



FAYETTEVILLE PUBLIC WORKS COMMISSION

PROCUREMENT DEPARTMENT

<https://www.faypwc.com/bids/>

**Bid Addendum**

**PWC Number:** PWC2324029

**Bid Title :** Cross Creek Water Resource Facility and Rockfish Creek Water Resource Facility Screw Pump Improvements

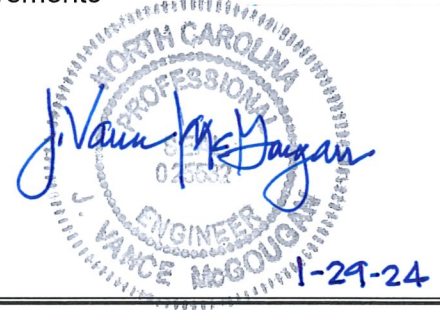
**Bid Opening Date and Time:** Thursday, February 8, 2024

**Addendum Number:** 3

**Addendum Date:** January 29, 2024

**Procurement Advisor:** Carla Wint

[procurement@faypwc.com](mailto:procurement@faypwc.com)



1. Return one properly executed copy of this addendum with bid response prior to the Bid Opening Date/Time listed above.
2. Following are questions received about the solicitation and SME's answers to the questions (continued from ADDENDUM #2):
  - Q5. Section 01 14 00 stipulates that only one screw pump at a time may be demolished. During demolition and installation, we anticipate that workers will need to work from the wall located between screw channels and feel that working between one idle channel and one live channel is a safety issue. Please consider allowing two adjacent channels to be demolished at the same time.
    - A5. Please see Addendum #3 Technical Specification attachment below.
  - Q6. Spec 26 05 00-1.11 states contractor shall provide studies in accordance with Section 26 05 73 - Power System Studies. This spec is not included in the Contract Documents. Please provide.
    - A6. Please see Addendum #3 Technical Specification attachment below.
  - Q7. Spec 26 05 33.13-3.01.R states conduit emerging from within or below concrete encasement shall be PVC coated rigid galvanized steel. The Conduit Uses table on page 20 of the same spec show this scenario utilizing PVC coated rigid aluminum conduit. Please advise which is correct.
    - A7. Please see Addendum #3 Technical Specification attachment below.
  - Q8. Per Conduit Uses table beginning on page 19 of spec 26 05 33.13, please confirm PVC-coated rigid aluminum conduit is to be used for Instrumentation wiring for the following conduit installation scenarios:
    - Concealed within non-elevated concrete slabs
    - Concealed below concrete slabs
    - A8. Please see Addendum #3 Technical Specification attachment below.

**Q16.** Please review Section 43 24 41 Part 3.03 B. 1. We suggest that if the screw pump manufacturer is going to prep, shop prime, stripe coat, and shop finish coat the steel screw pump torque tubes, all expenses associated with the inspection and testing of the surface preparation by a NACE Level 3 Certified Coating Inspector should be the responsibility of the manufacturer and not the Contractor.

**A16.** Please see Addendum #3 Technical Specification attachment below.

**Q17.** Regarding Section 43 24 41 Part 3.03 A., does the Owner prefer painted steel torque tubes or 304 stainless steel torque tubes? We suggest that the Owner include their preference in the Base Bid and provide an additive / deductive bid item for the other option.

**A17.** Please see Addendum #3 Technical Specification attachment below.

**Q24.** The response A10 provided to question Q10 as part of Addendum No. 2 is not clear. Please confirm the following:

- NC reimbursable sales and use taxes are not to be included in the Bid. (Confirmed)
- The successful Contractor will pay all applicable taxes, including NC reimbursable sales and use taxes. (Confirmed)
- The successful Contractor will bill the Owner for NC reimbursable sales and use taxes, and will be reimbursed by the Owner for all NC reimbursable sales and use taxes paid by the Contractor, since these costs are not to be included in the Bid. The Contractor is responsible for petitioning the State of North Carolina for reimbursement of sales and use taxes expended on this project. PWC will assist as needed.

**A24.** See responses above.

**Q25.** The Bid Form for this project includes the following statement:

A. BIDDER agrees that Work shall be completed within the time frame indicated in the Agreement as follow:

1. All work described herein to be complete, including restoration and all punch list items from Notice to Proceed until March 30, 2025.

The March 30, 2025 completion date is not in agreement with the revised contract duration provided in Addendum No. 1 (912 days).

**A25.** Prospective Bidders' attention is directed to page 7 of Section 00300 – BID FORM. Replace statement A.1. with the following:

- A.1. All work described herein to be complete, including restoration and all punch list items from Notice to Proceed until September 28, 2026.

**Q28.** At the prebid, it was stated that the GC should "include taxes on all prices". However, the bid form, item A (Lump Sum Bid Price:) has the phrase "Excluding sales tax" under it. Is the GC supposed to include sales tax on Purchase Order Materials in their bid? Google states "The minimum combined 2023 sales tax rate for Fayetteville, North Carolina is 7%. This is the total of state, county and city sales tax rates." Is this correct

**A28.** See responses to question #24 above.

**Q29.** During the online pre-bid meeting it was stated that the owner would pay for the costs of construction materials testing (concrete, geotech, etc.). Please confirm.

**A29.** (Confirmed)

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**Failure to acknowledge receipt of this addendum may result in rejection of the response.**

Check ONE of the following options:

- Bid has not been mailed. Any changes resulting from this addendum are included in our bid response.
- Bid has been mailed. No changes resulted from this addendum.
- Bid has been mailed. Changes resulting from this addendum are as follows:

**Execute Addendum:**

**Offeror:** \_\_\_\_\_

**Authorized Signature:** \_\_\_\_\_

**Name and Titled (Typed):** \_\_\_\_\_

**Date:** \_\_\_\_\_

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**ADDENDUM NO. 3 – TECHNICAL SPECIFICATIONS AND DRAWINGS**

Date: 1/25/24  
Project: Cross Creek WRF and Rockfish Creek WRF Screw  
Pump Improvements  
Owner: Fayetteville Public Works Commission  
Engineer: Hazen and Sawyer

To All Bidders:

Contractors submitting Proposals for the above-named Project shall take note of the following changes, additions, deletions, clarifications, etc., in the Contract Documents, which shall become part of and have precedence over anything contrarily shown or described in the Contract Documents, and all such shall be taken into consideration and be included in the Contractor's Bid Proposal.

All other general items, conditions, drawings, and specifications shall remain the same. Please acknowledge the receipt of this Addendum on the Bid Form.

Refer to the Attached Sheets.



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Colin W. W. Beck, PE  
Hazen and Sawyer

## Cross Creek WRF and Rockfish Creek WRF Screw Pump Improvements

### Addendum No. 3

#### **SPECIFICATIONS:**

##### 01 14 00 – Coordination with Owner’s Operations

1.06-B-2-a-3 Add the following sentence at the end of all three paragraphs:

1.06-B-2-b-2

1.06-C-1 “To Safely perform demolition and installation work in a screw pump bay, adjacent screw pumps may be locked and tagged out, at average daily flows or less, at a specific time, and for a specific duration, as directed by the Owner.”

##### 01 52 00 - Construction Facilities

Add this Section. See Attachment 1.

##### 26 05 33.13 – Conduit for Electrical Systems

3.01-R Delete “galvanized steel” and replace with “aluminum”.

##### 26 05 73 - Power System Studies

Add this Section.

##### 43 24 41 – Screw Pumps

1.01-D Delete and replace with the following:

“Manufacturer shall supply 304 stainless steel torque tube and flights.”

2.02-A-3 Delete “to minimize abrasion to the paint system.”

3.03 Delete in its entirety.

#### **LIST OF ATTACHMENTS:**

- Attachment 1 - 01 52 00 - Construction Facilities ADD3
- Attachment 2 - 26 05 73 - Power System Studies ADD3

**Attachment 1 - 01 52 00 - Construction Facilities ADD3**

**SECTION 01 52 00**  
**CONSTRUCTION FACILITIES**

**PART 1 – GENERAL**

**1.01 SUMMARY**

- A. Contractor shall provide construction facilities for performance of the Work, including the following:
1. Contractor's field office, sheds, and storage containers that shall be erected within 30 days of Notice to Proceed on the Project.
  2. Engineer's field office provided with specified temporary utility services that shall be erected within 30 days of Notice to Proceed on the Project.
  3. Project sign and panel that shall be erected within 21 days of Notice to Proceed on the Project.

**1.02 FACILITY DESCRIPTION**

- A. Contractor's Field Office, Sheds, and Storage:
1. Contractor shall provide and maintain a field office at the Site, including temporary utility services specified.
  2. Size and Furnishings: As required by Contractor
  3. Features: Exterior Contractor identification sign, night lighting for security, and temporary utilities specified in Section 01 51 00 – Temporary Utilities.
  4. Location: As shown on the Contract Documents.
  5. Contractor shall provide and maintain one set of Contract Documents, latest approved Shop Drawings, Field Orders, request for interpretations, clarification notices, Work Change Directives, proposal requests, Change Proposals, Change Orders, and other pertinent Project related correspondence.
- B. Engineer's Field Office:
1. Contractor shall provide Engineer's field office for Resident Project Representative (RPR).
  2. Requirements:
    - a. Separate structure with a minimum of 720 sq ft of floor area.

- b. Separate covered porch with a minimum of 72 sq ft of floor area at main entrance to structure. Cover shall have separate roof and rainproof seal to main structure.
- c. Doors and windows provided with locking devices and hardware to prevent unauthorized entry. Door keys shall be provided to Engineer for the duration of the Project. Door keys will be returned to Contractor following completion of Project.
- d. Functional, totally enclosed restroom and mirror shall be provided.
- e. Minimum temporary utilities requirements:
  - 1) Heating: Maintain 68°F in winter.
  - 2) Cooling: Maintain 75°F in summer.
  - 3) Interior electrical outlets: Minimum one outlet per wall of structure
  - 4) Electrical service: Adequate temporary electrical service for fully functional field office
  - 5) Individual, direct line telephone service with equipment for up to four persons.
  - 6) Individual, direct high-speed internet service (DSL or cable), at minimum 50 Mbps up and down Internet speed, with hardwired networking up to four persons and Wi-Fi for exclusive use by the Engineer.
  - 7) Potable water service to water closet and lavatory.
  - 8) Interior and exterior lighting: Conforms to Section 01 51 00 – Temporary Utilities and as specified in this Section.

3. Furnishing:

2	Flat top desk, 2-1/2 x 5 feet, with drawers at each end
1	Plywood drawing table, 3 x 6 feet tilt top with drafting stool
12	Straight chairs
2	Four-drawer, legal size steel filing cabinets with lock and key (HON 210P Series full-suspension files)
1	23-gallon metal or heavy-duty plastic waste baskets with lids
3	28-quart metal or heavy-duty plastic waste baskets



1	Hanging drawing racks with appurtenances
2	Wall-mounted fire extinguishers
1	Bookcase with 4 shelves, 3 feet wide
3	Metal/plastic office folding tables, 30 x 60 inches (minimum)
1	Metal/plastic office folding table, 30 x 96 inches (minimum)
1	Steel storage cabinets (72" H x 36" W x 24" D) with four adjustable shelves and locks
1	First aid cabinet (conforms with OSHA requirements for construction site of up to five people)
2	Tilt/swivel type desk chairs
1	4 cu ft capacity refrigerator
1	1.4 cu. ft. countertop microwave with double-oven cart
1	Laser copying/printing/scanner/facsimile machine with local service contract (printing/scanning in full color up to 11" x 17" paper size)
1	Office hard drive (1 TB minimum) and router networked for up to 4 personnel with high speed internet and 4-in-1 printer

4. Exterior Engineer identification sign: 24" x 36" plywood sign painted white with blue, centered 3-inch high lettering with the following inscription:

Field Office

Hazen and Sawyer

Office Location

5. Location: As shown on the Contract Documents.
6. Consumables: Contractor shall provide consumables and supplies for the Engineer's Field Office including, but not limited to, waste basket heavy-duty liners, floor entry mats, mud-cleaning brushes, paper towels, toilet paper, printer ink, copying machine paper (all sizes), etc., for the duration of the Contract.
7. Cleaning services: Contractor shall provide qualified, professional cleaning services to clean Engineer's field office a minimum of two times per week for the duration of the Project.
8. Contractor shall respond and address maintenance issues that occur at the Engineer's field office with 24 hours notification.

C. Project Identification Sign:

1. Contractor shall provide in accordance to this Section.
2. Contractor shall maintain project identification sign for the duration of the Contract.
3. Contractor shall remove and dispose of project identification sign at the completion of the Project when notified by the Engineer.
4. Contractor shall not receive additional payment for deterioration or replacement of names and other pertinent sign information throughout the duration of the Project.

### **1.03 SUBMITTALS**

- A. Action/Informational Submittals: Project identification sign layout, details, and materials of construction.

## **PART 2 – PRODUCTS**

### **2.01 COMPONENTS**

- A. Project Identification Sign
  1. Sign Panel: 3/4-inch thickness (minimum) marine plywood rabbeted in a 2" x 4" wood frame. Panel shall be fastened to sign supports with six 3/8" dia galvanized bolts, nuts and washers (minimum).
  2. Sign Supports: Two, 4" x 4" treated wood posts.
  3. Fasteners and Hardware: Galvanized
  4. Painting: Supports, trim and back of sign panel shall be painted with two coats (minimum) of same paint for sign face. Paint shall be exterior grade paint, suitable for wood application and in accordance with Section 09 90 00 – Painting.

## **PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**Attachment 2 - 26 05 73 - Power System Studies ADD3**

**SECTION 26 05 73**  
**POWER SYSTEM STUDIES**

**PART 1 – GENERAL**

**1.01 THE REQUIREMENT**

- A. The Contractor shall provide all power system studies for the project as specified herein. The following shall be performed:
  - 1. Short Circuit Studies
  - 2. Load Flow Analyses
  - 3. Protective Device Coordination Studies
  - 4. Equipment Evaluation
  - 5. Arc Flash Risk Assessment
- B. The scope of work for these studies shall include all existing electrical equipment as well as new electrical equipment furnished under this Contract for the two (2) electrical subsystems and associated feeders:
  - 1. New Pump Station 3 Switchboard and all associated feeders and loads
  - 2. New Influent Pump Station Switchboard and all associated feeders and loads
- C. The studies shall include all electric utility protective devices, transformers, generators, cables, switchgear, switchboards, motor control centers, individual motor controllers, variable-frequency drives, panelboards, protection relays, and control panels.
- D. Prior to receiving final approval of the distribution equipment shop drawings for the equipment proposed under this Contract and/or prior to release of that equipment for manufacture, the Preliminary Report, as specified herein, shall be submitted and approved. Contractor shall expedite the completion of the Preliminary Report so that final approval of proposed equipment is not delayed.
- E. The studies shall be performed with the aid of SKM Systems Analysis Power Tools for Windows (PTW) software, Version 9.0 or newer. No other software analysis packages are acceptable.

**1.02 CODES AND STANDARDS**

- A. All work shall be performed in accordance with the following Codes and Standards, as applicable (latest edition, unless otherwise specified):

1. Institute of Electrical and Electronic Engineers (IEEE):
  - a. Standard 141, Recommended Practice for Electric Power Distribution for Industrial Plants
  - b. Standard 241, Recommended Practice for Electric Power Systems in Commercial Buildings
  - c. Standard 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
  - d. Standard 3002.2, IEEE Recommended Practice for Conducting Load Flow Studies and Analysis of Industrial and Commercial Power Systems
  - e. Standard 3002.3, IEEE Recommended Practice for Conducting Short-Circuit Studies and Analysis of Industrial and Commercial Power Systems
  - f. Standard 1584-2018, IEEE Guide for Performing Arc-Flash Hazard Calculations
2. American National Standards Institute (ANSI):
  - a. Standard C37.90, IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus
  - b. Standard C37.91, Guide for Protective Relay Applications to Power Transformers
  - c. Standard C37.95, Guide for Protective Relaying of Utility-Consumer Interconnections
  - d. Standard C37.96, Guide for AC Motor Protection
  - e. Standard C57.12.59, Guide Dry-Type Transformer Through-Fault Current Duration
  - f. Standard C.57.13, Standard Requirements for Instrumentation Transformers
  - g. Standard C57.109, Guide for Liquid-Immersed Transformer Through Fault-Current Duration
3. National Fire Protection Agency (NFPA):
  - a. NFPA 70, National Electrical Code (NEC)
  - b. NFPA 70E, Standard for Electrical Safety in the Workplace (2021 Edition)

### **1.03 SUBMITTALS**

- A. The Contractor shall submit the following reports for review and approval:
  - 1. One (1) printed copy and one (1) electronic copy of the Preliminary Report.
  - 2. One (1) printed copy and one (1) electronic copy of the Pre-final Report.
  - 3. Four (4) printed copies and one (1) electronic copy of the Final Report.
- B. The Contractor shall submit one (1) complete electronic copy of the final power system model and all required database files generated by the software analysis package used. Files shall be placed on portable storage media (USB 3.0 flash storage device) or be uploaded to a cloud-based file sharing service and be submitted with the Final Report. Furnish any necessary documentation requiring the Owner's signature to allow model to be transferred to the Owner.

### **1.04 QUALIFICATIONS**

- A. The studies shall be performed by a professional electrical engineer actively licensed in the state or commonwealth in which the project is located. The licensed professional electrical engineer shall have a minimum of five (5) years of experience in performing power system studies.
- B. The resume of the licensed professional electrical engineer shall be submitted for approval prior to the start of work. An experience table shall also be provided detailing the power system studies of similar scope to this Contract that have been performed by the proposed engineer over the last two (2) years. The table shall, at a minimum, list the facility owner's name, facility contact person with phone number and email address, and overall scope of work that was provided.

## **PART 2 – PRODUCTS (NOT USED)**

## **PART 3 – EXECUTION**

### **3.01 DATA COLLECTION**

- A. The Contractor shall collect all required utility transformer and service information for use in these studies. The serving electric utility representative contact information can be found in Section 26 05 00, Basic Electrical Requirements.
- B. Approved equipment shop drawings and product information for all equipment furnished under this Contract shall be used for these studies. Including data for equipment that is not yet approved is not acceptable.

- C. One (1) field visit to the project site to collect pertinent data from existing equipment by the personnel performing the studies is permitted. The visit shall span as many days as required to collect all necessary information. This visit shall occur as soon after the Contract is awarded as possible and shall be coordinated with the Owner. The Contractor and personnel performing these studies are responsible for collecting all required data for these studies. If equipment is to be examined while energized parts are exposed, the examining personnel shall wear appropriate PPE in accordance with the requirements of NFPA 70E.
- D. Using data from record drawings, "as-built" drawings, or a previous power system study is not acceptable. All data for existing equipment shall be field verified.

### **3.02 STUDY PARAMETERS**

- A. The following parameters shall be used for all studies:
  - 1. Transformers 75kVA (nominal) and larger shall be modeled with actual nameplate data including impedance data. Motors 30hp and larger shall be modeled with actual nameplate power factor and efficiency data.
  - 2. Room heating and cooling loads are mutually exclusive. Only the larger of these two load types shall be modeled as in service.
  - 3. Each set of pumps for a specific application (e.g. Influent Sewage Pumps) has one redundant unit. For the purposes of these studies, that redundant unit shall be modeled as out of service.
  - 4. The sources that shall be used in these studies are the serving electric utility and the standby generators. The generators are capable of paralleling with each other AND with the utility source for extended periods of time. Therefore, each source shall be considered both independently and in parallel for the purposes of these studies.
- B. Other parameters may apply for specific studies if noted in the respective study requirements herein.

### **3.03 SHORT CIRCUIT STUDIES**

- A. The short circuit studies shall be performed in accordance with IEEE Standard 3002.3.
- B. The study input data shall include the short circuit contribution obtained from each source. Short circuit close and latch duty values and interrupting duty values shall be calculated on the basis of assumed three-phase bolted short circuits at each bus. Single-line diagrams shall show the results of the analysis by using datablocks constructed as shown in Appendix A. Provide the results of this study in a tabular format as well, included as an appendix to the report.

- C. The short circuit study report shall include an analysis of whether the equipment short circuit and withstand ratings shown in the Contract Documents are suitable.

### **3.04 PROTECTIVE DEVICE COORDINATION STUDIES**

- A. A protective device coordination study shall be performed to provide the necessary calculations and logic decisions required to select or to check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage circuit breaker trip characteristics and settings.
- B. The coordination study shall include all equipment from the serving electric utility company source protective devices down to and including all adjustable circuit protective devices. The phase and ground overcurrent protection shall be included as well as settings of all other adjustable protective devices.
- C. The time-current characteristics of the proposed protective devices shall be printed on log-log scale coordination plots as specified below.
  - 1. Each plot shall be accompanied by a representative single-line diagram. The coordination plot and single-line diagram shall each occupy one-half of the same printed sheet for ease of cross reference. Each printed sheet shall have a distinct title that identifies the portion of the electrical system it represents.
  - 2. Each coordination plot shall include the following:
    - a. Sufficient number of separate curves shall be used to clearly indicate the coordination achieved
    - b. Identification of each curve with its respective component's name
    - c. Complete operating bands for fuse and low voltage circuit breaker trip curves
    - d. Transformer magnetizing inrush and ANSI transformer withstand parameters
    - e. Cable thermal overcurrent withstand limits
    - f. Significant symmetrical and asymmetrical fault currents for the portion of the electrical system represented by the plot
  - 3. Each accompanying single-line shall include datablocks as described in Appendix A.
  - 4. All restrictions of the National Electrical Code shall be adhered to, and proper coordination intervals and separation of characteristic curves shall be maintained.
- D. The selection and settings of all protective devices shall be provided separately in the report in a tabulated form listing circuit identification, IEEE device number, current



transformer ratios and connections, manufacturer and type, range of adjustment and recommended settings.

### **3.05 LOAD FLOW ANALYSIS**

- A. The load flow analysis shall be performed in accordance with IEEE Standard 3002.2.
- B. A load flow analysis shall be performed to determine the steady-state loading profile of the system(s) being studied. From the results of the load flow analysis, the report shall indicate areas of overloaded conductors, busses, or other equipment in the power distribution system. The load flow analysis results shall be presented in a tabular format as well as a single-line diagram format. Single-line diagrams shall show the results of the analysis by using datablocks constructed as shown in Appendix A. All assumptions associated with the analysis shall be documented in the report.

### **3.06 ARC FLASH RISK ASSESSMENT**

- A. An arc flash risk assessment shall be performed in accordance with IEEE Std. 1584-2018, NFPA 70E, and OSHA 29-CFR, Part 1910 Subpart S. The assessment shall use the incident energy analysis method. The arc flash PPE category method shall not be used.
- B. The following parameters shall be used for the arc flash risk assessment:
  - 1. Working distance for all equipment: 18 inches
  - 2. Arcing duration limit: 2 seconds, or higher (based on engineering judgement) for equipment locations where additional time may be required to exit the arc flash boundary.
  - 3. Equipment box dimensions and electrode configuration shall be entered for each piece of equipment (existing and/or new) to be assessed. Using software default dimensions and electrode configuration is not acceptable.
  - 4. For equipment operating at 240VAC or below, report incident energy as “<1.2 cal/cm<sup>2</sup>” if the bolted fault current is calculated to be less than 2000A.
  - 5. Any protective device settings changes that were recommended as part of these studies shall be included. For devices where settings changes are recommended, the “as-found” settings shall be documented separately in dedicated tables for record purposes.
  - 6. The following operational scenarios shall be used in the assessment, with the worst-case values from each scenario being shown in the study report and on the arc flash labels:

- a. Scenario 1: All tie circuit breakers at distribution equipment are open, all main circuit breakers are closed, and the facility is served by the electric utility source.
- b. Scenario 2: All A-side main circuit breakers at distribution equipment are open, all tie circuit breakers are closed, all B-side main circuit breakers are closed, and the facility is served by the electric utility source.
- c. Scenario 3: All B-side main circuit breakers at distribution equipment are open, all tie circuit breakers are closed, all A-side main circuit breakers are closed, and the facility is served by the electric utility source.
- d. Scenario 4: All tie circuit breakers at distribution equipment are open, all main circuit breakers are closed, and the facility is served by the standby generator source.
- e. Scenario 5: All A-side main circuit breakers at distribution equipment are open, all tie circuit breakers are closed, all B-side main circuit breakers are closed, and the facility is served by the standby generator source.
- f. Scenario 6: All B-side main circuit breakers at distribution equipment are open, all tie circuit breakers are closed, all A-side main circuit breakers are closed, and the facility is served by the standby generator source.

C. The arc flash risk assessment report shall include but not be limited to the following:

- 1. A brief overview of what arc flash hazards are and how to avoid them.
- 2. Definitions of key terms used in the report.
- 3. Confirmation of all parameters and scenarios used in the report.
- 4. Documentation of any assumptions made for the report.
- 5. Serving electric utility information received. Copies of the information received shall be included in an appendix.
- 6. Any recommendations to reduce the arc flash incident energies via protective device settings changes where incident energies are found to exceed  $12 \text{ cal/cm}^2$ . Protective device settings change recommendations shall not negatively impact selective coordination.
- 7. A copy of the PPE information from Table 130.5 G in NFPA 70E.
- 8. Arc flash labels as specified herein.
- 9. An NFPA 70E energized electrical work permit for each location where an arc flash label is provided.

10. An arc flash evaluation summary sheet, based on the worst-case scenario, that contains the following minimum information:
  - a. Bus name
  - b. Protective device name
  - c. Bus line-to-line voltage
  - d. Bus bolted fault
  - e. Protective device bolted fault
  - f. Protective device arcing fault
  - g. Trip/delay time
  - h. Breaker opening time
  - i. Equipment type
  - j. Gap
  - k. Electrode configuration
  - l. Box height, width, and depth
  - m. Arc flash boundary
  - n. Working distance
  - o. Incident energy
  - p. Notes

#### D. Arc Flash Labels

1. Arc flash labels shall be provided for each piece of equipment that is likely to require examination, adjustment, servicing, or maintenance while energized. When opening an enclosure exposes energized parts on both the line and load side of a device, provide a label with the worst case (line versus load) incident energy printed. The following equipment, at a minimum, shall be provided with labels in the quantities specified:
  - a. Switchgear/Switchboards – quantity of 1 label per section on front, 1 label per section on rear if rear is accessible. Provide second label at main circuit breaker sections where it is possible to open covers and separately expose line side and load side energized parts.

- b. Motor control centers – quantity of 1 label per section on front, 1 label per section on rear if rear is accessible. Provide second label at main circuit breaker sections where it is possible to open covers and separately expose line side and load side energized parts.
  - c. Panelboards – quantity of 1
  - d. Variable frequency drives – quantity of 1 label per section
  - e. Other stand-alone motor starters/controllers – quantity of 1 label per section
  - f. Automatic and manual transfer switches – quantity of 1
  - g. Enclosed circuit breakers – quantity of 1
2. Arc flash labels shall be thermal transfer type that is printed on adhesive backed polyester material. Labels shall be ANSI Z535.4 compliant, 4 inches tall by 6 inches wide, and provided with a 5-year warranty. For incident energy values of less than 40 cal/cm<sup>2</sup>, the labels shall have an orange-colored header with the word “WARNING”. For incident energy values equal to and above 40 cal/cm<sup>2</sup>, the labels shall have a red-colored header with the word “DANGER”. Each label shall include the following information:
- a. Equipment name
  - b. Date of issue and name of firm performing assessment
  - c. Incident energy
  - d. Working distance
  - e. Arc flash boundary
  - f. Nominal system voltage
3. A generic arc flash label that has a red-colored header with the word “DANGER” and text in large letters that shows “ENERGIZED WORK NOT PERMITTED” shall be provided for the following equipment:
- a. Any equipment that requires an arc flash label (as specified above) that is located within a hazardous area.
  - b. Any equipment found to be in poor working condition, where in the judgement of the engineer performing the study, energized work should not be performed at all, regardless of the outcome of the incident energy analysis at that equipment.

### 3.07 STUDY REPORTS

- A. The results of the studies shall be documented in a series of reports. A total of three (3) separate reports shall be provided as follows:
1. Preliminary Report – The Preliminary Report shall consist of all power systems studies as specified herein, with the following exceptions:
    - a. NFPA 70E energized electrical work permits shall not be included.
    - b. One (1) WARNING label and one (1) DANGER label shall be printed on plain paper for format review purposes only. Actual adhesive labels with calculated values shall not be included.
  2. Pre-final Report – The Pre-final Report shall incorporate all comments received from the previous report review and shall include specific equipment data from the approved shop drawings of the proposed electrical equipment. The Pre-final Report shall consist of all power systems studies as specified herein, with the following exceptions:
    - a. NFPA 70E energized electrical work permits shall not be included.
    - b. Sample arc flash hazard warning labels one (1) WARNING label and one (1) DANGER label) shall be printed on the proposed adhesive material for review purposes.
  3. Final Report – The Final Report shall consist of all power systems studies as specified herein, including final adhesive arc flash hazard warning labels. Final report shall incorporate all installed electrical equipment, including any field changes made during construction, and all comments received from the previous report review. All 'as-left' protective device settings shall be included in the report. The Final Report shall bear the signature and seal of the professional electrical engineer that performed the study.
- B. Hard copies of reports shall be furnished in the quantities specified herein, neatly organized into properly identified 3-ring binders. Tabs shall clearly separate each section of the report.
- C. Electronic copies of reports shall be provided in PDF file format. Electronic copies shall have searchable text and bookmarks for each section of the report.
- D. Each report shall begin with a table of contents followed by an executive summary. The executive summary shall detail the configuration of the electrical system and summarize any concerns or recommendations for the electrical distribution system that resulted from the studies specified herein.

- E. Reports shall include simplified single line diagrams with only the device name information displayed for all equipment, as well as single line diagrams with specific data displayed as specified herein for each study.
- F. All data used in the reports such as conductor sizes and lengths, motor sizes, utility contribution information, fault analysis input, fault contributions, and the like shall be included in the appendices of the report.
- G. All single line diagrams and time current curves shall be provided in the reports on 11x17 paper, properly folded to fit into the report binder. Use of standard 8.5x11 paper for these purposes is not permitted. Single line diagrams shall be appropriately split up between several sheets (if required) to allow the drawing scale to be adjusted in order to make text and symbols legible.

### **3.08 FIELD ADJUSTMENT**

- A. The Contractor shall adjust all relay and other protective device settings according to the recommended settings table provided in the approved Pre-Final Report.
- B. The Contractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

### **3.09 ARC FLASH LABEL PLACEMENT**

- A. The Contractor shall place approved adhesive arc flash labels on equipment after the Final Report is reviewed and approved.

### **3.10 TRAINING**

- A. The Contractor shall train the Owner's qualified electrical personnel of the potential arc flash hazards associated with working on energized equipment. The training shall be provided in two (2) separate sessions of no less than two (2) hours each. The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET), or equivalent. Training certificates shall be provided for all attendees.

**END OF SECTION**

**APPENDIX A – SUPPLEMENTARY INFORMATION**

## REQUIRED DATABLOCK CONTENTS FOR POWER SYSTEM STUDIES

Component Type	Input Data Single-Line	Short Circuit and TCC Single-Lines	Load Flow Single-Line
Utility	Nominal Voltage	Nominal Voltage	Nominal Voltage LF kW and kVAR
Generator	Nominal Voltage Rating (kW) Power Factor	Nominal Voltage	Nominal Voltage LF kW and kVAR
Bus	Voltage	Voltage Fault Magnitude (3P RMS) Fault Magnitude (SLG RMS)	Voltage Percent Voltage Drop
Cable	Size (AWG or kcmil) Parallel Sets Length Type (Cu/Al/Cu-Al)	Total Ampacity	Total Ampacity Percent Voltage Drop LF kW, kVAR, and Amperes
Transformer	Rating (kVA) Impedance (%Z) X/R Ratio	N/A	Percent Voltage Drop LF kW, kVAR, and Amperes
Motor	Rating (hp) Rated Voltage FLA Power Factor	Rating (hp) FLA	Rating (hp) FLA
Non-Motor Load	Rating (A, kW, kVA) Rated Voltage Power Factor	N/A	N/A
Fuse	Manufacturer Model Rating (A)	Same as Input Data	Same as Input Data
Relay*	Manufacturer Model CT Ratio Curve Elements	Same as Input Data	Same as Input Data



Component Type	Input Data Single-Line	Short Circuit and TCC Single-Lines	Load Flow Single-Line
Circuit Breaker** (all others)	Manufacturer Model [SCCR (kA)] Frame/Sensor/Plug Ratings Settings** LTPU [LTD Curve Shape] [LTD] [STPU] [STD and I <sup>2</sup> T On/Off] INST [GFPU] [GFD and I <sup>2</sup> T On/Off] [AF Maint. Setting/Curve]	Same as Input Data	Same as Input Data
Motor Circuit Protector	Manufacturer Model [SCCR (kA)] Frame/Trip Ratings	Same as Input Data	Same as Input Data
Motor Overload Relay	Manufacturer Model [SCCR (kA)] Frame/Trip Ratings Settings	Same as Input Data	Same as Input Data

\* Complex and/or non-overcurrent settings for multifunction relays (e.g. bus/winding differential, motor thermal model parameters, under/overvoltage, RTD alarm and trip setpoints, etc.) are excluded from the model.

\*\* Hide setting elements where not applicable for a given circuit breaker. Recommended settings for non-overcurrent settings for electronic trip circuit breakers (e.g. under/overvoltage, zone-selective interlocking, alarm setpoints, etc.) are excluded from the model.