled as practicable.
- C. Handle equipment to prevent damage, denting, or scoring during shipping and delivery.
- D. Protect from weather, dirt, water, construction debris, and physical damage in accordance with manufacturer's instructions.

## 1.08 WARRANTY

- A. Provide manufacturer's standard 1-year warranty from date of delivery.

## PART 2 PRODUCTS

### 2.01 SYSTEM REQUIREMENTS

- A. Design equipment using system characteristics and ratings shown on Data Sheets.

### 2.02 DISCONNECT SWITCH

- A. Insulator units: ANSI C29.9.
- B. Operating mechanism:
  - 1. Manual:
    - a. Heavy-duty, swing-handle operated complete with accessories, including flexible grounding cable and provision for padlocking in "Open" and "Closed" positions.
    - b. Stainless steel or galvanized after fabrication.
    - c. Size to eliminate twisting or sag.
    - d. Switch mechanism shall be such that, if properly aligned, it is impossible to remain in partially opened or closed position.
  - 2. Motor operator:
    - a. High-speed (4 seconds maximum), heavy-duty motor operator including:
    - b. "Close" and "Open" test pushbuttons for local control of motor operator.
    - c. Mechanical indicator for local indication of operator position.
    - d. Provide decoupling mechanism with following:
      - 1) Hand crank for manual operation of motor operator with motor de-energized.
      - 2) Means for electrical operation of motor operator without operation of primary switch.
      - 3) Swing handle operator for manual operation of switch with motor operator unit decoupled.
- C. Linkage: Provide between operator and switch including flexible grounding strap.
- D. Switch poles: Fully coordinated and field adjustable per pole and for alignment and 3-phase timing coordination.
- E. Switch contacts:
  - 1. Self-wiping.
  - 2. Field-adjustable.
  - 3. Field-adjustable contact pressure.
- F. Standards: NEMA SG6 and ANSI C37.32.
- G. Manufacturer: Mindcore, ABB, Pascor, Southern States L.L.C., Royal Electric Manufacturing Company, Inc., S&C Electric Company, Siemens, or USCO Power Equipment Corp.

### 2.03 CIRCUIT SWITCHER

- A. Operating mechanism: If provided with decoupling mechanism, should permit operation of interrupter and motor operator with disconnect blades locked open, provided with padlocking provisions.
- B. Mounting pedestals:
  - 1. Construction: Galvanized steel with frame to support 3 poles of switchers.
  - 2. Galvanized anchor bolts with 2 washers and 2 heavy hex nuts.

- C. Operations and controls:
  - 1. Pushbuttons for local control of circuit switcher.
  - 2. "Local-Remote" selector switch.
  - 3. Operating linkage between operator and switch
  - 4. Position indicator or indicating light for operator.
  - 5. Electric operation counter.
  - 6. If disconnect switch specified on Data Sheets, decoupling mechanism to permit operation of interrupter and motor operator with disconnect blades locked open.
  - 7. Manual trip lever for interrupter.
  - 8. Manual opening handle for disconnect blades, if specified on Data Sheets
- D. Terminals: 4-hole with NEMA drilling.
- E. Current transformers when specified on Data Sheets:
  - 1. Multiratio, with fully distributed windings for relaying or metering service in quantities, ratios, and ratings as indicated on Data Sheets.
  - 2. Extend leads into junction box and terminate on shorting-type terminal blocks.
  - 3. Extend leads into NEMA 3R minimum junction cabinet and terminate on shorting-type terminal blocks.
  - 4. Design for mounting directly on circuit switcher.
  - 5. Provide complete with mounting hardware, supports, and wiring.
- F. Standard: NEMA SG6.
- G. Manufacturer: ABB, Siemens, or S & C Electric Company.

#### 2.04 SURGE ARRESTERS

- A. Type: Metal-oxide station class arresters with ground connections.
- B. Connectors: Primary and ground.
- C. Standard: ANSI C62.11.
- D. Manufacturer: General Electric "Tranquell," Ohio Brass "DynaVar," or ABB "ExlimQ."

#### 2.05 CURRENT TRANSFORMERS

- A. Primary terminal: Tin-plated copper bars suitable for either copper or aluminum connections.
- B. Secondary terminals: In closed connection box with conduit entrances.
- C. Ground terminal: Clamp-type connector suitable for No. 6 to No. 2 AWG.
- D. Standard: ANSI C57.13.
- E. Manufacturer: General Electric or ABB.

#### 2.06 VOLTAGE TRANSFORMERS

- A. Primary terminal: Clamp type connector suitable for No. 2 to 4/0 AWG copper or aluminum cable.
- B. Secondary terminals: In closed connection box with conduit entrances.
- C. Ground terminal: Clamp type connector suitable for No. 6 to No. 2 AWG.

D. Standard: ANSI C57.13

E. Manufacturer: General Electric or ABB.

#### 2.07 SWITCH TERMINAL PAD DESIGN LOADINGS

A. Longitudinal switches (parallel to switch blades) shall be capable of resisting, without injury or failure, force listed in ANSI C37.32, Table 2.

#### 2.08 FINISHES

A. Stainless steel or galvanized. Apply to exposed parts after fabrication.

#### 2.09 SOURCE QUALITY CONTROL

A. Perform factory testing in accordance with applicable standards of IEEE, ANSI, and NEMA.

B. Tests shall be performed at 60 Hz.

C. Certified accuracy tests on metering type current and voltage transformers shall be in accordance with ANSI C57.13.

D. Test results shall indicate that equipment meets standard specified before shipment can be made.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

A. Verify site conditions.

#### 3.02 MANUFACTURER FIELD SERVICES

A. Provide manufacturer's service representative to support installation and construction as required.

<b>DATA SHEET SUBSTATION CHARACTERISTICS (APPLIES TO ALL DATA SHEETS)</b>		Substation Name: Kautz Road	
		REV. #	
DESCRIPTION	UNITS	SPEC DATA	VENDOR DATA
Voltages;			
High Voltage	kV	34.5	
Low Voltage	kV		
24 Hr. Avg. Ambient Design Temperature	°C	30	
Maximum Ambient Temperature	°C	40	
Minimum Ambient Temperature	°C	-30	
Site Elevation Above Sea Level	ft	Less than 3,300 ft	
Specific local Building Code and specific sections on seismic requirements used in equipment design	---	By Manufacturer	
Symmetrical short circuit current	kA	40	
Operating Frequency	Hz	60	

DATA SHEET DISCONNECT SWITCH		Equipment Name: Line Switch	
		Tag No.: LS-1	REV. #
DESCRIPTION	UNITS	SPEC DATA	VENDOR DATA
Manufacturer	N/A	By Manufacturer	
Catalog/Serial No.	N/A	By Manufacturer	
<b>CHARACTERISTICS</b>			
Group Operated	Y/N	Y	
Number of Poles	1 or 3	3	
Number of Insulators Per Pole	2 or 3	2	
Operating Mechanism	Manual / Motor	Motor	
Quick Break Arc Restrictors	Y/N	N	
Rotating Insulator	Y/N	Y	
Break Type	Vertical , Center or Single Side Break	Center	
Single-Throw	Y/N	y	
Use (Line Switch, Bypass Switch, Bus Transfer Switch, etc)	----	Line Switch	
<b>RATINGS</b>			
Nominal Circuit Voltage	kV	34.5kV	
BIL	kV	200	
Continuous Current	A	1200	
<b>INSULATION</b>			
Insulator Type	TR- x	By Manufacturer	
Phase Spacing	Inches	48	
Insulator BIL	kV	200	
Minimum creepage distance	inches	By Manufacturer	
<b>MOTOR OPERATING MECHANISM</b>			
Motor Operator Required	Y/N	Y	
High Speed	Y/N	Y	
Control Voltage (AC or DC)	V	125 VDC	
Fused Disconnect Switch	Y/N	Y	
Space Heaters	Y/N	Y	
Close/Open Pushbuttons For Local Control	Y/N	Y	
Mechanical Indicator For Operator Position	Y/N	Y	
Decoupling Mechanism	Y/N	Y	
Linkage	Y/N	Y	
Quantity N.O. (8)		8	
Quantity N.C. (8)		8	
<b>DELIVERY</b>			
Method of Shipment (truck, rail)	---	By Manufacturer	
Total No. of Weeks from Award of Contract, FOB site	wks	By Manufacturer	
Submittal of Review Drawings After Award of Contract	wks	By Manufacturer	
Manufacturing Time after Receipt of Approved Drawings	wks	By Manufacturer	

DATA SHEET DISCONNECT SWITCH		Equipment Name: Transformer Switch	
		Tag No.:	REV. #
DESCRIPTION	UNITS	SPEC DATA	VENDOR DATA
Manufacturer	N/A	By Manufacturer	
Catalog/Serial No.	N/A	By Manufacturer	
<b>CHARACTERISTICS</b>			
Group Operated	Y/N	Y	
Number of Poles	1 or 3	3	
Number of Insulators Per Pole	2 or 3	2	
Operating Mechanism	Manual / Motor	Manual	
Quick Break Arc Restrictors	Y/N	N	
Rotating Insulator	Y/N	Y	
Break Type	Vertical , Center or Single Side Break	Center	
Single-Throw	Y/N	y	
Use (Line Switch, Bypass Switch, Bus Transfer Switch, etc)	----	Transformer Switch	
<b>RATINGS</b>			
Nominal Circuit Voltage	kV	34.5kV	
BIL	kV	200	
Continuous Current	A	1200	
<b>INSULATION</b>			
Insulator Type	TR- x	By Manufacturer	
Phase Spacing	Inches	48	
Insulator BIL	kV	200	
Minimum creepage distance	inches	By Manufacturer	
<b>MOTOR OPERATING MECHANISM</b>			
Motor Operator Required	Y/N	N	
High Speed	Y/N		
Control Voltage (AC or DC)	V		
Fused Disconnect Switch	Y/N		
Space Heaters	Y/N		
Close/Open Pushbuttons For Local Control	Y/N		
Mechanical Indicator For Operator Position	Y/N		
Decoupling Mechanism	Y/N		
Linkage	Y/N		
Quantity N.O. (8)			
Quantity N.C. (8)			
<b>DELIVERY</b>			
Method of Shipment (truck, rail)	---	By Manufacturer	
Total No. of Weeks from Award of Contract, FOB site	wks	By Manufacturer	
Submittal of Review Drawings After Award of Contract	wks	By Manufacturer	
Manufacturing Time after Receipt of Approved Drawings	wks	By Manufacturer	

<b>DATA SHEET CIRCUIT SWITCHER</b>		<b>Equipment Name: Line Circuit Switcher</b>	
		<b>Tag No.: CS-1 REV. #</b>	
<b>DESCRIPTION</b>	<b>UNITS</b>	<b>SPEC DATA</b>	<b>VENDOR DATA</b>
Manufacturer	N/A	By Manufacturer	
Catalog/Serial No.	N/A	By Manufacturer	
<b>TYPE</b>			
Group Operated	Y	Y	
Number of Poles	3	3	
Power Operated Disconnect	Y/N	Y	
Interrupter Orientation	Vertical or Horizontal	Vertical	
Single-Throw	Y	Y	
Bypass Blades	Y/N	N	
Service Type	Indoor or Outdoor	Outdoor	
<b>RATINGS</b>			
Nominal Circuit Voltage Class	kV rms	34.5	
Maximum Voltage	kV rms	38	
BIL	kV	200	
Continuous Current	A	1200	
Momentary Current	A	104,000	
Three Second Current	A	40,000	
Fault Closing Capability	A	40,000	
Primary Fault Interrupting	A	40,000	
Secondary Fault Interrupting	A	4000	
Operating Frequency (50 or 60)	Hz	60	
Maximum Interrupting Time	cycles	3	
<b>INSULATION</b>			
Insulator BIL	kV	200	
Minimum creepage distance	inches	By Manufacturer	
Insulator Color		ANSI 70 Gray	
Phase Spacing	Inches	48	
<b>ELECTRICALLY SEPARATE AUXILIARY SWITCHES</b>			
# of N.O. For Remote Ind./Control (8)		8	
# of N.C. For Remote Ind./Control (8)		8	
# of N.O. Which Follow Operator Mech. (2)		2	
# of N.C. Which Follow Operator Mech. (2)		2	
<b>TARGETS</b>			
Adequate Gas Pressure In Interrupter	Y/N	Y	
Position of Interrupter Contacts	Y/N	Y	
<b>ACCESSORIES</b>			
Operating Linkage Between Operator And Switch	Y	N	
Position Indicator or Indicating Light for Operator	Y	Y	
Electric Operation Counter	Y	Y	
Decoupling Mechanism With Padlock Provisions	Y	Y	
Manual Trip Lever For Interrupter	Y	Y	
Manual Opening Handle for Disconnect Blades	Y/N	Y	



<b>DATA SHEET CIRCUIT SWITCHER</b>		<b>Equipment Name: Line Circuit Switcher</b>	
		<b>Tag No.: CS-1 REV. #</b>	
<b>DESCRIPTION</b>	<b>UNITS</b>	<b>SPEC DATA</b>	<b>VENDOR DATA</b>
<b>COLOR</b>			
Insulators and Painted Surfaces	ANSI 70 Gray	ANSI 70 Gray	
<b>MOUNTING PEDASTAL</b>			
Height	Inches	By Contactor	
<b>TARGETS VISIBLE FROM GROUND LEVEL</b>			
Adequate Gas Pressure	Y	Y	
Position Of Interrupter Contacts	Y	Y	
<b>DELIVERY</b>			
Method of Shipment (truck, rail)	---	By Manufacturer	
Total No. of Weeks from Award of Contract, FOB site	wks	By Manufacturer	
Submittal of Review Drawings After Award of Contract	wks	By Manufacturer	
Manufacturing Time after Receipt of Approved Drawings	wks	By Manufacturer	

<b>DATA SHEET SURGE ARRESTER</b>		Equipment Name: xxxxxx	
		Tag No.: xxx-#####	REV. #
DESCRIPTION	UNITS	SPEC DATA	VENDOR DATA
Manufacturer	N/A	By Contractor	
Catalog/Serial No.	N/A	By Contractor	
<b>RATINGS</b>			
Maximum Continuous Operating Voltage (MCOV)	kV	22	
Duty Cycle	kV	27	
Class	Intermediate or Station	Station	
Type	Metal Oxide Varistor or Silicon Carbide	Metal Oxide Varistor	
<b>INSULATION</b>			
Minimum creepage distance	inches	By Manufacturer	
Insulator Color		ANSI 70 Gray	
Phase Spacing	Inches	48	
<b>COLOR</b>			
Color		ANSI 70 Gray	
<b>DELIVERY</b>			
Method of Shipment (truck, rail,)	---	By Manufacturer	
Total No. of Weeks from Award of Contract, FOB site	wks	By Manufacturer	
Submittal of Review Drawings After Award of Contract	wks	By Manufacturer	
Manufacturing Time after Receipt of Approved Drawings	wks	By Manufacturer	

<b>DATA SHEET</b> <b>VOLTAGE TRANSFORMER</b>		Equipment Name: Line and Bus VT	
		Tag No.: xxx-##### REV. #	
DESCRIPTION	UNITS	SPEC DATA	VENDOR DATA
Manufacturer	N/A	By Manufacturer	
Catalog/Serial No.	N/A	By Manufacturer	
<b>TYPE</b>			
Outdoor	Y	Y	
Insulation	Dry Type or Oil Filled	Dry	
Number of Bushings	1	1	
Number and Type of Secondary Windings	X and Y	X	
Quantity	----	6	
<b>RATINGS</b>			
Nominal Primary Circuit Voltage	kV L-L	34.5	
Transformer Primary Voltage	kV L-G	19.9	
Transformer Secondary Voltage	( / )volts	115/67	
Ratio	( / :1)	175/300:1	
Transformer Primary Connection	L-G	L-G	
BIL	kV	200	
Frequency (50 or 60)	Hz	60	
Accuracy Classification		0.3 W, X, M, Y, Z	
Thermal Burden Rating Total Both Windings	VA	2000	
<b>INSULATION</b>			
Insulator BIL	kV	200	
Minimum creepage distance	inches	By Manufacturer	
Insulator Color		ANSI 70 Gray	
Phase Spacing	Inches	48	
<b>Color</b>			
Color		ANSI 70 Gray	
<b>DELIVERY</b>			
Method of Shipment (truck, rail,)	---	By Manufacturer	
Total No. of Weeks from Award of Contract, FOB site	wks	By Manufacturer	
Submittal of Review Drawings After Award of Contract	wks	By Manufacturer	
Manufacturing Time after Receipt of Approved Drawings	wks	By Manufacturer	

<b>DATA SHEET</b> <b>CURRENT TRANSFORMER</b>		Equipment Name: Line CT	
		Tag No.: xxx-##### REV. #	
DESCRIPTION	UNITS	SPEC DATA	VENDOR DATA
Manufacturer	N/A	By Manufacturer	
Catalog/Serial No.	N/A	By Manufacturer	
<b>TYPE</b>			
Outdoor	Y	Y	
Insulation	Dry Type or Oil Filled	Dry	
Number of Bushings	1	1	
Number and Type of Secondary Windings	SR or DR or MR	MR	
Quantity	----	3	
<b>RATINGS</b>			
Nominal Primary Circuit Voltage	kV L-L	34.5	
Transformer Primary Amperage	A	1200	
Transformer Secondary Voltage	( / )volts	115/67	
Ratio	( :5)	1200:5	
BIL	kV	200	
Frequency (50 or 60)	Hz	60	
Accuracy Classification		C400	
Thermal Rating Factor	--	2	
<b>INSULATION</b>			
Insulator BIL	kV	200	
Minimum creepage distance	inches	By Manufacturer	
Insulator Color		ANSI 70 Gray	
Phase Spacing	Inches	48	
<b>COLOR</b>			
Color		ANSI 70 Gray	
<b>DELIVERY</b>			
Method of Shipment (truck, rail)	---	By Manufacturer	
Total No. of Weeks from Award of Contract, FOB site	wks	By Manufacturer	
Submittal of Review Drawings After Award of Contract	wks	By Manufacturer	
Manufacturing Time after Receipt of Approved Drawings	wks	By Manufacturer	

END OF SECTION

- 1) Philip E. Schulz
- 2) Seth G. Weiss

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Design, furnish, deliver, and install:
  - 1. Substation steel structures, stands, and bus supports required for mounting equipment located above ground or at foundation level.
  - 2. Substation bus system, including buses, connectors, insulators, and accessories.
  - 3. Shielding masts.
  - 4. Anchor bolt assemblies for structures, stands, and shielding masts.
  - 5. Hardware and assemblies as required to install specified structures and equipment.
- B. Electrical connectors for equipment unless specified otherwise.
- C. Grounding for equipment mounted on structures.
- D. Switch operator grounding platforms.

### **1.02 WORK BY CONTRACTOR**

- A. Receipt, unloading, and storage of structures.
- B. Erection and installation of structures including side and load side flexible bus connections to other equipment and lines.
- C. Furnish and install substation concrete foundations.
- D. Furnish and install substation and equipment grounding.
- E. Furnish and install anchor bolts for structures and stands.
- F. Furnish and install substation equipment.

### **1.03 INFORMATIONAL SUBMITTALS**

- A. Submit with Bid:
  - 1. Completed Data Sheets.
  - 2. Material list indicating quantity, description, and manufacturer of components including approximate structure weights.
- B. Product Data:
  - 1. Recommended installation sequence for structures.
  - 2. Complete instruction manuals and parts list for equipment furnished.
  - 3. Bus cutting and splicing guide for use by erection crew.
  - 4. Manufacturer's installation instructions for bus fittings. Provide temperature compensation chart for bus expansion fittings. Special structure installation instructions shall be provided with detail erection drawings, including but not limited to:
    - a. Limitations on attachments and attachment locations.
    - b. Field welding limitations.
- C. Shop Drawings:
  - 1. Prepare Shop Drawings and calculations under seal of a professional engineer registered in state indicated by location on Data Sheets.
  - 2. Structural design calculations.
  - 3. Anchor bolt plans and details shall be included with the design calculations submittal.
  - 4. Assembly, installation, and anchor bolt detail drawings for structures, and stands including baseplate dimensions and minimum foundation dimensions.

5. Foundation loading diagrams:
    - a. Indicate simultaneous shear in each direction, simultaneous moment in each direction, and vertical load at each structure bearing plate for each specified load condition.
    - b. For multiple leg or multiple column structure, loading diagrams shall show simultaneous loading at each column or leg for each load condition.
    - c. State whether indicated loads are working loads or multiplied by an overload factor. If overload factors are included, magnitude shall be indicated.
  6. If Contractor is packaging structures as appropriate to provisions of contract:
    - a. General arrangement drawings to exact scale with complete dimensions showing plans, elevations, and sections of substation structures and stands with equipment, buses, and jumpers mounted thereon and showing electrical clearances.
    - b. Bus plan and elevations drawings shall indicate size, type and location of electrical connection bolts. Include instructions for bolt tightening.
    - c. Steel erection drawings
    - d. Shop Drawings on nonstandard components.
  7. Shop fabrication detail drawings for structures.
  8. Steel drawings shall indicate size, type and location of structure connection bolts.
  9. Include instructions for bolt tightening
- D. Quality assurance data:
1. Welding certificate for each person welding, showing that person has passed tests specified by AWS.
  2. Structural design computations and drawings showing additional detail, if requested by Engineer.

#### 1.04 ACTION SUBMITTALS

- A. Product Data:
1. Manufacturer's catalog sheets with catalog number identified on standard components and accessories.
  2. Detailed list of materials identifying quantity, description, and manufacturer of components. List manufacturer's catalog number and type. Cross reference material list to item numbers used on design drawings (if applicable).
  3. Such other similar material that Engineer may request.
- B. Shop Drawings:
1. Prepare Shop Drawings and calculations under seal of a professional engineer registered in the state indicated by location on Data Sheets.
  2. Steel erection drawings.
  3. Steel drawings shall indicate size, type and location of equipment mounting bolts.
  4. Steel design forces for design of foundations.
  5. Shop Drawings on nonstandard components

#### 1.05 CLOSEOUT SUBMITTALS

- A. Project Record Documents.
- B. Operation and maintenance manuals. In addition to requirements of Section 01785, provide at a minimum:
1. General description and technical data.
  2. Receiving, storage, installation, and testing instructions.
  3. Operating and maintenance procedures.
  4. Complete set of final drawings.
  5. Complete documentation of inspections and tests performed, including any logs, curves, and certificates. Documentation shall note any replacement of equipment or components that failed during testing.
  6. Spare parts lists.
  7. Installation field reports.
  8. Data sheets updated to reflect field installation conditions.

## 1.06 QUALITY ASSURANCE

- A. Steel design shall be signed and sealed by engineer registered in state indicated by location on Data Sheets.
- B. Regulatory requirements:
  - 1. Detail in accordance with AISC Structural Steel Detailing Manual.
  - 2. When applicable, equipment and materials supplied shall be of types listed in "List of Materials Acceptable for Use on Systems of RUS Electrification Borrowers, "Informational Publication 202-1."
  - 3. Structures shall be designed, fabricated, assembled, and tested in conformance to:
    - a. American Institute of Steel Construction (AISC), Manual of Steel Construction.
    - b. American Society of Civil Engineers (ASCE), Substation Structure Design Guide.
    - c. NEMA SG6 - Power Switching Equipment and TT1- Tapered Tubular Steel Structures.
    - d. RUS Bulletin 1724E-300 (when applicable).
    - e. National Electric Safety Code (NESC) for structures that terminate transmission conductors within the substation.
    - f. American National Standards Institute (ANSI).
    - g. American Society for Testing Materials (ASTM).
    - h. American Welding Society (AWS).
- C. Substation structures shall be designed and furnished by single manufacturer.
- D. Manufacturer qualifications:
  - 1. Manufacturer of major components within assembly.
  - 2. ISO 9001 certified.
  - 3. Produced similar electrical equipment for a minimum period of 5 years.
  - 4. Qualified design staff regularly devoted to development of structural plans associated with substation structure design and fabrication.
  - 5. Regularly engaged in design and fabrication of substation structures.
  - 6. When requested by Engineer, provide acceptable list of similar equipment installations complying with requirements of this specification.
- E. Fabricator qualifications: Fabricators of steel structures shall be subject to review of Engineer and shall have following qualifications:
  - 1. Regularly engaged in fabrication of substation structures.
  - 2. Previously designed and fabricated substation structures of general types specified.
  - 3. Qualified design staff regularly devoted to design and detailing of substation structures.
  - 4. When applicable, fabricators of steel structures shall have a working familiarity with RUS Bulletin 1724E-300, June 2001 Edition, "Design Guide for Rural Substations," Chapter VII, Structures.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle and transport structural steel with care to avoid bending or damage to coating system.
  - 1. Pieces or structures bent in handling may be used only if they can be straightened without injury to galvanizing or pieces or structures.
- B. During delivery and storage, handle equipment to prevent damage, denting, or scoring.
- C. Store equipment and components in clean, dry place. Protect from weather, dirt, water, construction debris, and physical damage in accordance with manufacturer's instructions.

## 1.08 SITE CONDITIONS

- A. Environmental requirements shall be as determined for location indicated on Data Sheets.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Arthur Tatman Associates, Inc.
- B. Dis-tran Packaged Substation, LLC.
- C. M.D. Henry Company.
- D. Substation Enterprises, Inc.
- E. Substation Products, Inc.
- F. Valmont Utility.

### **2.02 DESIGN REQUIREMENTS**

- A. Materials and equipment shall be furnished in a fully engineered and coordinated design package.
- B. Determine required quantities of structures and bus from Drawings.
- C. Structure and bus system shall be complete with required insulators, connectors, fastenings, and accessories.
- D. Design substation for voltages listed in Data Sheets.
- E. One-line diagram, plan, and elevations of substation is shown on Drawings.
- F. Substation shall be of low-profile type using rolled and formed structural shapes. Lattice-type structures not acceptable.
- G. Transmission lines shall enter substation as shown on Drawings and Data Sheets.
- H. As appropriate to design, power fuses, single-pole disconnects, and voltage regulator bypass switches shall be operable from ground level
- I. Design structures and buses for connection to power transformers, as shown on Drawings.
- J. Individual cantilevered columns supporting equipment shall be tubular sections.

### **2.03 STEEL STRUCTURES**

- A. Dimensions:
  - 1. As required to provide structural strength, maintain electrical clearances, and to suit equipment provided.
  - 2. Required clearances and spacings:
    - a. Bus and line clearances: NEMA SG6, NESC, and as shown on Drawings.
    - b. Phase spacing, outdoor switches, and fuses: NEMA SG6 and as shown on Drawings.
  - 3. Minimum equipment spacing: As recommended by equipment manufacturer for electrical clearance and maintenance.
- B. Design:
  - 1. Loading shall be determined for all structures.
  - 2. Conform to ASCE Substation Structure Design Guide Manual No. 113, NEMA SG6 and TT1 manufacturing standards with following additions.
  - 3. Load cases with ice shall include ice on structures.



4. Structure sizing may be based on design stress taken as yield stress for factored loading cases.
  5. Structures that terminate transmission conductors within the substation shall be designed to satisfy NESC Heavy District Loading Rule 250B, Extreme Wind Rule 250C, and Extreme Ices with Concurrent Wind Rule 250D in addition to requirements of other specified regulatory documents.
    - a. Conductors:
      - 1) Incoming wires: single 477 ACSR.
      - 2) Shield wires: 3/8" (10 mm) EHS.
    - b. Design Tensions:
      - 1) Incoming line tensions: unfactored, 3,000 lbs. under NESC Heavy District Loading per wire, each phase.
      - 2) Shield wire tension: unfactored, 1,500 lbs. under NESC Heavy District Loading per wire.
    - c. Design structures to take maximum unbalanced condition of external line load which can be imposed upon structures.
    - d. Design structures for a minimum incoming line angle of 15 degrees unless noted otherwise.
  6. Proper provisions shall be made for temporary stresses caused by erection or maintenance.
  7. Deflections of structures under unfactored loads shall be less than those required by ASCE Substation Structure Design Guide Manual No. 113.
  8. Structures shall be tubular (square, rectangular, or multiple-sided) or rolled open sections (wide flange shapes).
- C. Shielding mast
1. Type: Self-supporting, continuously tapered tubular; galvanized steel; with welded baseplate; anchor bolts; hand-hole at base; internal damping cable, or equivalent means.
  2. Grounding: Provide 2 ground lugs on opposite sides.
- D. Steel fabrication:
1. Structural steel shapes and plates shall conform to ASTM A36 or A992, unless otherwise specified. Hollow structural steel tubing, (HSS shapes) shall conform to ASTM A500, Grade B or C, unless otherwise shown.
  2. Materials for tubular steel plates for shafts, base plates, and accessory plates must conform to ASTM A36, A500, A572, A588, or A871 amended to date. All high strength steel plates shall meet or exceed minimum Charpy impact values at 15 ft-lbs. at -20°F (-29°C).
  3. Steel work, including anchor bolts, nuts and washers, shall be hot-dip galvanized after fabrication in accordance with ASTM A123 and A385.
  4. Anchor bolts shall be supplied by steel fabricator along with templates for proper alignment.
  5. Anchor bolts shall be in accordance with ASTM F1554, Grade 36 or Grade 55, weldable, minimum and shall be galvanized on the threaded end a minimum of 12" (300 mm) in accordance with ASTM A123, A153 and A385. Furnish anchor bolts with 2 washers, 1 heavy hex leveling nut, 1 heavy hex nut, 1 locknut, and setting templates. Nuts and washers shall be fully galvanized. Nuts shall conform to ASTM F563. Washers shall conform to ASTM F436. Alternate anchor bolt material may be proposed for Engineer's review.
  6. Erection bolts and equipment mounting bolts: ASTM A394 and A325. Bolts and nuts shall be hex head, galvanized.
  7. Locknuts: MF No. 1, ANCO, hex head, galvanized; or approved equal.
  8. Permanently stamped pieces on baseplate and at eye level with piece identification.
  9. Coordinate equipment mounting requirements with steel fabricator.
  10. Fabricate structures in accordance with AISC standards to provide individual structures with common structural members consistent with that structure and to provide overall aesthetic substation. Members with pre-punched holes on standard spacing will not be acceptable.
  11. Allowable stresses: Conform to AISC "Specification for Structural Steel Buildings", except increase in allowable stresses for wind loading shall not be applied to members subjected to stresses produced by winds in conjunction with other specified loads.
  12. Connections: Use high-strength bolts for field-connections. Conform to "Specification for Structural Joints Using ASTM A325 or A490 Bolts", as approved by Research Council on Structural Connections of the Engineering Foundation, and published by AISC.
  13. Furnish at least 5% extras of each size bolt and nut required in assembly. Drawing shall indicate sizes of bolts used and location.
  14. All welding work conforms to AWS D1.1 unless otherwise specified.

15. Welded connections may be used for factory-assemble structures if welding is done prior to galvanizing.
16. All welders employed shall be qualified, in accordance with the American Welding Society Standard Qualification Procedure.
17. All holes shall be punched to full size unless noted otherwise.
18. All holes shall be spaced accurately in accordance with the steel structural drawings and shall be located in the gauge line with a maximum allowable variation in hole spacing of 1/16".
19. Structural members with concealed surfaces may be used provided their thickness is increased 1/16" greater than thickness required for strength or deflection to allow for loss of metal from corrosion. Concealed surfaces shall not be galvanized.
20. Straightening: Members which are bent or out of line after galvanizing shall be carefully straightened with use of straightening roller machine. Use of sledges or other methods in which material or its finish may be mutilated shall not be allowed.
21. Marking: Each individual piece shall be marked with correct mark designation, as shown on shop detail drawings.

E. Finish: Cleaning and galvanizing of structural steel shall be in accordance with following:

1. Steel work, including bolts, shall be hot-dip galvanized after fabrication, unless otherwise specified. Galvanizing, tests, and inspection: ASTM A123 and A385.

F. Grounding (above-grade):

1. Provide grounding for equipment mounted on structures.
2. Structure ground attachment locations:
  - a. Provide NEMA 2-hole attachment 12" (300 mm) above each baseplate.
  - b. Provide single-hole attachment every 4' (100 mm) (maximum) on vertical and horizontal members to structure mounted equipment.
3. Ground cable: 4/0 AWG stranded soft-drawn copper.
4. Ground clamps:
  - a. Provide bolted, NEMA 2-hole, bronze or copper clamp on each structure leg or column 12" (300 mm) above baseplate.
  - b. Provide bolted, bronze or copper clamp for support of ground cable on vertical and horizontal members;
    - 1) Double-cable clamp: Burndy Type GC, or equal.
    - 2) Single-cable clamp: Burndy Type GB, or equal.
5. Grounding operator's platforms: 3'-0" x 4'-0" (900 mm x 1200 mm) galvanized steel grating with 1" x 3/16" (25 mm x 5 mm) serrated bearing bars at 1-3/16" (30 mm) oc, cross bars at 4" (100 mm) oc. Furnish for each group-operated switch and circuit switcher.

G. Anchor Bolts:

1. Structures will have concrete pier type foundations. Design and furnish anchor bolts with double nuts (one on either side of base plate). Up to two bolt diameter clearance between top of concrete and bottom of base plate can be expected; design anchor bolts for gap between concrete and steel.
2. Embedded length for deformed reinforcing bars used as anchor bolts shall be determined as specified in ASCE Substation Design Guide using 3,500 psi concrete (f'c).

## 2.04 TOUCH-UP OF GALVANIZING

- A. Galvanizing damaged prior to or during shipment shall be regalvanized by painting with a zinc-rich paint containing either 65% to 69% metallic zinc by weight or a minimum of 92% metallic zinc by weight in dry film. Galvanizing damaged prior to or during shipment shall be regalvanized by painting with "Galvanox" Type 1 by Carboline-Subox Div., or equal.
- B. For damage not repairable by use of zinc-rich paints, zinc-rich solders shall be used in accordance with ASTM A780.
- C. Apply in accordance with manufacturer's recommendations.

## 2.05 BUSES AND CONDUCTORS

- A. Rigid buses: Aluminum tubular bus conductor AA Schedule 40 pipe (standard pipe size), ASTM B429, 6063-T6 alloy of sizes indicated on Drawings.
- B. Cable for jumper buses shall be size and type as shown on Drawings, in accordance with:
  - 1. ACSR:
    - a. ASTM B232.
    - b. Each individual aluminum wire entering into construction of completed conductors shall conform to ASTM B230.
    - c. Core wire shall be galvanized steel wire, ASTM B245.
  - 2. 1350-H19 (EC) grade aluminum: ASTM B230.
- C. Provide damping conductor for horizontal bus runs of aluminum bus over 5' (1.5 m) and vertical runs where shown on Drawings.
  - 1. Damping conductor shall have multistrand steel core (ACSR).
  - 2. Minimum sizes for damping conductor:

Tube Size	Cable Size
3" and less	266.8 kcmil
3-1/2"	397.5 kcmil
4"	795 kcmil
5"	1,431 kcmil
6"	1,590 kcmil

- 3. Two damping cables may be substituted for single damping cable provided weight of two cables is at least as great as single cable and does not exceed weight of single cable by more than 10%.

## 2.06 BUS AND CONDUCTOR ACCESSORIES

- A. Furnish bus fittings, bus supports, connectors, electrical connection bolts and miscellaneous hardware as required.
- B. Contractor is responsible for hardware and is required to furnish replacements for material lost in shipping or incomplete shipping in a timely manner not to delay erection.
- C. Tubing bus connectors: Welded type unless otherwise noted on Drawings.
- D. Provide end plugs for tubing at all open ends, including at connectors.
- E. Connectors, fittings and hardware shall be as shown on Drawings.
- F. Suspension clamps, bus support clamps, compression-type terminals, deadend fittings, and strain clamps for use with ACSR conductor shall be aluminum alloy and shall be equal to reference details and manufacturer's references shown on Drawings, except that clevis connections shall be made with threaded hex-head bolts, nuts, and stainless steel self-locking cotter pins.
- G. Compression-type deadend fittings shall develop not less than 95% of ultimate strength of conductor and shall have conductivity of not less than that of conductor with which they are used.
- H. Couplers: High-strength aluminum alloy tubing, slotted design equal to Anderson Type WCI.
- I. Aluminum-to-aluminum and aluminum-to-copper connections: Use aluminum connectors unless otherwise indicated on Drawings.

- J. Aluminum connectors: Aluminum Alloy SC70A in accordance with ASTM B26 (AA Alloy Designation No. 356). Design and proportion for contact with copper surfaces without use of plating or bushings.
- K. Copper-to-copper connections shall be made with bronze connectors.
- L. Terminal pads shall be in accordance with latest NEMA Publication No. CC-1.
- M. Furnish terminal connectors for attaching to Owner-furnished equipment unless otherwise indicated on Drawings.
- N. Electrical connection bolts:
  1. Each bolt assembly shall consist of 1 bolt, 2 flat washers, 1 split lock washer, or 1 compression-type Belleville washer and 1 hex nut.
  2. Aluminum-to-aluminum connection: Aluminum Alloy 2024-T4 anodized, lubricated bolts, aluminum Alloy 6061-T6 nuts, aluminum Alloy 7075-T6 large, flat washers, aluminum Alloy 7075-T6 split lock washers.
  3. Aluminum-to-copper connection:
    - a. 18-8 stainless steel bolts, nuts, and flat washers.
    - b. Use compression-type Belleville washer instead of split lock washer.
    - c. Belleville washers shall be stainless steel with cadmium plating.
  4. Copper-to-copper connection: High-strength silicon bronze bolt, nut, flat washers, and split lock washer.
- O. Identification tags:
  1. Furnish porcelain enamel phase identification tags with 4" (100 mm) black letters on white background mounted to structures at ends and midway of each bus, at each incoming/outgoing line position, over each PCB position, and at each VT or CCVT.
  2. Furnish porcelain enamel phase identification tags with 3" (75 mm) black letters on white background with all numerals on single line.
  3. Furnish one tag for each switch and PCB with designations provided later by Owner.
  4. Switch identification tags shall be located on steel next to switch operator.
  5. Mounting:
    - a. Provide suitable devices for mounting tags.
    - b. Provide stainless steel mounting hardware.

## 2.07 INSULATORS

- A. Conform to NEMA SG6, NEMA HV1, and these Specifications.
- B. Refer to Data Sheets for insulator design specification data.
- C. Color: ANSI Z55.1 No. 70 light gray.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify Site conditions.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's installation instructions.
- B. Handle and transport structural steel with care to avoid bending or damage to coating system.
- C. Pieces bent in handling may be used only if they can be straightened without injury to coating system.

- D. Material on which coating system has been damaged shall be returned to fabrication shop and repaired unless, in opinion of Owner's inspector, damage is local and can be repaired in the field in accordance with provisions of Specifications.
- E. Cost for repair of damage to steel, including coating system, that occurs prior to delivery to site shall be borne by supplier of structures.
- F. Structures shall be stored on cribbing off of the ground and in a manner that permits easy access for inspection.
- G. Hardware shall be shipped and stored in containers suitable for exterior storage.

### 3.03 ERECTION

- A. Erect plumb and level; introduce temporary bracing required to support erection loads.
- B. Plumb columns within a tolerance of AISC Code of Standard Practice for Steel Buildings and Bridges.
- C. Use light drifting necessary to draw holes together. Drifting to match unfair holes is not allowed. Use of twist drills to enlarge holes to make connections is only permitted for slip-critical connections and is subject to Engineer's review. If diameter of enlarged hole exceeds original bolt diameter by 1/4" (6.4 mm) or more, provide a larger bolt so final hole does not exceed bolt diameter by more than 3/16" (4.8 mm).
- D. Provide washers, install, and tighten high-strength bolts in accordance with "Specification for Structural Joints Using ASTM F3125 Grade A325 or A490," as approved by Research Council on Structural Connections of the Engineering Foundation, and published by AISC.
- E. Welding: AWS D1.1. Provide Engineer with proof of qualification of welders. Proof of qualification not required for tack welds or welds not carrying stress.
- F. Slings or other equipment used for picking up members or portions of structures shall be of such material or protected in such a way as not to cut into corners or edges of the members, damage the finish, or distort or overstress members. Use of chains is not permitted. Members or portions of structures shall be raised in such a manner that no dragging on the ground or against portions of structures already erected will occur.
- G. When portions of structures are being ground assembled, such assembly shall be on surfaces or blocking which will provide support to prevent distortion or damage to structure steel. All bolts shall be installed in all connections of ground assembled portions of the structures before erection.
- H. Mud, dirt, and other foreign matter shall be removed from the members before erection, with special attention given to cleaning the contact surfaces at joints before bolting up bolts and nuts. Power washing the structures not permitted.

### 3.04 INSPECTION OF BOLTED CONNECTIONS

- A. Verify appropriate test certificates have been furnished by manufacturer for bolts, nuts, and washers according to ASTM specification requirements.
- B. Verify certificate lot numbers coincide with lot numbers on containers at job site.
- C. Verify bolting crews are installing bolts in accordance with references specified.
- D. Verify bearing-type connection bolts are snug tight bringing all plies into contact.

- E. After installation and verification of all bolted connections, the nut and mounting steel shall be marked with a line to indicate the installed position of the nut. Marks shall be visible from the ground whenever possible. Red or white paint pen shall be used.

### 3.05 INSPECTION AND REPAIR OF WELDS

- A. Visually inspect all field welds.
- B. Repair welds shown by inspections or testing to have discontinuities that would reduce weld strength in accordance with AWS D1.1. Cost of reworking welds and follow-up inspections and tests shall be borne by Contractor.

DATA SHEETS STEEL STRUCTURES, BUSES AND INSULATORS		Equipment Name: xxxxxx	
		Tag No.: xxx-#####	REV. #
DESCRIPTION	UNITS	SPEC DATA	VENDOR DATA
Manufacturer	N/a		
Catalog/Serial No.	N/a		
<b>System Data:</b>			
Substation Name	---	Kautz Rd.	
Location	---	Geneva, IL	
Substation Voltage Levels			
High Voltage	kV	34.5	
Low Voltage	kV	12.47	
Ambient High Temperature	°C	40	
Minimum ambient temperature	°C	-30	
Altitude	Ft	Less than 3,300'	
Line Exits			
High Voltage Side	Overhead / Underground	OH	
Low Voltage Side	Overhead / Underground	UG	
<b>Steel Structure Data:</b>			
Loading Cases to be Checked			
ASCE Substation Structure Design Guide Loading	Y/N	Y	
Fault Current/Short Circuit Loading	Amps		
Seismic Loading	Y/N		
Structures Termination Transmission Conductors			
NESC District Loadign Rule 250B	Y/N	Y	
NESC Extreme Wind Loading Rule 250C	Y/N	Y	
NESC Extreme Ice Loadign Rule 250D	Y/N	Y	
Seismic Load Data			
Building Code			
Spectral Response Acceleration, SS	N/A	0.189	
Spectral Response Acceleration, S1	N/A	0.062	
Site Class A, B, C, D, E, or F	N/A	D	
Occupancy Category	N/A	III	
Importance Factor	N/A	1.25	
Galvanized w/ Standard Finish	Y/N	Y	
Galvanized w/ Dulled Finish	Y/N	N	
<b>Shielding Masts:</b>			
Shielding Mast(s)	Y/N	Y	
<b>Anchor Bolts:</b>			
Provide for structures furnished	Y/N	Y	
Provide for pad mounted equip.	Y/N	N (By Contractor)	
Delivery (enter date or weeks after receipt of order)		By Manufacturer	
<b>Rigid Bus Data:</b>			
Bus Type	Tubular/ Angular	Tubular	
Bus Size and Type Al	5", 4", 3" etc., 6063-T6, 6061-T6,	3"	

DATA SHEETS STEEL STRUCTURES, BUSES AND INSULATORS		Equipment Name: xxxxxx	
		Tag No.: xxx-#####	REV. #
DESCRIPTION	UNITS	SPEC DATA	VENDOR DATA
	Schedule 40		
Bus Rating	Amp	1200	
Short Circuit Bracing	kA	40	
<b>Station Post Insulator Data:</b>			
High Voltage Insulators			
High Side NEMA Classification		TR-210	
High Side BIL	kV	200	
Strength classification	----	Standard	
Cantilever	lb	By Vendor	
Stack Type	----	By Vendor	
Bolt Circle Diameter	In	3	
Color	---	ANSI Z55 No. 70 Gray	
Porcelain (POR) or Polymer (PLY)	POR/PLY	POR	
Low Voltage Insulators			
Low Side NEMA Classification		N/A	
Low Side BIL	kV		
Strength classification	----		
Cantilever	lb		
Stack Type	----		
Bolt Circle Diameter	In		
Color	---	ANSI Z55 No. 70 Gray	
Porcelain (POR) or Polymer (PLY)	POR/PLY		
<b>Delivery Schedule:</b>			
Total No. of Weeks from Award of Contract, FOB site	wks	By Manufacturer	
Submittal of Review Drawings After Award of Contract	wks	By Manufacturer	
Manufacturing Time after Receipt of Approved Drawings	wks	By Manufacturer	
<b>Special Requirements:</b>			
Special Environmental or Other Requirements:	---		
Site Conditions:			
Sequencing:			
Scheduling and Coordination:			

END OF SECTION

- 1) Hannah Henry
- 2) Jason L. Varone, Phillip E. Schulz



## PART 1 GENERAL

### 1.01 SECTION INCLUDES

- A. Design, manufacture, test, deliver, assemble, and install Class I medium power transformers and accessories for liquid-immersed, self-cooled, forced-air cooled, and forced-liquid cooled, with self-cooled ratings as follows:
1. High voltage windings above 110 kV BIL to below 450 kV BIL.
  2. Transformers base rated 50,000 kVA and lower.

### 1.02 EVALUATION AND PENALTIES

- A. Bid evaluation:
1. Bids will be evaluated considering base and/or alternate bids plus additions as described herein.
  2. Loss evaluation:
    - a. Cost of equipment losses will be considered in Bid evaluations,
    - b. Guaranteed equipment kW losses will be evaluated at rates listed on Data Sheets.
    - c. Evaluation basis:
      - 1) No-load losses at 100% voltage.
      - 2) Load losses at maximum MVA rating.
    - d. Evaluation:
      - 1) Guaranteed equipment losses listed on Data Sheets included with Bid will be multiplied by rates listed on Data Sheets.
      - 2) Above determined values will be added to quoted equipment price.
  3. Transformers manufactured outside continental United States can be assessed a cost for Owner's expenses. Expenses will be added to evaluated bid price:
    - a. Additional cost of Owner and Engineer to witness test each individual unit.
    - b. At Owner's option, cost of an independent professional to expedite and monitor quality control.
- B. Penalties:
1. Penalties will be assessed if actual no-load or load losses from certified shop test reports exceed guaranteed values by more than tolerances allowed by IEEE C57 standards.
  2. Penalty evaluation: Penalty will be computed by multiplying load and no-load kW losses stated on certified shop test reports that exceed guaranteed values provided on Data Sheets by more than tolerances allowed by IEEE C57.12.00 by \$/kW shown on Data Sheets.
  3. Total dollar value of above computed penalty will be assessed to Vendor.
  4. Losses less than those guaranteed will not be credited.

### 1.03 WITNESS TESTING ALLOWANCE

- A. Costs included in cash allowances: Include costs for Owner and Engineer to attend witness testing for testing as specified on Data Sheet.
1. Travel allowance:
    - a. Travel shall be per round trip required for witness testing.
      - 1) Owner: \$2,500 per round trip.
      - 2) Engineer: \$2,500 per round trip.
      - 3) Above cost for continental United States only. Additional charges will be assigned for international flights.
  2. Daily per diem allowance: Expenses other than travel shall be covered by per diem allowance at the following rates:
    - a. Owner: \$500 per day.
    - b. Engineer: \$2,500 per day.
  3. Two per diem days shall be added for each round trip to cover expenses for travel days.
  4. Proposal shall provide quantities for allowances, if additional trips are needed they will be paid at the same rate at manufacturer's expense.
- B. Total trip cost will be deducted from final payment of transformer.

## 1.04 WORK BY OTHERS

- A. Foundations.
- B. External electrical connections of main and auxiliary conductors.

## 1.05 INFORMATIONAL SUBMITTALS

- A. Submit with Bid:
  1. Equipment proposed shall be furnished to have sufficient mechanical strength to withstand without failure all through-fault currents. Demonstrate equipment will meet this requirement by one of following methods:
    - a. Certified test data showing that equipment with core and coil identical in design and construction and identical or similar with respect to kVA capacity, kV ratings, BIL, impedance and voltage taps has been tested without failure for short-circuit strength.
    - b. History of successful experience with equipment of identical or similar ratings, design, and construction.
      - 1) List units in service with core and coils that are essentially identical in design, construction, and manufacture to equipment covered by this Specification.
      - 2) Provide information on date of installation, location, and failures if any.
    - c. Where equipment has not been built or cumulative service record is less than 20 equipment years, submit list of equipment in service that represent closest approximation to equipment covered by this Specification. Information submitted shall be:
      - 1) Representative of total experience of manufacturer, with design of equipment it proposes to furnish.
      - 2) Include dates of installation or shipping.
      - 3) Ratings of equipment.
      - 4) Failures and causes of failure, if any, that have been experienced.
  2. Copy of warranties.
  3. Guaranteed loss data as required in Data Sheets.
  4. Guaranteed sound analysis as required in Data Sheets.
  5. Location of manufacture of each transformer.
  6. Drawings with proposed overall estimated dimensions, weight, enclosure construction, and general layout of equipment and accessories.
  7. List of equipment shipped loose requiring field installation.
  8. Special equipment, tools and accessories required for installation or maintenance.
  9. Data describing specifically and in detail location of service facilities and engineers and spare parts inventories and extent of inventory in United States for equipment furnished.
  10. Completed preliminary Data Sheets.
  11. Testing schedule.
- B. Quality assurance data:
  1. Document submittal index.
  2. Test reports of all shop tests conducted in accordance with IEEE C57.12.00 prior to shipment.
  3. Certified shop test reports for each power transformer prior to shipment.
  4. Dew point of gas in transformer just prior to shipment.
  5. Insulating liquid test reports just prior to and immediately following transformer testing.
  6. Current transformer excitation and ratio correction factor curves.
  7. Maximum allowable impact readings that can occur during shipping in X, Y, and Z directions.
  8. Engineering, part procurement, manufacturing, testing and shipping schedule.
  9. Notice of any cancellation, delay, material change, or schedule impact upon knowledge of information.
  10. Status reports provided monthly.
  11. Storage, handling, and erection requirements.
  12. Notification of inspection and test schedule.

## 1.06 ACTION SUBMITTALS

### A. Product Data:

1. Fan and pump motor data sheets.
2. Complete instruction manual and parts list for each transformer.

### B. Shop Drawings:

1. Certified Data Sheets.
2. Drawings detailing overall dimensions, weight, lifting points, enclosure construction, and layout of transformer and accessories.
3. Outline, general arrangement, assembly, installation, and foundation arrangement drawings. Drawings shall provide following information:
  - a. Dimensions from centerline of tank in plan and elevation views to centerline of high-voltage and low-voltage bushings, assembled transformer center of gravity, extreme edge of jacking pads, extreme edge of base in contact with foundation, distance to outside edge of radiators.
  - b. Elevation above foundation of center of gravity, maximum liquid level, minimum liquid level, top of tank, top of radiators, base and tops of surge arrestors and bushings, jacking pads, and high and low voltage live parts.
  - c. Shipping and installed weight of transformer and weight of liquid required. Quantity of liquid in gallons and liters.
  - d. Location of control cabinets and conduit entrances dimensioned from equipment centerlines and bottom of base.
  - e. Certified flange details and bolt pattern for isolated phase or nonsegregated phase bus duct if requested on Data Sheets.
4. Drawings of transformer nameplate with complete data.
5. Drawings of transformer nameplate, schematic and wiring diagrams showing tap arrangements, wiring of accessories, and connection and interconnection wiring diagrams.

## 1.07 CLOSEOUT SUBMITTALS

### A. Operation and maintenance data. Provide at a minimum:

1. General description and technical data.
2. Receiving, storage, installation, and testing instructions.
3. Operating and maintenance procedures.
4. Complete set of approved drawings and documents submitted for review.
5. Certified copies of final transformer and communications test reports.
6. Certified copies of field installation tests.
7. Final transformer nameplate drawings including transformer test impedances.
8. Current transformer excitation and ratio correction factor curves.

## 1.08 MAINTENANCE MATERIALS

- A. Extra materials: Provide 2-quarts of touch-up paint for each transformer, in pressurized aerosol cans.

## 1.09 QUALITY ASSURANCE

### A. Regulatory requirements:

1. Design, fabricate, and test equipment in accordance with applicable standards of ANSI, NEMA, and IEEE and in accordance with applicable requirements of OSHA, specifically:
  - a. IEEE C57.12.00 – General Requirements for Distribution, Power, and Regulating Transformers.
  - b. IEEE C57.12.10 – Requirements for Transformers 230 kV and Below, 833/958 through 8333/10417 kVA, Single phase, and 750/862 through 60,000/80,000/100,000 kVA Three Phase With and Without Load Tap Changers.
  - c. IEEE C57.12.80 –Standard Terminology for Power and Distribution Transformers.
  - d. IEEE C57.12.90 – Test code for Distribution, Power, and Regulating Transformers and Guide for Short Circuit Testing Distribution and Power Transformers.
  - e. IEEE C57.98 –Guide for Transformer Impulse Tests.

- f. IEEE C57.116 –Guide for Transformers Directly Connected to Generators.
- g. IEEE C57.131 – IEEE Standard Requirements for Load Tap Changers
- h. NEMA TR 1 – Transformers, Regulators, and Reactors.

B. Perform routine production and required tests on equipment prior to shipment, in accordance with IEEE C57.12.00 and as noted on Data Sheets.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Ship transformer assembly as complete as transportation limitations permit to job site. Shipping to nearest rail unloading facility not acceptable.
- B. If nitrogen tanks are furnished, tanks shall become property of Owner.
- C. Insulating liquid shipped separately shall be in nonreturnable drums or by tanker truck. Coordinate liquid shipment and storage with site personnel.
- D. Instruments and gages shall be covered and protected from damage, either physical or climate.
- E. Provide with each transformer a 3-way temporary impact recorder to measure magnitude and direction of longitudinal (Y), lateral (X) and vertical (Z) impacts that occur during shipment. Stipulate in shipping order to carrier that only Owner may remove an impact recorder.
- F. Upon delivery, notify Owner for removal of impact recorders.
  - 1. If a recorder indicates impacts equal to or greater than those listed by Agreement in any of three directions specified, Contractor will be notified.
  - 2. Upon notification Contractor shall inspect and test transformer.
- G. Determine if dew point of gas in tank is acceptable just prior to shipment, record data, and submit for review.

#### 1.11 SERVICE CONDITIONS

- A. Transformer shall be capable of operating at rated kVA under usual operating conditions as defined in IEEE C57.12.00 including ambient temperatures, cooling medium temperatures, frequency, voltage, altitude, and load current.

#### 1.12 WARRANTY

- A. Transformer shall be provided with manufacturer's standard, 1-year warranty from date of delivery.
- B. Submit separate prices for extending transformer warranty to 2 and 5 years, respectively.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Delta Star, Inc.
- B. Hitachi Energy.
- C. Niagara Power Transformers.
- D. OTC Services Inc.
- E. Virginia – Georgia Transformer
- F. Weg Transformers.

## 2.02 SYSTEM DESCRIPTION

- A. Transformer shall be capable of withstanding without injury mechanical and thermal stresses resulting from short circuit currents as outlined in IEEE C57.12.00.
- B. When indicated on Data Sheets for direct connection to generator (indicated as unit auxiliary transformer or as generator step-up transformer), transformer shall be capable of withstanding, without injury, mechanical and thermal stresses caused by through faults on external terminals of any winding, up to 125% of its rated voltage in accordance with IEEE C57.116.
  - 1. Thermal and time duration shall be as stated in IEEE C57.12.00.
  - 2. Transformer shall be capable of operating 10% above rated secondary voltage at no-load, and 5% at full load.
- C. Provide appropriate hole spacing and hole quantities at termination location on bushings as required for connections to both high-voltage and low-voltage bushings, as indicated on Data Sheets
- D. Provide auxiliary equipment and services as indicated on Data Sheets.

## 2.03 DESIGN REQUIREMENTS

- A. Design equipment enclosure in accordance with seismic requirements as listed in most recent local building code and Data Sheets.
- B. Audible sound levels shall not exceed values as indicated on Data Sheets when measured in factory in accordance with NEMA TR 1 test code.
- C. If Load Tap Changer is specified, transformer shall be capable of delivering rated kilovolt amperes at rated low voltage position and on all positions above rated low voltage.

## 2.04 COOLING CLASS

- A. Cooling class designation shall be as indicated on Data Sheets and shall be consistent with IEEE C57.12.00.
  - 1. First letter designates internal cooling medium in contact with windings.
    - a. O – Mineral oil or synthetic liquid with fire point  $\leq 300^{\circ}\text{C}$ .
    - b. K – Insulating liquid with fire point  $> 300^{\circ}\text{C}$ .
    - c. L – Insulating liquid with no measurable fire point.
  - 2. Second letter designates circulation method for internal cooling medium.
    - a. N – Natural convection flow.
    - b. F – Forced circulation through cooling equipment (i.e., coolant pumps), natural convection around windings.
    - c. D – Forced circulation through cooling equipment, directed into at least main windings.
  - 3. Third letter designates external cooling medium.
    - a. A – Air.
    - b. W – Water.
  - 4. Fourth letter designates circulation method for external cooling medium.
    - a. N – Natural convection.
    - b. F – Forced circulation (i.e., fans for air cooling, pumps for water cooling).

## 2.05 MECHANICAL CONSTRUCTION

- A. Fabricate tanks, bases, radiators, covers, junction boxes, and other attached compartments from materials of sufficient strength to withstand normal service stresses without distortion or damage.
- B. Base shall be suitable for rolling or skidding in a direction parallel with either centerline.

- C. Design tanks and enclosures:
  - 1. Suitable for vacuum filling and vacuum drying in field.
  - 2. Maximum tank pressure shall comply with IEEE C57.12.00.
- D. Transformer tank top shall be domed to prevent water accumulation, and have a skid-resistant surface.
- E. Main tank cover, joints in transformer tanks, non-removable flanges, and bases shall be made gastight and liquidtight by welding.
- F. Recessed gaskets shall be used for flange connections on manhole, bushings, and other bolted connections.
- G. Equip transformer with provisions for jacking in accordance with IEEE C57.12.10. Provide lifting hooks on tank, and lifting eyes on cover.
- H. Unless alternate method is used to prevent corrosion of exterior of bottom of transformer tank, transformer tank design shall be such that ventilation is provided between concrete supporting slab and bottom of transformer tank.
- I. Only supporting steel beneath bottom of transformer tank may touch concrete slab. Design of steel supporting transformer tank bottom shall be such that bottom is accessible for inspection after installation.
- J. Provide recommendation for attachment of transformer to foundation with design drawings. Method of attachment will take into account seismic requirements of job site as indicated on Data Sheets.
- K. Gages and indicators mounted more than 5' (1.5 m) above bottom of base supports shall be sized and angled such that they are easily read from ground line elevation.
- L. Wiring:
  - 1. Wiring, thermocouple wiring, and connections shall be separately supported and protected to prevent damage during shipment or after final installation.
  - 2. Wiring shall be neatly bundled, terminated and marked in accordance with connection diagrams.

## 2.06 GROUNDING

- A. Two copper-faced steel grounding pads, each not less than 2" x 3-1/2" (50 mm x 88 mm) with 2 holes vertically spaced on 1-3/4" (44 mm) centers drilled and tapped for 1/2" (13 mm), 13 UNC thread. Minimum threaded depth of holes: 1/2" (13 mm).
- B. Protect threads by use of noncorrosive material.
- C. Weld ground pads on tank wall at diagonally opposite sides of transformer, located at, or near base.
- D. Provide ground conductors from equipment mounted on transformer that require grounding, to ground pads. Use No. 4/0 AWG, minimum
- E. Provide separate ground strap or conductor from neutral bushing to ground pad for transformers with solidly grounded neutrals. Ground strap to be sized for maximum ground fault with maximum duration as indicated on Data Sheet. For transformers with impedance grounded neutral, neutral ground strap shall be insulated from transformer and metallic parts for line-to-line voltages.

## 2.07 CORE AND COILS

- A. Brace to withstand short-circuit forces without damage or displacement of coil or core in accordance with IEEE C57.12.00.

1. 3-phase transformers rated less than or equal to 5.0 MVA: Limited only by transformer impedance – Category II.
  2. 3-phase transformers rated greater than 5.0 MVA: Limited by transformer and system impedance in accordance with Category III and IV.
- B. Core and coils shall withstand forces normally expected from shipping, moving and handling without use of special internal shipping braces.
- C. Provide suitable cooling liquid passages to limit hot spot temperature rise above average winding temperature rise at rated load.
- D. Complete core and coil assembly shall be readily removable from tank for repairs.
- E. Insulate coils from core and each other with sufficient insulation to withstand standard impulse and low frequency test for transformers of specified voltage class.
- F. Core ground connection shall be accessible at manhole without removing liquid from transformer tank or climbing into tank.
- G. Transformer cores: Circular in cross section for transformers 10 MVA and larger.
- H. Windings: Circular in cross-section and made up of copper conductor.
- I. Tertiary windings (if specified on Data Sheets):
1. kVA rating as required to meet short circuit withstand, but not less than 35% of transformer rating.
  2. Loading conditions: Transformer shall be suitable for operation for loading conditions specified on Data Sheets.
  3. Impedance: Limit fault magnitude to conditions specified on data sheets with in-feed from both high- and low-voltage terminals simultaneously.
- J. When dual voltage high voltage windings are specified the high voltage winding reconnection shall be made via a manual operated reconnection switch accessible from outside the transformer tank with position indicator and provisions for padlocking on transformer case minimum 48" (1.2 m) above bottom of baseplate support.

## 2.08 TOP LIQUID TEMPERATURE INDICATOR

- A. Provide dial-type, liquid temperature indicator relay for visible indication of top liquid temperature.
- B. Indicator:
1. Gage: Not less than 6" (150 mm) in diameter; clearly readable from ground elevation.
  2. Temperature controller:
    - a. Microprocessor temperature monitor and controller.
    - b. 3 temperature monitoring probes.
    - c. Outputs for SCADA monitoring.
    - d. RS232 with DNP3.0.
    - e. Software:
      - 1) Complete set of software to operate, communicate, and analyze data.
      - 2) Corporate license to software for Owner's and Engineer's use.
    - f. Communications wired to auxiliary control cabinet.
    - g. Manufacturer: Advance Power Technologies TTC 1000, or equal.
- C. Equip indicator with separate alarm contact and trip contact and manually resettable maximum temperature indicating hand.
- D. Mount so sensing element can be removed without loss of liquid and not interfere with tanking and un-tanking transformer core and coils.

## 2.09 COOLING EQUIPMENT AND CONTROLS

- A. Furnish integrally mounted equipment to provide required cooling capacity to maintain specified transformer rating.
  1. Radiators: Furnish radiator valves when detachable radiators are required by design of unit.
  2. Position to not obstruct access to manholes, hand holes, or other inspection/maintenance locations.
  3. Design to inhibit collection or retention of water or debris.
- B. Temperature control shall be provided by electronic winding temperature indicator arranged, and designed to automatically operate transformer cooling equipment in steps proportionate to transformer load and temperature.
- C. Winding temperature indication:
  1. At a minimum, electronic hot spot winding temperature indicator shall have alarm contacts and 4 levels of operation.
  2. Contacts shall be provided for customer remote indication for high temperature and high-high temperature.
  3. Provide current transformer required for winding temperature indicators.
  4. Hot spot thermal relay shall be provided with test switch so test can be circulated through relay with transformer in service and current transformer shorted out.
- D. Arrange cooling equipment controls so no single fault in control circuitry will cause loss of more than one half of cooling system capability.
- E. Arrange transformer cooling equipment controls so single remote contact will shut down all fans, regardless of mode of operation selected (manual or auto).
- F. Arrange ODAF cooling controls as follows:
  1. "Auto-Manual" selector switch and local "On-Off" switches for each fan bank and each pump bank.
  2. When in "Auto" state, cooling shall be initiated from integral winding hot spot detection.
  3. Provide 2 external control override when control switch is in "Auto." One external connection shall start cooling system regardless of hot spot temperature; second shall stop cooling systems regardless of hot spot detection.
- G. Provide cooling fan and pump motor contactor status for remote monitoring of cooling system.

## 2.10 AUXILIARY POWER AND CONTROL CABINET

- A. Enclose control equipment in weatherproof cabinet with NEMA rating as indicated on Data Sheet. Permanently attach to transformer.
- B. Location:
  1. Locate cabinet at height above bottom of base support such that it is suitable for operation and inspection by person standing at level of bottom of base support.
  2. Top of cabinet height shall be no more than 6'-7" (2 m) measured from bottom of base support elevation.
- C. Extend auxiliary power and control circuits that require an external connection to a common weatherproof control cabinet wired to terminal blocks.
- D. Wiring:
  1. Provide wiring, raceway, and terminal blocks in accordance with Section 26 05 00.
  2. Equip terminal blocks with washer head binding screws, covers, and white terminal identification marking strips General Electric Type EB-25, Marathon Type 1600, or equal. Screw shall accept standard holding type screw drivers only.
  3. Minimum No.12 AWG for control and minimum No.10 for current transformer wiring. Provide ring-tongue terminals on each end of control wiring.



4. Use either molded-case or DIN-rail mounted miniature circuit breakers to protect individual branch circuits integral to control cabinet for external circuits entering cabinet.
- E. Auxiliary power source:
1. Others will provide single or dual source of ac power and single source of dc power to control cabinet for fans, space heaters, auxiliaries, and control as indicated on Data Sheet.
  2. If second source of power for fans is specified on Data Sheets, use transfer switch to automatically switch between sources. Transfer switch shall be break-before-make and integral to control cabinet.
  3. If transformer equipment is furnished that operates on voltages other than that provided, equipment required to transform voltage of auxiliary power shall be furnished with transformer and shall be integral to control cabinet. Locate transformer to prevent damage or field personnel usage as step.
- F. Provide control cabinet with space heaters capable of maintaining cabinet internal temperature above dew point.
1. Heaters shall be spaced away, and be thermally insulated from devices and painted surfaces.
  2. Controlled by adjustable thermostat, factory set to close on falling temperature at 80°F (On) and open on rising temperature at 95°F (Off).
- G. Interior lighting:
1. Furnish interior cabinet LED light fixture that illuminates automatically when door is opened.
  2. Overcurrent protection device within cabinet shall protect fixture.
  3. Confirm cabinet lamps are readily available within Owner's service area.
- H. Furnish duplex 120-volt, 20-ampere, general use GFI receptacle within each enclosure to provide power for maintenance personnel. Overcurrent protection device within cabinet shall protect receptacle.
- I. Paint inside of cabinet white.
- J. Fan and/or pump motor starters, control power transformers, and protective devices as required for a complete and operational transformer shall be furnished as part of control cabinet.
- K. Provide undervoltage relays to actuate alarm on loss of any external auxiliary power source with contacts wired to terminal blocks for external use.
- L. Communications:
1. Provide central communications panel for communication connection to transformer mounted and/or provided equipment.
  2. Panel shall be clearly labeled including communications ports of any type.
  3. Communications shall be fully tested through panel as part of testing procedure and detailed reports provided.
- M. Provide operating and maintenance manual holding slot integral to control cabinet.
- N. Provide red shipping jumpers on current transformer terminals. Use of shorting-type terminal blocks only not acceptable.
- O. Locate transformer nameplate on door of transformer control cabinet.

## 2.11 CURRENT TRANSFORMER CIRCUITS

- A. Extend current transformer leads into transformer control cabinet. Terminate current transformer leads on shorting-type General Electric EB-27 terminal blocks mounted in transformer control cabinet.
- B. Ratios of multi-ratio current transformers shall be wired to transformer control cabinet.

- C. Short CT circuits at full ratio for shipment.

## 2.12 INSULATING LIQUID

- A. Ship transformer filled whenever possible.
- B. Furnish sufficient quantity of insulating liquid for complete vacuum filling to manufacturer's recommended level.
- C. Design transformer with sufficient bracing and strength to permit full vacuum filling with insulating liquid.
- D. Insulating liquid shall meet requirements as defined by ANSI/ASTM D3487 or ANSE/ASTM D6871 and following:
  1. Chemically stable.
  2. Free from acidity or other corrosive ingredients.
  3. Possess high dielectric strength.
  4. Contain less than 15 ppm water when tested in accordance with procedures of ASTM D1533 (Karl Fischer method).
  5. Test at least 30 kV upon receipt at final destination when tested in accordance with procedures of ASTM D877.
  6. If dielectric test strength of any liquid received in field, whether shipped separately or in transformer, tests less than 30 kV, provide labor, supervision, material, and equipment required to replace liquid in its entirety until test meets these specifications.
- E. Insulating liquid sampling and test procedures at factory shall conform to requirements of ASTM D117 and ASTM D923 for insulating liquid.
- F. Insulating liquid shall be inhibited with 0.3% by weight of DBPC (2, 6-Ditertiary-Butyl Para-Cresol). Transformer nameplate shall state that liquid is inhibited.
- G. Certify and warrant that equipment furnished insulating liquid without PCBs. Replace equipment at no cost should testing indicate that equipment does not meet this condition. Affix sign to transformer near drain valves which states that liquid used in equipment. Wording: "CONTAINS NO PCBs."

## 2.13 INSULATING LIQUID PRESERVATION SYSTEM

- A. Provide transformer with manufacturer's standard liquid conservation system unless noted otherwise on Data Sheets. Indicate type of proposed liquid conservation system on Data Sheets.
- B. Conservator liquid preservation system:
  1. If indicated on Data Sheets or if proposed by manufacturer, furnish conservator liquid preservation system as specified on Data Sheets as defined in accordance with IEEE C57.12.80.
  2. Type: Automatically maintained system that seals liquid from atmosphere. Provide required tank, piping, liquid level gage, upper filter press connection, and sampler.
  3. Design conservator system to withstand full vacuum. Provision shall be made for filling of main tank and conservator while under vacuum.
  4. System shall maintain constant atmospheric pressure on liquid. Provide sufficient capacity in conservator tank to prevent low level alarms for complete operating temperature range of transformer for ambient conditions listed on Data Sheets.
  5. Volume of liquid shall be adjusted such that no liquid shall be released until after top liquid temperature exceeds 120°C.
  6. Conservator system shall include, but not be limited to:
    - a. Conservator shut off valve.
    - b. Main tank shut off valve.
    - c. Drain valve.
    - d. Dehydrating breather with liquid seal used with air cell breather.
    - e. Pressure/vacuum bleeder with gage. Set to operate at lowest level consistent with reliable operation mounted on conservator air space.

- f. Dual pressure/vacuum switch to operate prior to bleeder operation mounted on conservator air space.
  - g. Vent valves with easy open/close feature.
  - h. Liquid level gage with high and low-level alarm contacts.
  - i. Buchholz relay 2-float version of flow-through type installed between tank and conservator system. Selected and installed in accordance with Buchholz requirements. Relay contacts shall be supplied with Form "C" contacts for each of functions and shall be wired to control cabinet.
  - j. Interconnecting piping: Metallic.
- C. Inert gas system:
- 1. Where specified on Data Sheets, provide automatically maintained system to provide dry nitrogen gas atmosphere above liquid. System shall include electronic monitoring system with alarm contacts arranged for remote indication of low, low/low, and high gas pressure.
  - 2. Provide valves to permit purging gas space and testing tank seal by admitting dry nitrogen under pressure.
  - 3. Nitrogen gas:
    - a. Bottled in 200 cu ft cylinders with connection No. 580 of ANSI/CGA-V-1.
    - b. Gas shall be in accordance with ASTM D1933, Type III.
    - c. Filling pressure: 2,200 ft-lb/sq in at 21.1°C.
    - d. Provide gas for initial charge on transformer and one full extra bottle for future use.
  - 4. Nitrogen control equipment, including adequate space for nitrogen bottles, shall be protected by easily accessible, weatherproof enclosure mounted on transformer tank.

#### 2.14 CURRENT TRANSFORMERS (CT)

- A. Provide bushing type CTs with fully distributed windings for relaying or metering service in quantities, ratios, and ratings as indicated on Data Sheets or on one-line diagrams.
- B. Extend current transformer leads into transformer control cabinet and terminate on shorting-type terminal blocks.

#### 2.15 BUSHINGS

- A. Suitable for service conditions specified herein.
- B. Bushing insulation class: Not less than that of winding to which connected.
- C. Bushing electrical characteristics and tests: IEEE C57.12.00 and IEEE C57.19.00.
- D. Bushing dimensions: IEEE C57.19.01 and NEMA TR1.
- E. Bushing color: Manufacturer's standard.
- F. Terminals: As indicated on Data Sheets.
- G. 110 kV BIL and above: Oil-filled, IEEE C57.19.00 and IEEE C57.19.01.
- H. Above 110 kV BIL: Provide with facilities for power factor testing.
- I. Minimum clearances: NEMA TR 1-1980, Table TR 1-0.06.

#### 2.16 SURGE ARRESTERS

- A. When indicated on Data Sheets, provide metal-oxide station class arresters with voltage ratings as specified on Data Sheets. General Electric "Tranquell," Ohio Brass "DynaVar," or ABB "ExlimQ."

- B. Mount near bushings such that they do not interfere with connections with minimum clearances specified in NEMA TR 1 for bushings are achieved with clearances approaching NEMA SG6 where practicable.
- C. Provide with full-capacity, copper connections, maximum 750 kcmil conductor size, between arrester and transformer bushing terminals to allow connection to arresters.
- D. Provide with ground connections.
- E. Connections between bushings and arresters shall contain provisions for expansion and contraction.

## 2.17 TAP CHANGER

- A. Provide tap voltages as indicated on Data Sheets. Each tap position shall be fully rated and shall not limit kVA rating of transformer.
- B. De-energized tap changer (NLTC):
  1. Provide operator for de-energized tap changer with extension to allow manual operation of tap changer at base elevation.
  2. Mount manual operating mechanism with tap position indicator and provisions for padlocking on transformer case minimum 48" (1.2 m) above bottom of baseplate support.
  3. Locate mechanism inside tank above core and coils if possible. If this location is impractical, mechanism shall be accessible through ports.
  4. Each tap position shall be fully rated.
- C. Load tap changer (LTC) when specified on Data Sheets:
  1. Operating mechanism with motor drive, local position indicator, operation counter, and raise/lower switches for manual operation.
  2. Equipment for LTC shall be mounted in a weatherproof compartment adjacent to tap changer compartment.
  3. Meet requirements of IEEE C57.131
  4. High-speed resistance or vacuum reactance.
  5. Design for minimum of 500,000 operations before contact or vacuum bottle replacement.
  6. Preventative transformer or series transformer required shall be power class, copper wound, and of a round core/coil design.
  7. Mount tap changer in separate oil-filled compartment, capable of withstanding full vacuum in main tank without bypass piping.
    - a. LTC compartment to be filled with mineral oil.
  8. LTCs intended for automatic operation shall have at a minimum:
    - a. Top filling plug.
    - b. Drain valve with sampling device.
    - c. Cover mounted pressure relief device.
    - d. Pressure control switch with alarm contacts.
    - e. Liquid level gage with alarm contacts.
    - f. Local position indicator.
    - g. Operations counter.
    - h. Space for mounting equipment for circulating current method for parallel operation.
    - i. Selsyn-type transmitter for position indication.
    - j. Raise and lower switches for manual control.
    - k. Current transformer for input to LDC shall be provided separate of other required transformer CTs.
    - l. Controller:
      - 1) Digital control package Beckwith M2001D with line-drop compensator (LDC) with resistance and reactance adjustments and one current transformer.
      - 2) If specified on Data Sheet:
        - a) Include external communications device
        - b) Transformer paralleling communications and devices.
    - m. Auto-manual selector switch.
    - n. Testing terminals.

- o. Static voltage regulating relay.
  - p. Control and time delay relays.
  - q. Reactance reversing switch.
  - r. Control compartment mounted to transformer with terminal blocks, space heaters, interior lighting, and convenience receptacle.
  - s. Continuous oil filtering system.
9. LTCs intended for remote operation shall have at a minimum:
    - a. Remote-Local selector switch.
    - b. Remote tap position indicator for mounting on remote control cabinet.
  10. Design drive mechanism such that LTC can be manually operated, while transformer is operating under load, safely with no risk to transformer or operator.
  11. If mechanism stalls in "Off-Tap" position, whether in automatic or manual operation, LTC shall be capable of maintaining full load indefinitely and an alarm contact shall be provided for remote monitoring.
  12. Manufacturer: Reinhausen RMV-II or ABB UZF.

## 2.18 ACCESSORIES

- A. Provide standard accessories in accordance with IEEE C57.12.10.
- B. Provide following devices with at least one set of single-pole, double-throw (SPDT) alarm contacts for each:
  1. Magnetic liquid level indicator.
  2. Pressure relief device piped such that releases occur away from bushings, control cabinets etc. Include dry Form C contact for remote indication. Wire to control cabinet.
  3. Top liquid temperature indicator.
  4. Loss of control power.
  5. Loss of auxiliary ac power alarm devices.
- C. Alarm contacts: Indicator contacts, switches, and relays used as alarm contacts shall be ungrounded and suitable for interrupting 0.02 ampere dc inductive, 0.2 ampere dc noninductive, or 2.5 amperes ac noninductive load at 250 volts maximum.
- D. Liquid drain and sampling devices.
- E. Upper and lower filter press connections.
- F. Lifting, moving and jacking facilities.
- G. Tilt transformer gages for ease of reading from ground. Mount within 5' (1.5 m) elevation of transformer base.
- H. Provide Buchholz fault pressure relay system, sensitive to rate of pressure increase including single-pole, single-throw (SPST) primary element controlling auxiliary seal-in relay and reset switch arranged and connected to provide manually resettable lockout function on operation of primary element.
  1. Design auxiliary relay for satisfactory operation on specified dc system. Provide electrically separate contacts for use with remote equipment. Mount inside main control cabinet.
  2. Wire rate of pressure rise relay equipment to terminal points in main control cabinet. Provide complete provisions for testing.
  3. Fault pressure relay: "Quailitrol."

## 2.19 IDENTIFICATION AND TAGGING

- A. Provide permanent nameplates to identify protective relays, meters, instruments, selector switches, indicating lights, terminal blocks, and other devices within various compartments.
- B. Nameplates shall have black lettering on white background. Fasten in place using Type 316 stainless steel, self-tapping screws. Nameplates shall be heat- and UV-resistant.

- C. Terminal blocks shall be clearly marked for wiring using permanent printed markers. Each internal interconnecting wire shall be identified at both ends with sleeve type wire markers with from/to information.
- D. Tag equipment with item number as shown on Data Sheets.

## 2.20 PAINTS AND FINISHES

- A. Type: Polyurethane or epoxy, durable.
- B. Tank paint: Manufacturer's standard ANSI gray.
- C. Radiators: Bare galvanized steel.

## 2.21 SOURCE QUALITY CONTROL

- A. Transformer no-load and load-loss test results shall be certified by a licensed professional Engineer.
- B. Perform routine production and required tests on equipment prior to shipment, in accordance with IEEE C57.12.00 and as noted on Data Sheets.
- C. Perform routine accuracy tests on each metering accuracy current transformer in accordance with IEEE C57.13.
- D. Witness testing. Notification in writing shall be provided not less than 30 days prior to scheduled starting date of factory test. Provide notification of performance date for each test not less than 10 days prior to date of test to allow witness testing if so desired.
- E. Unusual events or damage occurring during fabrication of transformer and of tests, which do not meet specified standard values shall be reported. Inspection of such damages or test failures may be witnessed. Corrective measures to overcome such damage or failure shall be subject to acceptance by Engineer.
- F. Temperature test: Not required on individual units if tests exist for thermal duplicate unit of previous manufacture. Copy of test on file shall be furnished.
- G. Special tests:
  - 1. Impulse tests:
    - a. Perform in accordance with IEEE Standard C57.12.90 using neutral current method of fault detection.
    - b. Oscillographic records of test shall be included in test reports.
  - 2. Partial discharge test:
    - a. Test for partial discharge in accordance with partial discharge procedures specified in "Partial Discharge Measurement" and IEEE C57.113.
    - b. Test voltage shall be determined in accordance with ANSI/IEEE C57.12.00.
    - c. Acceptable measured partial discharge above background:
      - 1) RIV level:
        - a) Lower than 100 microvolts with increase in RIV not exceeding 30 microvolts during 1-hour test.
        - b) Shall not exceed 250 microvolts at any time during test.
      - 2) Apparent charge measurement level below 500 picocoulombs.
    - d. Perform partial discharge test after other dielectric tests are completed.
    - e. Test report:
      - 1) Provide test results in both microvolts and picocoulombs
      - 2) Curve of data obtained in test shall be included in test reports.
  - 3. Megger tests: Perform in accordance with following procedure. Resistance measurements shall be corrected to 20°C.

- a. Perform with transformer filled with liquid and with appropriate bushings interconnected to measure resistance from high to ground, low to ground, and from high to low. Perform using applied potential of 2,500 volts.
- b. Perform between core and ground using applied potential of 500 volts.
- 4. Gas-in-liquid: Before testing begins and after tests specified are completed, dissolved gas-in-liquid analysis shall be made of main tank liquid.
- 5. Audible sound level: Not to exceed values given in NEMA TR 1 when measured in factory in accordance with NEMA TR 1 test code.
- 6. Communications test: Perform communications testing on devices with external communications capability and provide test report to document satisfactory operations. Tests shall include, but not be limited to:
  - a. Original device manufacturer installation and operational tests.
  - b. Signal levels and communications panel.
  - c. Demonstration of equipment operation during Owner witness tests.
  - d. Submit test report to document satisfactory operations.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's recommended procedures in presence of manufacturer's service representative.
- B. Move transformer to permanent location. Use cribbing and planking as required avoiding damage to underground piping or ducts in vicinity of foundation.
- C. Do not start assembly of transformer (except unloading and moving) until manufacturer's service representative is on job site.
- D. Assemble, fill with liquid, test, and refilter liquid if necessary as specified; connect and test. Provide vacuum pumping equipment required for filling transformer.
- E. Install accessories as directed by service representative.
- F. Install insulating liquid under vacuum and through a filter. Provide vacuum pumping.
- G. Provide and maintain power to heaters in transformer control cabinets.
- H. Provide documented field tests in accordance with manufacturer's recommendations.
- I. Cooperate with Owner test team for checkout and commissioning of communications.

#### **3.02 PLACEMENT OF INSULATING LIQUID**

- A. Receive and place liquid in liquid-filled equipment.
- B. Placement:
  - 1. Place liquid in equipment through filter in complete accordance with manufacturer's recommendations and these specifications. Vacuum filling is required for power transformers.
  - 2. Liquid removed to facilitate moving or assembly of equipment shall be replaced in same manner as liquid in new equipment.
  - 3. Use metal hose or liquid proof synthetic hose for liquid placement.
  - 4. When work is performed inside equipment tank, use extreme care to prevent dropping tools or other loose objects within tanks.
  - 5. Open work on equipment shall be done in clear, still weather or under shelter.

## C. Testing:

1. Test liquid before and after placement or replacement of liquid.
2. IEEE C57.106 and ASTM D877 or ASTM D1816, and ASTM D923 under observation of manufacturer's service representative.
3. Provide necessary testing facilities.

## D. Filtering:

1. When directed by Engineer or Owner, filter liquid by recirculating through filter as required, to bring to insulation level recommended by manufacturer.
2. Filtering of liquid during original placement or replacement shall be considered part of equipment installation.
3. Refiltering of liquid, which has become contaminated due to Contractor's failure to conform to manufacturer's recommendations and these specifications for placement of liquid, or due to failure to properly protect liquid from contamination when exposed to outside air, shall be provided by Contractor at no additional cost to Owner.
4. Provide necessary filtering equipment.

## E. Vacuum filling:

1. Fill in accordance with manufacturer's recommendations. General procedure is as specified below.
2. Following items shall be as recommended by manufacturer:
  - a. Maximum exposure time of core and coils to atmosphere.
  - b. Minimum vacuum pressure before and during liquid filling operations.
  - c. Length of time vacuum is to be maintained before liquid filling.
  - d. Temperature of core and coils prior to liquid filling.
  - e. Temperature of liquid when filling.
  - f. Moisture and air content of liquid.
  - g. Vacuum pressure to be maintained after completion of liquid placement.
  - h. Length of time vacuum is to be maintained after completion of liquid placement, prior to being released with nitrogen.
  - i. Time duration after completion of work prior to energizing transformer.
3. Using a vacuum pump, produce a vacuum in transformer tank, maintain minimum vacuum pressure as specified by manufacturer; maintain vacuum for length of time as specified by manufacturer.
4. Fill transformer with liquid to level above core and coils, maintaining vacuum during filling process. Break vacuum and open transformer to atmosphere; install bushings.
5. If bushings cannot be installed immediately after vacuum is broken, fill transformer with dry nitrogen.
6. After parts have been installed, re-establish vacuum and maintain vacuum while adding liquid to transformer to obtain proper level. Furnish high-capacity vacuum pump, heating equipment and piping hoses, connections, and accessories required to comply with manufacturer's recommendations.

## 3.03 PAINTING

- A. Apply 3-coat paint system over near white, grit-blasted metal, 4 to 6 mil minimum.
- B. Furnish Material Safety Data Sheet with shipping documents.

## 3.04 MANUFACTURER'S FIELD SERVICES

- A. Provide services of manufacturer's service representative(s) to supervise and/or check installation.
- B. Provide labor required to assist service representative(s) in checking and testing equipment.



<b>DATA SHEETS</b> <b>3-PHASE, 2-WINDING TRANSFORMER</b>		Equipment Name: Tag No.:	
DESCRIPTION	UNITS	SPEC DATA	VENDOR DATA
Manufacturer	-	By Manufacturer	
Catalog/Serial No.	-	By Manufacturer	
<b>SITE CONDITIONS</b>			
24 Hr. Avg. Ambient Design Temperature	°C	30	
Maximum Ambient Temperature	°C	40	
Minimum Ambient Temperature	°C	-30	
Site Elevation Above Sea Level	ft	Less than 3,300 ft	
Seismic Requirements			
Site Class			
S <sub>DS</sub> – Design Spectral Ground Acceleration at Short Periods (0.2 Seconds)			
I <sub>p</sub> – Component Importance Factor			
R <sub>p</sub> – Structure Response Modification Factor			
a <sub>p</sub> – Component Amplification Factor			
Specific local Building Code and specific sections on seismic requirements used in equipment design	---	By Manufacturer	
Symmetrical short circuit current			
Limited Only by transformer impedance (ANSI standard)	Y/N	Y	
Minimum system short circuit current and X <sub>0</sub> /X <sub>1</sub>	kA/#.#	NONE	
<b>CHARACTERISTICS</b>			
Operating Frequency	Hz	60	
Design Temperature Rise	°C	55	
Maximum Temperature Rise	°C	65	
Cooling Class	-	KNAN/KNAF/KNAF	
Capacity at Design Temp Rise	MVA	12/16/20	
Capacity at Maximum Temp Rise	MVA	13.4/17.9/22.4	
Impedance (Z%/ %Tolerance)	Z%/+-x	7.5%/+-7.5%	
HV to LV impedance at nominal voltage on Base Rating	Z%/+-x	7.5%/+-7.5%	
HV to Tertiary at nominal voltage on Base Rating	%	NONE	
LV to Tertiary at nominal voltage on Base Rating	%	NONE	
Transformer X/R Ratio	-	By Manufacturer	
Core and Coil Construction Type	-	Circular	
Type of Material Used in Coils	-	Cu	
<b>SYSTEM CONFIGURATION</b>			
Utilized as a Unit Auxiliary Transformer	Y/N	N	
Utilized as a Generator Step-Up Transformer	Y/N	N	
Utilized as a Substation Transformer	Y/N	Y	
Utilized as a Station Service Transformer	Y/N	N	
<b>WINDINGS</b>			
High Voltage:			
Nominal Rated Voltage	kV	34.5	
Basic Impulse Level	kV BIL	200	
Connection	D or Y	D	
Low Voltage:			
Nominal Rated Voltage	kV	12.47	
Basic Impulse Level	kV BIL	110	

<b>DATA SHEETS 3-PHASE, 2-WINDING TRANSFORMER</b>		<b>Equipment Name: Tag No.:</b>	
<b>DESCRIPTION</b>	<b>UNITS</b>	<b>SPEC DATA</b>	<b>VENDOR DATA</b>
Connection	D or Y	Y	
Displacement Between HV and LV Windings	deg	30° (ANSI std)	
Tertiary:		NONE	
Nominal Rated Voltage	kV	N/A	
Capacity (MVA)	Xx/xx/xx	N/A	
External Connection	Y/N	N/A	
Basic Impulse Level (External connection)	kV	N/A	
Connection	----	N/A	
Neutral:			
Basic Impulse Level	kV BIL	110	
Connection (Un-Grd, Solid, H-Res, L-Res)	-	Solid	
Neutral Insulation (Uniform, Graded)	-	Graded	
<b>BUSHINGS</b>			
High Voltage:			
Manufacturer	-	By Manufacturer	
Type	-	Porcelain	
Location	-	Cover	
Segment	-	3	
HV bushing BIL	kV	200	
Minimum creepage distance	In	35	
Low Voltage:			
Manufacturer	-	By Manufacturer	
Type	-	Porcelain	
Location	-	Side	
Segment	-	1	
LV bushing BIL	kV	110	
Minimum creepage distance	In	11	
Tertiary Voltage:		NONE	
Manufacturer	-	N/A	
Type	-	N/A	
Location	-	N/A	
Segment	-	N/A	
Tertiary bushing BIL	kV	N/A	
Minimum creepage distance	In	N/A	
Manufacturer	-	N/A	
Type	-	N/A	
Location	-	N/A	
Segment	-	N/A	
Neutral bushing BIL	kV	110	
Minimum creepage distance	In	11	
Location		Same as LV	
<b>CURRENT TRANSFORMERS</b>			
High Voltage (Bushing Current Transformers):			
Quantity on Each Bushing	Qty	2	
Ratio of Each CT	Pri/Sec	600:5	
Multi-Ratio	Y/N	Y	

<b>DATA SHEETS 3-PHASE, 2-WINDING TRANSFORMER</b>		<b>Equipment Name: Tag No.:</b>	
<b>DESCRIPTION</b>	<b>UNITS</b>	<b>SPEC DATA</b>	<b>VENDOR DATA</b>
Accuracy Class	-	C800	
<b>Low Voltage (Bushing Current Transformers)::</b>			
Quantity on Each Bushing	Qty	1	
Ratio of Each CT	Pri/Sec	1200:5	
Multi-Ratio	Y/N	Y	
Accuracy Class	-	C800	
<b>Tertiary Voltage (Bushing Current Transformers)::</b>			
Quantity on Each Bushing	Qty	NONE	
Ratio of Each CT	Pri/Sec	N/A	
Multi-Ratio	Y/N	N/A	
Accuracy Class	-	N/A	
<b>Tertiary (Internal Current Transformers):</b>			
Quantity on Each Winding	Qty	NONE	
Ratio of Each CT	Pri/Sec	N/A	
Multi-Ratio	Y/N	N/A	
Accuracy Class	-	N/A	
<b>Neutral Bushing (Bushing Current Transformers)::</b>			
Quantity on Each Bushing	Qty	1	
Ratio of Each CT	Pri/Sec	600:5	
Multi-Ratio	Y/N	Y	
Accuracy Class	-	C800	
<b>CONNECTIONS</b>			
<b>High Voltage (Select one):</b>			
Overhead Cable – Open Air	Y/N	Y	
Underground Cable – Open Air	Y/N	N	
Underground Cable - Enclosed	Y/N	N	
Nonsegregated Bus Duct	Y/N	N	
Segregated Bus Duct	Y/N	N	
Isolated Phase Bus Duct	Y/N	N	
Gas insulated Bus Duct	Y/N	N	
<b>Low Voltage Side (Select one):</b>			
Overhead Cable – Open Air	Y/N	N	
Overhead Cable – Cable Bus	Y/N	N	
Underground Cable – Open Air	Y/N	N	
Underground Cable – Enclosed	Y/N	Y	
Nonsegregated Bus Duct	Y/N	N	
Segregated Bus Duct	Y/N	N	
Isolated Phase Bus Duct	Y/N	N	
<b>Tertiary (Select one for external connected only):</b>			
Overhead Cable – Open Air	Y/N	N/A	
Underground Cable – Open Air	Y/N	N/A	
Underground Cable – Enclosed	Y/N	N/A	
Nonsegregated Bus Duct	Y/N	N/A	
<b>ARRESTERS</b>			
High Voltage Side	Y/N	Y	
Manufacturer	-		

<b>DATA SHEETS</b> <b>3-PHASE, 2-WINDING TRANSFORMER</b>		Equipment Name: Tag No.:	
DESCRIPTION	UNITS	SPEC DATA	VENDOR DATA
MCOV Rating	kV	22	
Location (Segment)	---	3	
Discharge monitor	Y/N	N	
Low Voltage Side	Y/N	N	
Manufacturer	-	N/A	
MCOV Rating	kV	N/A	
Location (Segment)	---	N/A	
Discharge monitor	Y/N	N/A	
Tertiary (External connection only):	Y/N	NONE	
Manufacturer	-	N/A	
MCOV Rating	kV	N/A	
Location (Segment)	---	N/A	
Discharge monitor	Y/N	N/A	
<b>TAP CHANGER</b>			
De-energized taps:	Y/N	Y	
Tap Location	HV/LV	HV	
No. of Steps Above Nominal (Std. 2 x +2.5%)	Qty / %	2 x +2.5%	
No. of Steps Below Nominal (Std. 2 x -2.5%)	Qty / %	2 x -2.5%	
Load Tap Changer:	Y/N	Y	
Tap Location	HV/LV	LV	
No. of Steps Above Nominal (Std. 16 x +5/8%)	Qty / %	16 / +5/8	
No. of Steps Below Nominal (Std. 16 x -5/8%)	Qty / %	16 / -5/8	
Digital Tap Changer Control	Y/N	Y	
Automatic, Manual, or Both	-	Both	
Tap Changer Control Communications Connection		Fiber Ethernet	
Transformer Paralleling Equipment	Y/N	N	
<b>Preservation System (Select One):</b>			
Conservator Tank or Inert Gas Pressure System	-	Inert Gas Pressure	
Conservator tank location	Segment	N/A	
<b>LIQUID</b>			
Total Gallons in System	gal	By Manufacturer	
Qty shipped Separately	gal	By Manufacturer	
Weight of Liquid as Shipped/Quantity of Liquid	Lb./Gal.	By Manufacturer	
Proposed Method of Liquid Shipment	-	By Manufacturer	
<b>COOLING</b>			
Radiator/Cooler Location – Segment (1,2,3,4)	-	1,3	
Cooling Equipment Fans:			
Quantity of Fan Motors per Stage	Qty	By Manufacturer	
Horsepower rating of each motor	Hp	By Manufacturer	
Rated Voltage and Phases	V, ph	240V, 1 ph	
Full Load Current	A	By Manufacturer	
Cooling Equipment Pumps:		NONE	
Quantity of Pump Motors per Stage	Qty	N/A	
Horsepower rating of each motor	Hp	N/A	
Rated Voltage and Phases	V, ph	N/A	
Full Load Current	A	N/A	

<b>DATA SHEETS 3-PHASE, 2-WINDING TRANSFORMER</b>		<b>Equipment Name: Tag No.:</b>	
<b>DESCRIPTION</b>	<b>UNITS</b>	<b>SPEC DATA</b>	<b>VENDOR DATA</b>
<b>Guaranteed Power Requirements of Cooling Equipment</b>			
First Stage	kW	By Manufacturer	
Second Stage	kW	By Manufacturer	
Third Stage	kW	By Manufacturer	
<b>Maximum Expected Sound Level at Max. MVA Rating and All Fans Operating at:</b>			
1 foot	dBa	By Manufacturer	
6 feet	dBa	By Manufacturer	
<b>CONTROL CABINET</b>			
Location – Segment (1,2,3,or4)	-	2	
Ac Auxiliary Power Voltage supplied to Control Cabinet	VAC	120/240V, 1 ph	
Qty of Ac Auxiliary Power sources supplied to Control Cabinet	1,2	1	
Power Required for AC Auxiliary Power Source	kVA	By Manufacturer	
Dc Control Power Voltage supplied to Control Cabinet	VDC	125	
Dc Rated Continuous Power Required	A	By Manufacturer	
Dc Rated Peak Power Required	A		
<b>ACCESSORIES</b>			
Nitrogen Pressurization Tanks	Y/N	Y	
Special Paint	Y/N	N	
Ground Resistor	Y/N	N	
Automatic Transfer Switch for Second Power Supply	Y/N	N	
Provisions (only) for Gas Analyzer	Y/N	N	
Wheels	Y/N	N	
100% spare gaskets	Y/N	N	
<b>TESTS</b>			
ANSI Routine Tests	Y/N	Y	
Winding Insulation	Y/N	Y	
Core Insulation	Y/N	Y	
Insulation Power Factor	Y/N	Y	
Auxiliary Cooling Losses	Y/N	Y	
Single Phase Excitation & Rated Voltage	Y/N	Y	
No Load Losses & Excitation Current	Y/N	Y	
Zero Sequence Impedance	Y/N	N	
Temperature Rise	Y/N	By Manufacturer	
Low Frequency on Auxiliary Devices	Y/N	Y	
Lightning Impulse	Y/N	By Manufacturer	
Front of Wave Impulse	Y/N	N	
Switching Impulse	Y/N	N	
Partial Discharge	Y/N	N	
Audible Noise	Y/N	Y	
Dissolved Gases in Liquid Analysis	Y/N	Y	
Sweep Frequency Response Analysis (SFRA)	Y/N	Y	
<b>EFFICIENCY</b>			
At 100% of Maximum MVA	%	By Manufacturer	
At 75% of Maximum MVA	%	By Manufacturer	
At 50% of Maximum MVA	%	By Manufacturer	

<b>DATA SHEETS</b> <b>3-PHASE, 2-WINDING TRANSFORMER</b>		Equipment Name: Tag No.:	
DESCRIPTION	UNITS	SPEC DATA	VENDOR DATA
<b>VOLTAGE REGULATION</b>			
100% of Maximum MVA at:			
Unity Power factor	%	By Manufacturer	
80% lagging power factor	%	By Manufacturer	
80% leading power factor	%	By Manufacturer	
Excitation Current at 100% Rated Voltage and Max. MVA	%	By Manufacturer	
<b>GUARANTEED LOSSES</b>			
Auxiliary Losses at full load and Max. MVA rating	kW	By Manufacturer	
No-Load Losses at 100% Rated Voltage	kW	By Manufacturer	
Load Losses at Max. MVA Rating	KW	By Manufacturer	
<b>LOSS EVALUATION</b>			
Auxiliary Losses	\$/kW	130.53	
No-Load Losses	\$/kW	1740.27	
Load Losses	\$/kW	502.58	
<b>DIMENSIONS (APPROXIMATE)</b>			
Overall Height	in.	By Manufacturer	
Overall Width	in.	By Manufacturer	
Overall Depth	in.	By Manufacturer	
Transformer Base Width	in.	By Manufacturer	
Transformer Base Depth	in.	By Manufacturer	
Height over Tank	in.	By Manufacturer	
Height for Untanking	in.	By Manufacturer	
Minimum Distance Between Surge Arresters	in.	By Manufacturer	
Recommended Min. Space Between Transformer and Adjacent Structures	in.	By Manufacturer	
<b>WEIGHTS (APPROXIMATE)</b>			
Core and Coil	lbs.	By Manufacturer	
Tank and Fittings	lbs.	By Manufacturer	
Liquid	lbs.	By Manufacturer	
Total Transformer With Liquid	lbs.	By Manufacturer	
Total Shipping Weight	lbs.	By Manufacturer	
Weight of Largest Piece for Handling	lbs.	By Manufacturer	
<b>DELIVERY</b>			
Method of Shipment (truck, rail, barge, ship)	-	By Manufacturer	
Total No. of Weeks from Award of Contract, FOB site	wks	By Manufacturer	
Submittal of Review Drawings After Award of Contract	wks	By Manufacturer	
Manufacturing Time after Receipt of Approved Drawings	wks	By Manufacturer	
<b>SPECIAL REQUIREMENTS</b>			
List parts Requiring Field Assembly	-	By Manufacturer	
Describe Extent of Field Welding	-	By Manufacturer	

<b>DATA SHEETS</b> <b>3-PHASE, 2-WINDING TRANSFORMER</b>		<b>Equipment Name: Tag No.:</b>	
<b>DESCRIPTION</b>	<b>UNITS</b>	<b>SPEC DATA</b>	<b>VENDOR DATA</b>
List of Required Maintenance Tools Furnished With Equipment	-	By Manufacturer	
List of Required Spare Parts Furnished With Equipment - High Side Bushing with Gasket – Qty. 1 - Low Side Bushing with Gasket – Qty. 1 - LTC Tank Gaskets – Qty. 1 set		Price to be included in total price but Manufacturer to provide \$/part breakout here	
List any Special Considerations Maximum fault current available from tertiary in kA from both HV and LV windings:	-		

END OF SECTION

- 1) Philip E. Schulz
- 2) Seth G. Weiss

## **PART 1 GENERAL**

### 1.01 SECTION INCLUDES

- A. Grounding system requirements providing protection of equipment and personnel.

### 1.02 SYSTEM DESCRIPTION

- A. Grounding system includes, but is not limited to, rods, cable, connectors and miscellaneous hardware and materials.
- B. Engineer will provide outline, arrangement, and detail drawings for grounding system.

### 1.03 SUBMITTALS

- A. Product Data:
  - 1. Final product data sheets for each type of component.
  - 2. Accessories list.
  - 3. Ratings and nameplate information.
  - 4. Special installation tools list.
- B. Quality assurance data:
  - 1. Certified shop test reports.
  - 2. Certified field installation data and reports.
  - 3. Manufacturer's installation information.
  - 4. Copies of component warranties.

### 1.04 QUALITY ASSURANCE

- A. Manufacturer qualifications:
  - 1. Grounding assembly manufacturer shall be manufacturer of major components of ground system.
  - 2. Manufacturer shall be ISO certified.
  - 3. When requested by Engineer, provide acceptable list of similar equipment installations complying with this Specification.
- B. Regulatory requirements:
  - 1. Design, manufacture, and test ground system and accessories in accordance with applicable requirements of NFPA 70, IEEE STD 80, IEEE STD 81, IEEE STD 142, IEEE STD 837, and applicable state and local codes and regulations.
  - 2. Standards of foreign organizations shall not be used without written approval from Engineer.

### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Prepare detailed packing lists and shipping notification for items shipped.
- B. During delivery and storage, handle equipment to prevent damage.
- C. Store equipment in clean, dry place. Protect from weather, dirt, water, construction debris, and physical damage in accordance with manufacturer's instructions.

### 1.06 MAINTENANCE

- A. Grounding system shall not require maintenance after final installation, testing, and acceptance.
- B. Provide complete set of special tools as necessary for installation for each piece of equipment. Tools and their intended use shall be identified in assembly instructions.



## PART 2 PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. FCI-Burndy
- B. Erico
- C. Galvan Industries
- D. Southern Grounding Products
- E. Harger Lightning & Grounding
- F. Thompson Lightning Protection, Inc.

### 2.02 MATERIALS

- A. Grounding materials shall be new and undamaged.
- B. Ground rods: Copper-clad steel not less than 3/4" (19 mm) in diameter and 10' (3 m) in length unless noted larger on Drawings. Ground rods shall be UL listed with not less than 10 mils of Copper cladding and stamped near top of rod to show manufacturer, diameter, and length with one end pointed to facilitate driving. If ground rod is longer than 10' (3 m), use sectional, threaded ground rods.
- C. Bare ground cable: Soft drawn copper in accordance with ASTM B3, Class B stranding, not less than No. 4/0 AWG (120 mm<sup>2</sup>) in accordance with ASTM B8.
- D. Insulated ground conductors shall have green colored insulation.
- E. Ground conductors shall be bare or have green colored insulation or marked with green colored tape or adhesive labels at each end and at every point where conductor is accessible.
- F. Connections shall be made using an exothermic welded process.
  - 1. Exothermic molds and weld metal shall be selected for connection and be made in strict accordance with manufacturer's instructions.
  - 2. Where compression type connections are used, provide tools and proper dies as recommended by manufacturer.
  - 3. Where flush ground plates are to be embedded in concrete, ground cable shall be exothermally welded to plate and plate firmly secured to concrete forms.
- G. Above-grade connections shall be provided as shown on Drawings.
- H. Above-grade clamps and other hardware used with grounding system shall be bronze or copper alloy.
- I. Above ground bolts, washers, and nuts shall be silicon bronze alloy or approved type of cadmium-plated steel.
- J. Connections to ground rods and ground cables to be buried in earth or concrete shall be suitable for direct burial and shall be identified for such use.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify Site conditions are acceptable for installation.
- B. Verify grounding system components are in good condition and undamaged.

### **3.02 INSTALLATION**

- A. Install at locations shown on Drawings and in accordance with manufacturer's recommendations.
- B. Coordinate interface installation with existing grounding systems.
- C. Connect electrical equipment to ground grid with ground conductor. Electrical equipment shall be designated as metallic structures including equipment mounted thereon, instrument transformers, surge arrestors, overhead shield wires, transformers, breakers, voltage regulators, enclosures, switchgear, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits, operate continuously at ground potential, and provide low impedance path for possible ground fault currents.
- D. Install separate, green-insulated equipment grounding conductor in conduit with related phase and neutral conductor.
- E. Multiconductor power cables shall have dedicated grounding conductor integrated within cable construction.
- F. Ground medium-voltage cable shields at each end using cable termination shield grounding kits supplied with medium voltage terminations. Install in strict accordance with manufacturer's instructions.
- G. Ground motors with ground conductor originating at ground lug in equipment where motor power is supplied and connected to motor frame inside motor terminal conduit box. Where motor has separately mounted starter or disconnect switch, ground conductor shall be bonded to starter and disconnect device enclosures and motor frame.
- H. Above-grade connections to permanent and removable equipment shall be exothermic-weld, bolted, or compression-connection type.
- I. Connections to exposed structural steel within buildings or plants shall be exothermic-welded type, unless noted otherwise. Connections to structural steel within substations shall be bolted type. Connections to galvanized steel shall be by bolting.
- J. Above-grade conductors:
  - 1. Install exposed conductors inconspicuously in vertical or horizontal positions on supporting structures.
  - 2. When located on irregular supporting surfaces or equipment, conductors shall run parallel to or normal to dominant surfaces.
  - 3. Conductors routed over concrete, steel, or equipment surfaces shall be kept in close contact with surfaces by using fasteners located at intervals not to exceed 3' (1 m).
- K. Conduits extending into equipment shall be grounded through grounding bushings in enclosure where terminated. Grounding bushings shall be wired together and connected internally to enclosure ground lug or ground bus with bare copper conductors.

- L. Conduits connected to metal enclosures shall be grounded to enclosure by either grounding bushing or double locknuts, with one conduit locknut on each side of enclosure, to provide continuous ground path back to source voltage. Provide grounding bushing for knockout holes in metal enclosures that are oversized, elongated, or deformed.
- M. Install bare grounding conductor for entire length of power cable tray and where indicated on Drawings. Connect grounding conductor to each tray section and bond tray grounding system to station ground grid at minimum of every 100' (30 m). Cable tray shall additionally be continuous and rated for carrying fault current in accordance with NEC. Trays shall be bonded either by direct connection to or by bonded conduit or jumper conductor to panels, switchgear, and equipment tray cable serves. Conduit takeoffs from tray shall use UL-approved grounding clamps.
- N. Bare conductor, used for building or facility lightning protection system, shall be connected to below grade grounding system.
- O. Install ground conductor below grade around building perimeters, foundations, and equipment skids as indicated on Drawings. Repair or replace damaged ground system conductors.
- P. Exothermic welds shall encompass 100% of cable end being welded and shall resist moderate hammer blows.
- Q. Connect building and pipe support columns to grid with No. 4/0 AWG (120 mm<sup>2</sup>) cable. Equipment skid frames, switchgear and motor control center ground bars, dry-type transformer cases, and other required solid grounds shall be connected to site grid by "stingers" extended from grid. Where indicated on Drawings, stingers shall be same diameter as ground cable. Provide 5' (1.5 m) of coiled cable above grade for equipment connection.
- R. Extend plant ground grid system to utility substation ground grid or adjacent grounding systems where indicated. Care shall be taken when exposing and connecting to existing grounding systems to maintain continuity and backfill correctly.
- S. Excavate for grid conductor to depths of 18" (50 mm) minimum or as indicated on Drawings. Use special care for excavation near existing foundations and utilities. Excavate by hand in such areas. After installation of grid conductor, backfill with material from excavation, excluding large stones and organic material. Backfill around conductor completely, thoroughly tamping to provide good contact between earth and ground conductor.
- T. Install ground rods in firm soil outside of excavated areas. Drive top of rod to depth of 18" below grade as a minimum to match conductor depth, unless otherwise shown on Drawings. Use driving studs or other suitable means to prevent damage to threaded ends of sectional rods.
- U. Maximum resistance-to-ground of single driven ground rod shall not exceed 25 ohms. Maximum resistance-to-ground of ground grid system shall not exceed 2 ohms. If measured resistance exceeds above values, add rods and bond together to achieve desired resistance. Measurements shall be made and data recorded in presence of Owner's Representative.
- V. Install ground conductor near top and on each side of concrete encased duct bank. Connect duct bank ground conductor to plant grounding system. Install duct bank ground conductors through manhole walls to provide grounding for metallic noncurrent-carrying cable supports, metallic sheaths of cable, and enclosures. Metallic conduits within duct bank shall be provided with grounding bushings within manholes. Connect grounding bushings to grid conductor with minimum No. 8 AWG (10 mm<sup>2</sup>) conductor.

END OF SECTION

- 1) Preston K. Mitchell
- 2) Phil E. Schulz, John R. Sovers



**PUBLIC WORKS DEPARTMENT**  
**MEMORANDUM**

June 5, 2023

**Memo To:** Mayor Burns and Committee of the Whole  
**From:** Aaron Holton, Superintendent of Electrical Services  
**Re:** Recommendation for the Purchase of devices and equipment and the construction of the Kautz Rd Substation.

A key part of the City's Southeast Master Plan has been the construction of a 34.5/12kV electric substation to supply power to the proposed development. Staff has been working towards this goal for several years.

In partnership with Midwest Industrial Funds (the property owner) the City applied for and was subsequently awarded a \$1.2 Million Rebuild Illinois grant from the Illinois Department of Commerce and Economic Opportunity (DCEO). This money was specifically designated for the construction of the electric substation. One of the requirements of this grant is a Business Enterprise Program (BEP) utilization goal for 20% Minority Based Enterprises and 5% Women Based Enterprises. The approval process to meet these goals adds significant time to the bid award timeline, as the City cannot award a contract until the BEP utilization plan for the goals has gained approval from the DCEO. With this in mind, and the time limit of the Grant of 24 months, staff made the choice to bid this project as a whole instead of the City's normal practice of bidding individual components and then a labor contract, and subsequent approval for each individual contract.

Bids were advertised on February 18, 2023 and opened on March 27, 2023. One bid was received from Haugland Energy LLC. Five other bidders declined to bid due to various reasons ranging from lack of manpower to supply chain concerns. The Haugland bid is \$1.08 Million more than the engineer's estimate. In evaluating whether to rebid the project versus moving forward with the single bid, staff and the engineer considered the timing of the grant money spend, the likelihood of responses from a second bid and the overall timeline of the project. Staff concluded Geneva likely would not receive more responses to a second bid and an additional 8 weeks would place the grant funding in jeopardy due to the additional time to approve the BEP utilization plan.

Please note that the Rebuild Illinois Grant brings the City's share of the cost of the project below the engineer's estimated construction costs. This engineer's estimate is what staff utilizes to determine the general obligation bond amount, and staff does not anticipate an increase in the bond request due to this project.

The DCEO approved Haugland's BEP utilization plan on May 16, 2023. This step in the process allows the City to award the contract and begin moving forward with the construction of the substation.

### **Staff Recommendations;**

After careful and thorough review of the bids for the devices and equipment and construction, it is the staff's recommendation to COW, that COW approves and recommends City Council to **the bid for construction of the Kautz Rd substation to Haugland Energy, LLC in an amount of \$6,383,000 and allow the City Administrator to approve change orders not to exceed 10% of the contract amount.**

Cc: Stephanie Dawkins, City Administrator  
Ben McCready, Asst. City Administrator  
Rich Babica, Director of Public Works  
Jennifer Hilkemann, Manager of Distribution Construction and Maintenance  
Jose Ruiz, Manager of Electric Operations

May 31, 2023

Aaron Holton  
Electric Division Superintendent  
City of Geneva  
1800 South Street  
Geneva, IL 60134

**SUBJECT: Contract 23-01 Kautz Road Procurement/Construction –  
Letter of Recommendation**

Dear Aaron:

On March 27, 2023, one (1) bid was received and opened at the City of Geneva (Geneva) in response to the request for proposal for the Kautz Road procurement/Construction project. The bid was opened and read aloud by Geneva. The bid was then sent to Stanley Consultants to be reviewed in their office. A bid tabulation of this review is enclosed for your review (Attachment A). Bid Tabulation also shows bidders that were invited to bid that declined to bid. Copies of the no bid responses can be provided upon request.

The bid had a few technical exceptions. A questions/answers document was sent to clarify these exceptions. Their responses are attached for your review (Attachment B). One clarification changed the price of the bid. This was an adder for bonding that had been taken exception to in the original bid. The bidder provided two options for bonding for one year after construction.

- Bonding for the entire project amount: \$58,000
- Bonding for Material and Equipment only: \$26,000

The price for bonding for Material and Equipment only has been added to the contract price. This can be seen in the bid tabulation. With this change the new total bid price would be \$6,383,000.

There were also contractual exceptions for the City of Geneva to review.

Stanley Consultants recommends that Contract 23-01 Kautz Road Substation Procurement/Construction be awarded to Haugland Energy, LLC for the bid price of \$6,383,000.

A draft conformed contract between the City of Geneva and Haugland Energy, LLC has been provided (Attachment C). Please review and if Geneva is in agreement with the recommendation of awarding this contract to Haugland Energy, LLC please print and sign three originals of the Agreement Between Buyer and Seller page 6 and prepare a Notice-to-Proceed letter for Haugland Energy, LLC. Send the Notice-to-Proceed letter with the signed signature pages to Haugland Energy, LLC with the direction to sign and date all three originals and send to me to be used in creating the conformed contract. Also, in this letter request that Haugland Energy provide a copy of their certificate of insurance.

If you have any questions, please contact me at 563.264.6461.

Sincerely,

A handwritten signature in blue ink, appearing to read "Philip E. Schulz". The signature is fluid and cursive, with the first name "Philip" being the most prominent.

Philip E. Schulz  
Project Manager  
Stanley Consultants, Inc.

cc: Jose Ruiz  
Jennifer Hilkemann  
Files

Attachments: Attachment A - Bid Tabulation  
Attachment B – Haugland Energy Question/Answer Document  
Attachment C – Draft Conformed Contract

City of Geneva

Kautz Road Substation Procure/Construct  
12/16/20 MVA, 34.5 kV - 12.47/7.2 kV

Manufacturer	Haugland Energy LLC	Hooper Corperation	Kent Power	Michles	MJ Electric	JF Electric
Bid Document is Signed	Y	No Bid	No Bid	No Bid	No Bid	No Bid
Bid Bond	Y					
Warranty	Y					
Data Sheets	N					
Acknowledgement of Addendums	Y					
Clarifications	Y					
Completion Date	7/31/2025					
Liquidated Damages	Accepted					
Witness Testing Allowance						
Owner Transformer Travel Allowance	\$ 12,500.00					
Engineer Transformer Travel Allowance	\$ 12,500.00					
Owner Transformer Per Diem Allowance	\$ 2,500.00					
Engineer Transformer Per Diem Allowance	\$ 12,500.00					
Owner Building Travel Allowance	\$ 25,000.00					
Engineer Building Travel Allowance	\$ 25,000.00					
Owner Building Per Diem Allowance	\$ 5,000.00					
Engineer Building Per Diem Allowance	\$ 25,000.00					
Transformer Cost w/ Witness Testing	\$ 1,665,000.00					
Building & Switchgear w/Witness Testing	\$ 1,010,000.00					
Substation Steel and Equipment	\$ 257,000.00					
General Construction	\$ 3,425,000.00					
Total Bid Price	\$ 6,357,000.00					
Bond on Material/Equipment only - 1 year Adder	\$ 26,000.00					
Total Bid Price with Adder	\$ 6,383,000.00					
Comments	- A contractor license will be obtained prior to offical award, if applicable.					



## Contract 23-01 Kautz Road Substation Procurement/Construction

## Bid Review Questions for Haugland Energy LLC

Question	Haugland Energy LLC Response
1. Section 1: Utilization of Certified Vendors form that was filled out for MBE Fence, Inc. does not have an item circled in the checkbox row of "Certified with the CMS Business Enterprises Program (BPE) as a ..." Please updated this sheet and provide updated copy.	Addressed Previously – Revision sent prior to receiving this document.
2. Data Sheets provided in the bidding documents have not been filled out. Please fill out supplied Data Sheets and provide Copy for review.	Submitted via email – 4/18/23
3. Clarification states "Price for Transformer w/ Witness Testing allowance does not include any installation pricing." Verify that the pricing for the installation is included elsewhere in the pricing and will be performed in the overall project.	Installation is included in the General Construction item.
4. Clarification states "Price for Building/Switchgear w/ Witness Testing allowance does not include any installation pricing." Verify that the pricing for the installation is included elsewhere in the pricing and will be performed in the overall project	Installation is included in the General Construction item.
5. Clarification states "Price for Steel & Equipment does not include any installation pricing." Verify that the pricing for the installation is included elsewhere in the pricing and will be performed in the overall project	Installation is included in the General Construction item.
6. Clarification states, "Pricing does NOT include any soils/compaction testing/IEPA 663 or CCDD testing" Structural Excavation and Backfill, Grading and Aggregate surface spec require soil compaction testing. Please confirm that the test required in the spec will be performed as part of this overall project.	Installation is included in the General Construction item.
7. Transformer Spec requires warranty information be sent with bid. Please provide.	Submitted via email – 4/18/23
8. Transformer Supplier calls out SEC Electrical Equipment Sales in the List of Suppliers, but Submittal Schedule page 2 calls out WEG as the manufacturer. Our understanding is that PowerOne is the rep for WEG in Northern Illinois and that SEC Electrical Equipment Sales is the rep for Niagara. Please clarify manufacturer of transformer for this project.	Niagra from SEC Data Sheet Submitted was only one received at time of bid. Transformer Manufacturer will be Niagra and supplied by SEC.
9. Markup of Terms and Conditions show ending bond upon delivery. Protection for warranty of substation is needed for the year after construction. Would Haugland consider providing a reduced bond for the year after installation that would just cover the material cost instead of the overall project price?	HE is amenable to providing and can submit pricing should the determination be made to include. <b>Full Bond-\$58,000</b> <b>Bond on Material/Equip only -\$26,000</b>