

### **ADDENDUM NO. 3**

DATE: April 29, 2026  
PROJECT: Ouachita Water Treatment Plant Sedimentation Basins 1-5  
Plate Setter Project  
Hot Springs, Arkansas  
BID DATE: May 4, 2026, 2:00 PM

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This Addendum is part of the Contract Documents and modifies the original documents provided to Bidders, as noted below. Acknowledge receipt of this Addendum in the space provided in the BID FORM. Failure to do so may result in disqualification.

**Item No. 1. Advertisement for Bids**

The Advertisement for Bids is hereby revised as follows:

~~Bidders must provide with their bid a certificate regarding Equal Employment Opportunity, as applicable.~~

**Item No. 2. Specification – Section 269500 - Field Electrical Acceptance Tests**

See added Specification Section 269500 – Field Electrical Acceptance Tests.

**Item No. 3. Construction Drawings – Sheet E2 Site Plan**

See revised sheet herein.

**Item No. 4. Construction Drawings – Sheet E4 One-Line Diagram**

See revised sheet herein.

**Item No. 5. Construction Drawings – Sheet E6 Fiber Optic Network Diagram**

See revised sheet herein.

**Item No. 6. Clarification:**

The Statement of Compliance that is referred to in the Bid Form is the Statement of Requirements that is in the Bid Documents.

**END OF ITEMS**

All other provisions of the Contract Documents remain unchanged. Acknowledge receipt of this addendum on the Bid Form. Bids will be accepted at the City of Hot Springs Purchasing Office, 324 Malvern Ave., Hot Springs, AR 71901, until 2:00 PM on May 4, 2026.



Matthew D. Dunn, PE (Crist Engineers, Inc.)

4/29/26

Date

## SECTION 269500

### FIELD ELECTRICAL ACCEPTANCE TESTS

#### PART 1- GENERAL

##### 1.1 SUMMARY

- A. Section includes:
  - 1. Responsibilities for testing the electrical installation.
  - 2. Adjusting and calibration.
  - 3. Acceptance tests.
- B. Copyright information:
  - 1. Some portions of this Section are copyrighted by the InterNational Electrical Testing Association, Inc. (NETA). See NETA publication ATS for details.

##### 1.2 REFERENCES

- A. As specified in the Common Work Results for Electrical section.
- B. American National Standards Institute (ANSI).
- C. ASTM International (ASTM):
  - 1. D877 - Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes.
  - 2. D923 - Standard Practices for Sampling Electrical Insulating Liquids.
  - 3. D924 - Standard Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids.
  - 4. D971 - Standard Test Method for Interfacial Tension of Oil Against Water by the Ring Method.
  - 5. D974 - Standard Test Method for Acid and Base Number by Color-Indicator Titration.
  - 6. D1298 - Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method.
  - 7. D1500 - Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale).
  - 8. D1524 - Standard Test Method for Visual Examination of Used Electrical Insulating Liquids in the Field.
  - 9. D1816 - Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using VDE Electrodes.
  - 10. D2285 - Standard Test Method for Interfacial Tension of Electrical Insulating Oils of Petroleum Origin Against Water by the Drop Weight Method.
  - 11. D3612 - Standard Test Method for Analysis of Gases Dissolved in Electrical Insulating Oil by Gas Chromatography.
- D. Institute of Electrical and Electronics Engineers (IEEE):
  - 1. 43 - IEEE Recommended Practice for Testing Insulation Resistance of Rotating Machinery.
  - 2. 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.
  - 3. 95 - IEEE Recommended Practice for Insulation Testing of AC Electric Machinery (2300 V and Above) With High Direct Voltage.
  - 4. 421.3 - IEEE Standard for High-Potential Test Requirement for Excitation Systems for Synchronous Machines.

5. 450 - IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications.
  6. 1106 - IEEE Recommended Practice for Installation, Maintenance, Testing, and Replacement of Vented Nickel-Cadmium Batteries for Stationary Applications.
  7. 1188 - IEEE Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Applications.
  8. C57.13 - IEEE Standard Requirements for Instrument Transformers.
  9. C57.13.1 - IEEE Guide for Field Testing of Relaying Current Transformers.
  10. C57.13.3 - IEEE Guide for Grounding of Instrument Transformer Secondary Circuits and Cases.
  11. C57.104 - IEEE Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers.
- E. Insulated Cable Engineer's Association (ICEA).
- F. InterNational Electrical Testing Association (NETA).
1. ATS- Standard for Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems.
- G. International Electrotechnical Commission (IEC).
- H. Manufacturer's testing recommendations and instruction manuals.
- I. National Fire Protection Association (NFPA):
1. 70 - National Electrical Code (NEC).
  2. 110 - Standard for Emergency and Standby Power Systems.
- J. National Institute of Standards and Technology (NIST).
- K. Specification sections for the electrical equipment being tested.
- L. Shop drawings.

### 1.3 DEFINITIONS

- A. As specified in the Commissioning section and the Common Work Results for Electrical section.
- B. Specific definitions:
1. Testing laboratory: The organization performing acceptance tests.

### 1.4 SYSTEM DESCRIPTION

- A. Testing of all electrical equipment installed under this Contract in accordance with the manufacturer's requirements and as specified in this Section.
- B. The testing and inspections shall verify that the equipment is operational within the tolerances required and expected by the manufacturer, and these Specifications.
- C. Responsibilities:
1. Contractor responsibilities:
    - a. Ensure that all resources are made available for testing, and that all testing requirements are met.
  2. Electrical subcontractor responsibilities:
    - a. Perform routine tests during installation.

- b. Demonstrate operation of electrical equipment.
- c. Commission the electrical installation.
- d. Provide the necessary services during testing, and provide these services to the testing laboratory, Contractor, and other subcontractors, including but not limited to:
  - 1) Providing electrical power as required.
  - 2) Operating of electrical equipment in conjunction with testing of other equipment.
  - 3) Activating and shutting down electrical circuits.
  - 4) Making and recording electrical measurements.
  - 5) Replacing blown fuses.
  - 6) Installing temporary jumpers.
- 3. Testing laboratory responsibilities:
  - a. Perform all acceptance tests specified in this Section.
  - b. Provide all required equipment, materials, labor, and technical support during acceptance tests.

## 1.5 SUBMITTALS

- A. Furnish submittals as specified in the Common Work Results for Electrical section.
- B. LAN cable test form:
  - 1. LAN cable test reports:
    - a. Submit 3 copies of test reports showing the results of all tests specified in this Section:
      - 1) Test type.
      - 2) Test location.
      - 3) Test date.
      - 4) Cable number.
      - 5) Cable length.
      - 6) Certification that the cable meets or exceeds the specified standard.
    - b. Furnish hard copy and electronic copy for all traces.
- C. Manufacturers' testing procedures:
  - 1. Submit manufacturers' recommended testing procedures and acceptable test results for review by the Engineer prior to beginning testing.
- D. Test report:
  - 1. Include the following:
    - a. Summary of Project.
    - b. Description of equipment tested.
    - c. Description of tests performed.
    - d. Test results.
    - e. Conclusions and recommendations.
    - f. Completed test forms.
    - g. List of test equipment used and calibration dates.
    - h. LAN cable test reports.
- E. Test data records:
  - 1. Include the following:
    - a. Identification of the testing organization.
    - b. Equipment identification.
    - c. Nameplate data.
    - d. Humidity, temperature and or other conditions that may affect the results of the tests and or calibrations.
    - e. Dates of inspections, tests, maintenance and or calibrations.

- f. Indication of the inspections, tests, maintenance, and or calibrations to be performed and recorded.
- g. Expected results when calibrations are to be performed.
- h. Indication of as-found and as-left results as applicable.
- i. Indication of all test results outside specified tolerances.

F. Testing laboratory qualifications:

- 1. Submit a complete resume and statement of qualifications from the proposed testing laboratory detailing their experiences in performing the tests specified:
  - a. This statement will be used to determine whether the laboratory is acceptable, and shall include:
    - 1) Corporate history and references.
    - 2) Resume of individual performing test.
    - 3) Equipment list and test calibration data.

G. Division of responsibilities:

- 1. Submit a list identifying who is responsible for performing each portion of the testing.

## 1.6 QUALITY ASSURANCE

A. As specified in the Common Work Results for Electrical section.

B. Testing laboratory qualifications:

- 1. The testing laboratory may be qualified testing personnel from the electrical subcontractor's staff or an independent testing company.
- 2. NETA certification required.
- 3. Selection of the testing laboratory and testing personnel is subject to approval by the Engineer based on testing experience and certifications of the individuals and testing capabilities of the organization.

## 1.7 DELIVERY, STORAGE, AND PROTECTION (NOT USED)

## 1.8 PROJECT OR SITE CONDITIONS

A. As specified in the Common Work Results for Electrical section.

## 1.9 SEQUENCING

A. At least 30 days before commencement of the acceptance tests, submit the manufacturer's complete field testing procedures to the Engineer and to the testing laboratory, complete with expected test results and tolerances for all equipment to be tested.

B. Perform testing in the following sequence:

- 1. Perform routine tests as the equipment is installed including:
  - a. Insulation-resistance tests.
  - b. Continuity tests.
  - c. Rotational tests.
- 2. Adjusting and preliminary calibration.
- 3. Acceptance tests.
- 4. Demonstration.
- 5. Commissioning and plant start-up.

## 1.10 SCHEDULING (NOT USED)

### 1.11 WARRANTY

A. As specified in the Common Work Results for Electrical section.

### 1.12 SYSTEM START-UP (NOT USED)

### 1.13 OWNER'S INSTRUCTIONS (NOT USED)

### 1.14 MAINTENANCE (NOT USED)

## **PART 2 PRODUCTS (NOT USED)**

## **PART 3 EXECUTION**

### 3.1 EXAMINATION (NOT USED)

### 3.2 PREPARATION

A. Test instrument calibration:

1. Utilize a testing laboratory with a calibration program which maintains all applicable test instrumentation within rated accuracy.
  - a. The calibrating standard shall be of better accuracy than that of the equipment tested.
2. The accuracy shall be traceable to the NIST in an unbroken chain.
3. Calibrate instruments in accordance with the following frequency schedule:
  - a. Field instruments: 6 months maximum.
  - b. Laboratory instruments: 12 months maximum.
  - c. Leased specialty equipment where the accuracy is guaranteed by the lessor (such as Doble): 12 months maximum.
4. Dated calibration labels shall be visible on all test equipment.
5. Maintain an up-to-date instrument calibration record for each test instrument:
  - a. The records shall show the date and results of each calibration or test.
6. Maintain an up-to-date instrument calibration instruction and procedure for each test instrument.

B. Do not begin testing until the following conditions have been met:

1. All instruments required are available and in proper operating condition.
2. All required dispensable materials such as solvents, rags, and brushes are available.
3. All equipment handling devices such as cranes, vehicles, chain falls and other lifting equipment are available or scheduled.
4. All instruction books, calibration curves, or other printed material to cover the electrical devices are available.
5. Data sheets to record all test results are available.

### 3.3 INSTALLATION

A. Test decal:

1. The testing laboratory shall affix a test decal on the exterior of equipment or equipment enclosure of protective devices after performing electrical tests.
2. The test decal shall be color coded to communicate the condition of maintenance of the protective. The color scheme for condition of maintenance of overcurrent protective devices shall be:
  - a. White: electrically and mechanically acceptable.

- b. Yellow; minor deficiency not affecting fault detection and operation, but minor electrical or mechanical condition exists.
- 3. The decal shall include the following information at a minimum:
  - a. Testing organization.
  - b. Project identifier.
  - c. Test date.
  - d. Technician identifier.

#### 3.4 ERECTION, INSTALLATION, APPLICATION, CONSTRUCTION (NOT USED)

#### 3.5 REPAIR/RESTORATION (NOT USED)

#### 3.6 RE-INSTALLATION (NOT USED)

#### 3.7 COMMISSIONING

##### A. Testing and Training Phase: Installation Testing:

- 1. Also called "Field Acceptance Testing".
- 2. Panelboards:
  - a. Cleaning:
    - 1) Visually inspect panelboard for evidence of discoloration, abnormal dust accumulation, metal shards, or any other indication of overheating, wear, or other abnormal conditions prior to cleaning.
    - 2) Clean cabinet with a brush, vacuum cleaner, or clean, dry, lint-free rags to remove any accumulation of dust, dirt, or other foreign matter. Do not use liquids, solvents or detergents when cleaning panelboards or components.
    - 3) Avoid blowing dust into panelboards. Do not use a blower or compressed air.
    - 4) Clean Supports, terminals, and other major insulating surfaces with clean, dry, lint-free rags or soft bristled brushes.
    - 5) Remove dust, soot, grease, moisture, and foreign material from surface of circuit breakers.
  - b. General:
    - 1) Compare equipment nameplate data with the Contract Documents.
    - 2) Check panelboard circuit schedule for accuracy.
    - 3) Verify appropriate anchorage, required area clearances, and correct alignment.
    - 4) Inspect overall general condition for physical damage. Check for broken studs and loose or damaged wires, connector, terminations, etc. Check all bolts, nuts, washer, and pins for tightness. Tighten or use manufacture's replacement parts as required.
    - 5) Inspect cabinets for signs of rust, corrosion, or deteriorating paint. Inspect cabinets for evidence of localized heat damage to the paint. Investigate sources of heat. Repair painted surfaces.
    - 6) Check that covers are in place and fastened. Plug any open unused knockouts.
    - 7) Inspect panelboard for moisture. Seal off any cracks or openings which have allowed moisture to enter the cabinet. Inspect all component devices. Replace any components that show evidence of damage from moisture.
    - 8) Look for any recent changes in sprinklers or other plumbing that might expose indoor panelboards to a source of liquids. Eliminate sources of water, moisture, or liquids, or provide adequate barriers to protect panelboards from sources of water, moisture, or liquids.
    - 9) Inspect panelboards and internal components for evidence of overheating, arc spatter, sooty deposits, and tracking. Investigate and correct sources of

- arcing or overheating. Consult the panelboard manufacturer for recommendations.
- 10) Verify that fuse and/or circuit breaker sizes and types correspond to record drawings, if available, as well as to the circuit breaker's address for microprocessor communications packages, if equipped.
  - 11) Set adjustable circuit breakers in accordance with engineering coordination study supplied by Owner.
- c. Terminations, Connections, and Lugs:
- 1) Inspect bolted electrical connections for high resistance using one of the following methods:
    - a) Use of low-resistance ohmmeter.
      - (1) Compare bolted connection resistance values to values of similar connections:
        - (a) Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - b) Verify tightness of accessible bolted electrical connections by the calibrated torque wrench method:
      - (1) Refer to manufacturer's instructions for proper foot-pound levels or NETA ATS tables.
  - 2) Inspect terminations, connection, and lugs for alignment, physical damage, burns, corrosion, discoloration, flaking, heat damage, arcing, pitting, melting, deterioration, carbonization, cracks, chips, breaks, partial discharge, or moisture. Investigate and eliminate sources of any damage.
  - 3) Follow manufacturer recommendations for cleaning, repairing, and replacing damaged parts.
  - 4) Replace overheated connections. Tighten connections to proper to proper torque levels as specified above.
- d. Conductors and raceways:
- 1) Inspect supply conductors and terminations for overheating, discoloration, and oxidation. Investigate and correct any deficiencies.
  - 2) Ensure the conductors are protected within their ampacities.
  - 3) Visually check panelboard, cables, and raceways for proper bonding and grounding. Correct improper bonding and grounding.
  - 4) Inspect conductors for discoloration, arcing, pitting, melting, flaking of insulation and/or metal parts. Repair or replace damaged components in accordance with manufacturer's recommendations.
  - 5) Inspect for frayed or broken wires. Replace or repair damaged components in accordance with manufacturer recommendations.
  - 6) Inspect for frayed or broken wires. Replace or repair conductors as necessary.
  - 7) Inspect conduits for moisture. Seal conduits which are a source of moisture and provide means to drain moisture away from the panelboard.
- e. Circuit breakers:
- 1) Breakers rated less than 100 A:
    - a) Operate circuit breakers several times in order to exercise the mechanisms and the contacts, and to ensure smooth operation. Do not oil or grease parts of molded case circuit breakers.
    - b) Visually check circuit breakers for evidence of overheating and thermal damage. Investigate and eliminate sources of overheating.
    - c) Check circuit breakers for visual defects, chipping, cracks, breaks, burns, and deterioration. Replace damaged circuit breakers.
    - d) Verify correct operation of any auxiliary features such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free, and antipump function.
    - e) Inspect interchangeable trip-unit circuit breakers for tightness of trip units.

- f) Check circuit breaker terminals and connections for tightness as specified above.
  - 2) Breakers rated 100 A and higher:
    - a) Perform visual and mechanical inspection as specified in this Section.
    - b) Perform electrical tests as specified in this Section.
- 3. Dry type transformers:
  - a. Visual and mechanical inspection:
    - 1) Compare equipment nameplate data with the Contract Documents.
    - 2) Inspect physical and mechanical condition.
    - 3) Inspect anchorage, alignment, and grounding.
    - 4) Verify that resilient mounts are free and that any shipping brackets have been removed.
    - 5) Inspect equipment for cleanliness.
    - 6) Inspect bolted electrical connections for high resistance using one of the following methods:
      - a) Use of low-resistance ohmmeter.
      - b) Verify tightness of accessible bolted electrical connections by the calibrated torque wrench method:
        - (1) Refer to manufacturer's instructions for proper foot-pound levels or NETA ATS tables.
    - 7) Verify that as-left tap connections are as specified.
  - b. Electrical tests:
    - 1) Perform resistance measurements through bolted connections with a low-resistance ohmmeter.
    - 2) Perform insulation-resistance tests winding-to-winding and each winding-to-ground:
      - a) Apply voltage in accordance with manufacturer's published data.
        - (1) Refer to NETA ATS tables in the absence of manufacturer's published data.
    - 3) Calculate dielectric absorption ration or polarization index.
    - 4) Verify correct secondary voltage, phase-to-phase and phase-to-neutral after energization and before loading.
  - c. Test values:
    - 1) Compare bolted connection resistance values to values of similar connections:
      - a) Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - 2) Bolt-torque levels shall be in accordance with manufacturer's published data:
      - a) Refer to NETA ATS tables in the absence of manufacturer's published data.
    - 3) Tap connections are left as found unless otherwise specified.
    - 4) Minimum insulation-resistance values of transformer insulation shall be in accordance with manufacturer's published data:
      - a) Refer to NETA ATS tables in the absence of manufacturer's published data.
      - b) Investigate insulation values less than the allowable minimum.
    - 5) The dielectric absorption ratio or polarization index shall not be less than 1.0.
    - 6) Turns-ratio results should not deviate more than 1/2 percent from either the adjacent coils or calculated ratio.
    - 7) Phase-to-phase and phase-to-neutral secondary voltages shall be in agreement with nameplate data.
- 4. Low voltage cables, 600 volt maximum:
  - a. Visual and mechanical inspection:
    - 1) Compare cable data with the Drawings and Specifications.

- 2) Inspect exposed sections of cable for physical damage and correct connection as indicated on the Drawings.
- 3) Inspect bolted electrical connections for high resistance by one of the following methods:
  - a) Use of low-resistance ohmmeter.
  - b) Verify tightness of accessible bolted electrical connections by the calibrated torque wrench method:
    - (1) Refer to manufacturer's instructions for proper foot-pound levels or NETA ATS tables.
- 4) Inspect compression applied connectors for correct cable match and indentation.
- 5) Inspect for correct identification and arrangement.
- 6) Inspect cable jacket insulation and condition.
- b. Electrical tests:
  - 1) Perform resistance measurements through bolted connections with a low-resistance ohmmeter.
  - 2) Perform insulation resistance test on each conductor with respect to ground and adjacent conductors:
    - a) Applied potential shall be 500 volts dc for 300 volt rated cable and 1,000 volts dc for 600 volt rated cable.
    - b) Test duration shall be 1 minute.
  - 3) Perform continuity tests to insure correct cable connection.
  - 4) Verify uniform resistance of parallel conductors.
- c. Test values:
  - 1) Compare bolted connection resistance values to values of similar connections:
    - a) Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
  - 2) Insulation-resistance values shall be in accordance with manufacturer's published data:
    - a) Refer to NETA ATS tables in the absence of manufacturer's published data.
    - b) Investigate values of insulation-resistance less than the allowable minimum.
  - 3) Cable shall exhibit continuity.
  - 4) Deviations in resistance between parallel conductors shall be investigated.
5. Low voltage molded case and insulated case circuit breakers:
  - a. Visual and mechanical inspection:
    - 1) Compare equipment nameplate data with the Contract Documents.
    - 2) Inspect physical and mechanical condition.
    - 3) Inspect anchorage and alignment.
    - 4) Verify the unit is clean.
    - 5) Operate the circuit breaker to ensure smooth operation.
    - 6) Inspect bolted electrical connections for high resistance by one of the following methods:
      - a) Use of low-resistance ohmmeter.
      - b) Verify tightness of accessible bolted electrical connections by the calibrated torque wrench method:
        - (1) Refer to manufacturer's instructions for proper foot-pound levels or NETA ATS tables.
    - 7) Perform adjustments for final protective device settings in accordance with the coordination study.
  - b. Electrical tests:
    - 1) Perform resistance measurements through bolted connections with a low-resistance ohmmeter.

- 2) Perform insulation-resistance tests for 1 minute on each pole, phase-to-phase and phase-to-ground with the circuit breaker closed and across each open pole:
    - a) Apply voltage in accordance with manufacturer's published data.
    - b) Refer to NETA ATS tables in the absence of manufacturer's published data.
  - 3) Perform a contact/pole-resistance test.
  - 4) Determine long-time pickup and delay by primary current injection.
  - 5) Determine short-time pickup and delay by primary current injection.
  - 6) Determine ground-fault pickup and delay by primary current injection.
  - 7) Determine instantaneous pickup value by primary current injection.
  - 8) Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data.
  - 9) Verify correct operation of any auxiliary features such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free, anti-pump function and trip unit battery condition:
    - a) Reset all trip logs and indicators.
  - 10) Verify operation of charging mechanism.
- c. Test values:
- 1) Compare bolted connection resistance values to values of similar connections:
    - a) Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
  - 2) Bolt-torque levels shall be in accordance with manufacturer's published data:
    - a) Refer to NETA ATS tables in the absence of manufacturer's published data.
  - 3) Insulation-resistance values shall be in accordance with manufacturer's published data:
    - a) Refer to NETA ATS tables in the absence of manufacturer's published data.
    - b) Investigate values of insulation-resistance less than the allowable minimum.
  - 4) Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data:
    - a) If manufacturer's data is not available, investigate any values which deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.
  - 5) Long-time pickup values shall be as specified, and the trip characteristic shall not exceed manufacturer's published time-current characteristic tolerance band including adjustment factors:
    - a) If manufacturer's curves are not available, trip times shall not exceed the value shown in NETA ATS tables.
  - 6) Short-time pickup values shall be as specified, and the trip characteristic shall not exceed manufacturer's published time-current tolerance band.
  - 7) Ground fault pickup values shall be as specified, and the trip characteristic shall not exceed manufacturer's published time-current tolerance band.
  - 8) Instantaneous pickup values shall be as specified and within manufacturer's published tolerances:
    - a) Refer to NETA ATS tables in the absence of manufacturer's published data.
  - 9) Pickup values and trip characteristics shall be within manufacturer's published tolerances.
  - 10) Breaker open, close, trip, trip-free, anti-pump, and auxiliary features shall function as designed.

- 11) The charging mechanism shall operate in accordance with manufacturer's published data.
6. Grounding systems:
  - a. Visual and mechanical inspection:
    - 1) Inspect ground system for compliance with the Contract Documents, and the NEC.
    - 2) Inspect physical and mechanical condition.
    - 3) Inspect bolted electrical connections for high resistance using one of the following methods:
      - a) Use of low-resistance ohmmeter.
      - b) Verify tightness of accessible bolted electrical connections by calibrated torque wrench method:
        - (1) Refer to manufacturer's instructions for proper foot-pound levels or NETA ATS tables.
    - 4) Inspect anchorage.
  - b. Electrical tests:
    - 1) Perform resistance measurements through bolted connections with a low-resistance ohmmeter.
    - 2) Perform fall of potential test or alternative test in accordance with IEEE 81 on the main grounding electrode or system.
    - 3) Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, the system neutral and any derived neutral points.
  - c. Test values:
    - 1) Grounding system electrical and mechanical connections shall be free of corrosion.
    - 2) Compare bolted connection resistance values to values of similar connections:
      - a) Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
    - 3) Bolt-torque levels shall be in accordance with manufacturer's published data:
      - a) Refer to NETA ATS tables in the absence of manufacturer's published data.
    - 4) The resistance between the main grounding electrode and ground shall be as specified in the Grounding and Bonding section.
    - 5) Investigate point-to-point resistance values that exceed 0.5 ohm.
7. Surge arresters, low-voltage:
  - a. Visual and mechanical inspection:
    - 1) Compare equipment nameplate data with the Contract Documents.
    - 2) Inspect physical and mechanical condition.
    - 3) Inspect anchorage, alignment, grounding, and clearances.
    - 4) Verify the arresters are clean.
    - 5) Inspect bolted electrical connections for high resistance using one of the following methods:
      - a) Use of low-resistance ohmmeter.
      - b) Verify tightness of accessible bolted electrical connections by the calibrated torque wrench method:
        - (1) Refer to manufacturer's instructions for proper foot-pound levels or NETA ATS tables.
    - 6) Verify that the ground lead on each device is individually attached to a ground bus or ground electrode.
    - 7) Verify that stroke counter is correctly mounted and electrically connected, if applicable.
    - 8) Record stroke counter reading.
  - b. Electrical tests:

- 1) Perform resistance measurements through bolted connections with a low-resistance ohmmeter.
- 2) Perform an insulation-resistance test on each arrester, phase terminal- to- ground:
  - a) Apply voltage in accordance with manufacturers published data.
  - b) Refer to NETA ATS tables in the absence of manufacturer's published data.
- 3) Test grounding connection as specified in this Section.
- c. Test values:
  - 1) Compare bolted connection resistance values to values of similar connections:
    - a) Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
  - 2) Bolt-torque levels shall be in accordance with manufacturer's published data:
    - a) Refer to NETA ATS tables in the absence of manufacturer's published data.
  - 3) Insulation-resistance values shall be in accordance with manufacturer's published data:
    - a) Refer to NETA ATS tables in the absence of manufacturer's published data.
    - b) Investigate insulation values less than the allowable minimum.
  - 4) Resistance between the arrester ground terminal and the ground system shall be less than 0.5 ohm.
8. Fiber-optic cables:
  - a. Visual and mechanical inspection:
    - 1) Compare cable, connector, and splice data with the Contract Documents.
    - 2) Inspect cable and connections for physical and mechanical damage.
    - 3) Verify that all connectors and splices are correctly installed.
  - b. Optical tests:
    - 1) Perform cable length measurement, fiber fracture inspection, and construction defect inspection using an optical time domain reflectometer (OTDR):
      - a) OTDR test performed on fiber cables less than 100 meters shall be performed with the aid of a launch cable.
      - b) Adjust OTDR pulse width settings to a maximum setting of 1/1,000th of the cable length or 10 nanoseconds.
    - 2) Perform connector and splice integrity test using an optical time domain reflectometer.
    - 3) Perform cable attenuation loss measurement with an optical power loss test set:
      - a) Perform attenuation tests with an Optical Loss Test Set capable and calibrated to show anomalies of 0.1 dB as a minimum.
      - b) Test multimode fibers at 850 nanometer and 1,300 nanometer.
      - c) Test single mode fibers at 1,310 nanometer and 1,550 nanometer.
    - 4) Perform connector and splice attenuation loss measurement from both ends of the optical cable with an optical power loss test set:
      - a) At the conclusion of all outdoor splices at 1 location, and before they are enclosed and sealed, all splices shall be tested with OTDR at the optimal wavelengths (850 and 1,300 for multimode, 1,310 and 1,550 for single mode), in both directions. The splices shall be tested for integrity as well as attenuation.
    - 5) Perform fiber links integrity and attenuation tests using each link shall be an OTDR and an Optical Loss Test Set:

- a) OTDR traces shall be from both directions on each fiber at the 2 optimal wavelengths, 850 nanometer, and 1,300 nanometer for multimode fibers.
- b) Optical loss testing shall be done with handheld test sets in 1 direction at the 2 optimal wavelengths for the appropriate fiber type. Test equipment shall equal or exceed the accuracy and resolution of Agilent/HP 8147 high performance OTDR.
- c. Test values:
  - 1) Cable and connections shall not have been subjected to physical or mechanical damage.
  - 2) Connectors and splices shall be installed in accordance with industry standards.
  - 3) The optical time domain reflectometer signal should be analyzed for excessive connection, splice, or cable backscatter by viewing the reflected power/distance graph.
  - 4) Attenuation loss measurement shall be expressed in dB/km. Losses shall be within the manufacturer's recommendations when no local site specifications are available.
  - 5) Individual fusion splice losses shall not exceed 0.1 dB. Measurement results shall be recorded, validated by trace, and filed with the records of the respective cable runs.

3.8 FIELD QUALITY CONTROL (NOT USED)

3.9 ADJUSTING (NOT USED)

3.10 CLEANING

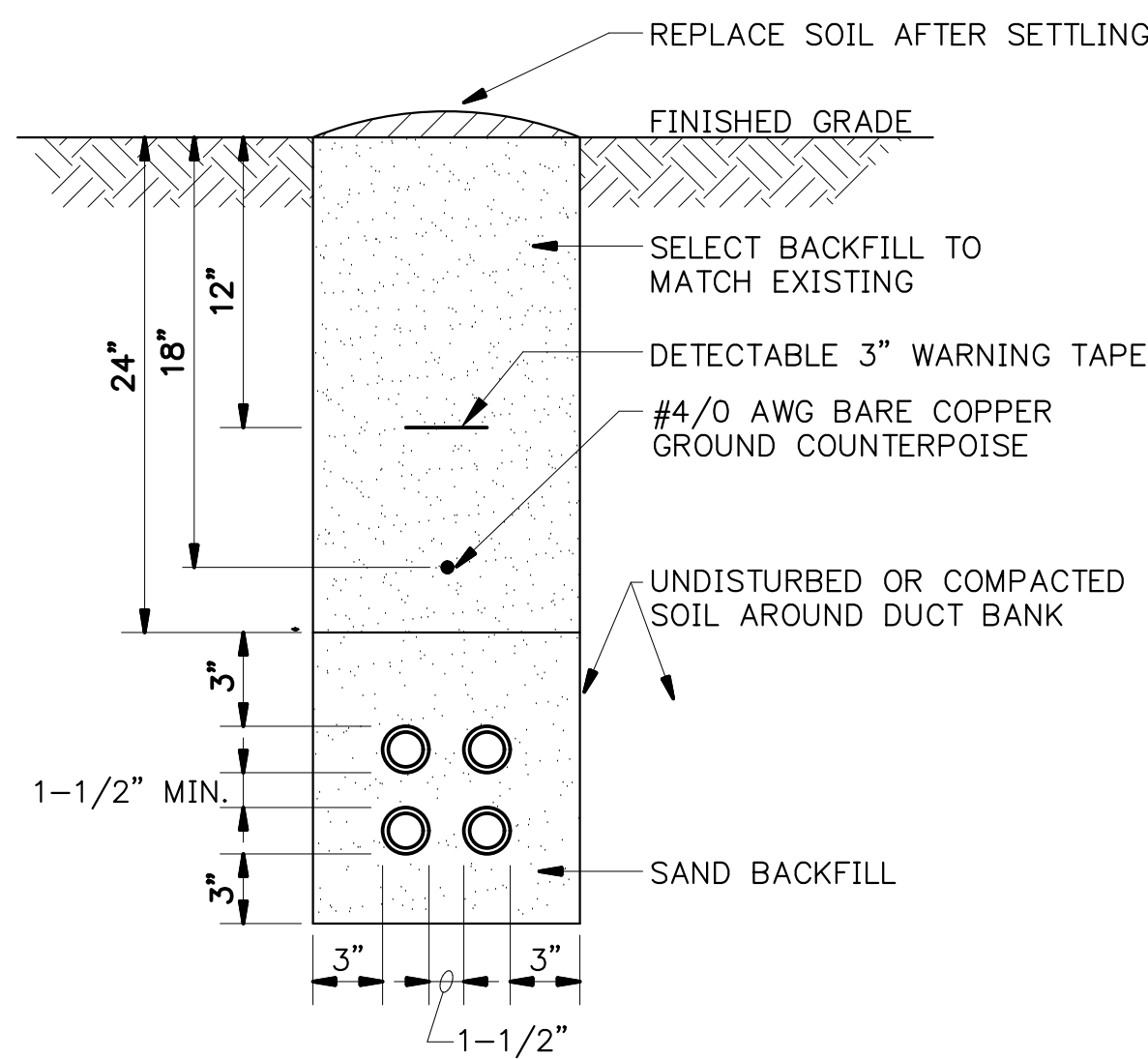
- A. As specified in the Common Work Results for Electrical section.
- B. After the acceptance tests have been completed, dispose of all testing expendables, vacuum all cabinets, and sweep clean all surrounding areas.

3.11 PROTECTION

- A. As specified in the Common Work Results for Electrical section.

3.12 SCHEDULES (NOT USED)

END OF SECTION



2 TRENCH DETAIL  
E2 SCALE: NONE

**ELECTRICAL DUCT NOTES:**

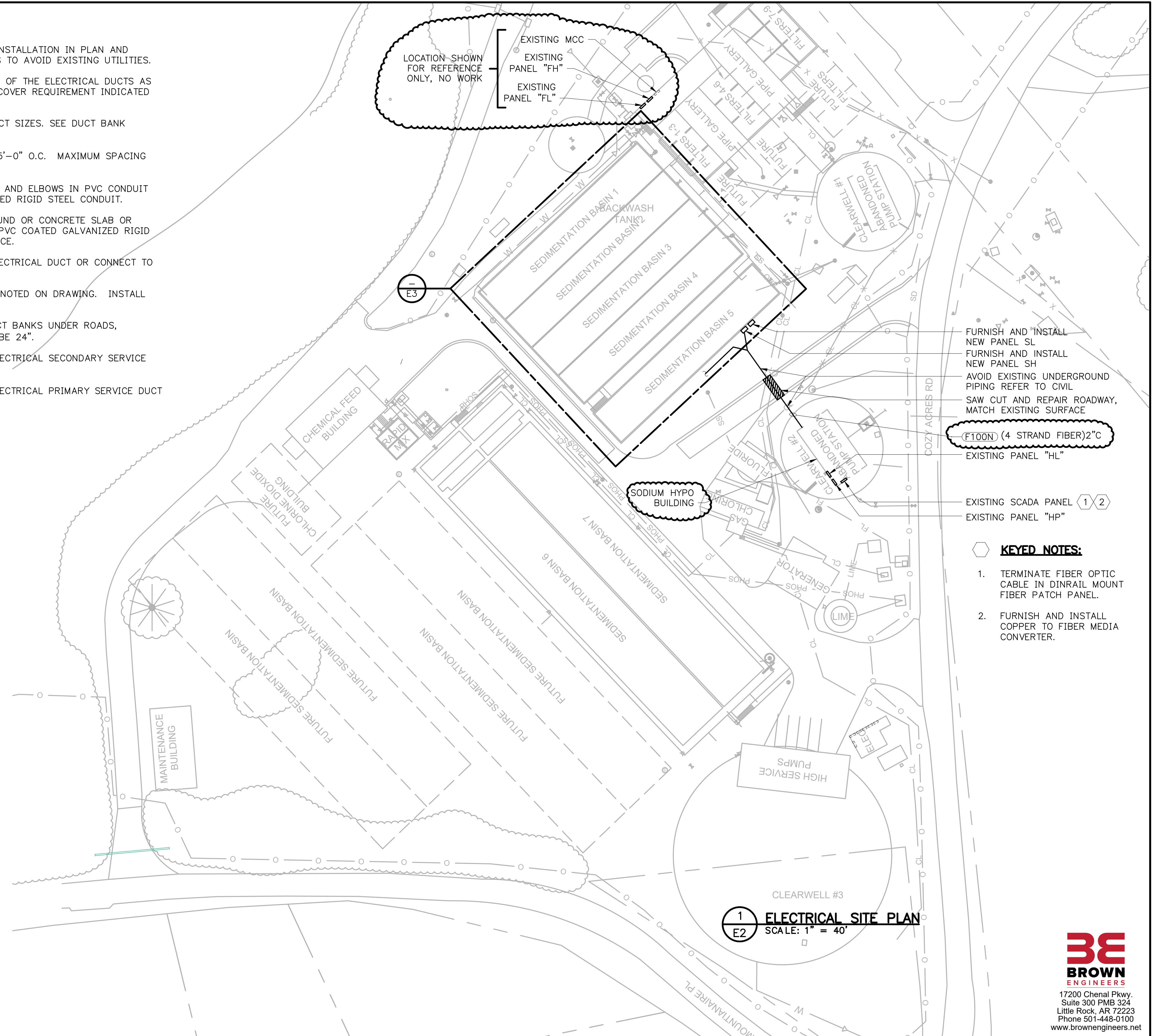
1. CONTRACTOR SHALL STAKE THE DUCT INSTALLATION IN PLAN AND ELEVATION FOR NEW ELECTRICAL DUCTS TO AVOID EXISTING UTILITIES.
2. CONTRACTOR SHALL ADJUST THE DEPTH OF THE ELECTRICAL DUCTS AS REQUIRED TO MAINTAIN THE MINIMUM COVER REQUIREMENT INDICATED AND AVOID EXISTING UTILITIES.
3. SIMILAR CONSTRUCTION FOR OTHER DUCT SIZES. SEE DUCT BANK SCHEDULE FOR QUANTITY AND SIZES.
4. INSTALL DUCT CONDUIT SUPPORTS AT 5'-0" O.C. MAXIMUM SPACING (TYPICAL ALL DUCTS).
5. OFFSETS AND BENDS OVER 10 DEGREES AND ELBOWS IN PVC CONDUIT RUNS SHALL BE PVC COATED GALVANIZED RIGID STEEL CONDUIT.
6. NO PVC SHALL EMERGE FROM THE GROUND OR CONCRETE SLAB OR ENCASEMENT, PVC SHALL CONVERT TO PVC COATED GALVANIZED RIGID STEEL CONDUIT PRIOR TO ITS EMERGENCE.
7. INSTALL GROUND RODS AT ENDS OF ELECTRICAL DUCT OR CONNECT TO GROUND RING.
8. INSTALL CONDUCTORS AND CABLES AS NOTED ON DRAWING. INSTALL PULLWIRE IN ALL SPARE DUCTS.
9. MINIMUM COVER REQUIREMENT FOR DUCT BANKS UNDER ROADS, DRIVEWAYS AND PARKING LOTS SHALL BE 24".
10. MINIMUM COVER REQUIREMENTS FOR ELECTRICAL SECONDARY SERVICE DUCT BANKS SHALL BE 30".
11. MINIMUM COVER REQUIREMENTS FOR ELECTRICAL PRIMARY SERVICE DUCT BANKS SHALL BE 36".

## FEEDER SCHEDULE

| FEEDER DESIGNATION | AMPERE RATING | CONDUCTOR SIZE<br>(AWG OF KCML) |     | CONDUIT  |        |
|--------------------|---------------|---------------------------------|-----|----------|--------|
|                    |               | PH                              | GND | NO. RUNS | SIZE   |
| F20                | 20            | 12                              | 12  | 1        | 1"     |
| F30                | 30            | 10                              | 10  | 1        | 1"     |
| F40                | 40            | 8                               | 10  | 1        | 1-1/4" |
| F50                | 50            | 6                               | 10  | 1        | 1-1/4" |
| F60                | 60            | 6                               | 10  | 1        | 1-1/4" |
| F70                | 70            | 4                               | 8   | 1        | 1-1/2" |
| F80                | 80            | 4                               | 8   | 1        | 1-1/2" |
| F90                | 90            | 2                               | 8   | 1        | 2"     |
| F100               | 100           | 2                               | 8   | 1        | 2"     |
| F110               | 110           | 2                               | 6   | 1        | 2"     |
| F125               | 125           | 1/0                             | 6   | 1        | 2-1/2" |
| F150               | 150           | 1/0                             | 6   | 1        | 2-1/2" |
| F175               | 175           | 2/0                             | 6   | 1        | 2-1/2" |
| F200               | 200           | 3/0                             | 6   | 1        | 3"     |
| F225               | 225           | 4/0                             | 4   | 1        | 3"     |
| F250               | 250           | 250                             | 4   | 1        | 4"     |
| F300               | 300           | 350                             | 4   | 1        | 4"     |
| F350               | 350           | 500                             | 2   | 1        | 4"     |
| F400               | 400           | 500                             | 1/0 | 1        | 4"     |
| F450               | 450           | 4/0                             | 2   | 2        | 3"     |
| F500               | 500           | 250                             | 2   | 2        | 4"     |
| F600               | 600           | 350                             | 1/0 | 2        | 4"     |
| F700               | 700           | 500                             | 1/0 | 2        | 4"     |
| F800               | 800           | 500                             | 1/0 | 2        | 4"     |
| F1000              | 1000          | 500                             | 2/0 | 3        | 4"     |
| F1200              | 1200          | 350                             | 3/0 | 4        | 4"     |
| F1600              | 1600          | 500                             | 4/0 | 5        | 4"     |
| F2000              | 2000          | 500                             | 250 | 6        | 4"     |
| F2500              | 2500          | 500                             | 350 | 7        | 4"     |
| F3000              | 3000          | 500                             | 500 | 8        | 4"     |
| F4000              | 4000          | 500                             | 500 | 11       | 4"     |

**FEEDER SCHEDULE NOTES:**

1. "H" SUFFIX INDICATES THAT FEEDER IS TO BE USED ON A 480 VOLT CIRCUIT.
2. "L" SUFFIX INDICATES THAT FEEDER IS TO BE USED ON 208/240 VOLT CIRCUIT.
3. "N" SUFFIX INDICATES THAT FEEDER CONTAINS A FULL SIZE NEUTRAL CONDUCTOR. OTHERWISE PROVIDE ONLY PHASE AND GROUND CONDUCTORS.
4. "1" PREFIX INDICATES A SINGLE PHASE FEEDER (LINE-TO-LINE). OTHERWISE ASSUME 3-PHASE FEEDER.
5. "S" PREFIX INDICATES A SERVICE FEEDER CONSISTING OF PHASE CONDUCTORS PLUS A FULL SIZE GROUNDED SERVICE CONDUCTOR (NEUTRAL).
6. "CO" MEANS PROVIDE CONDUIT ONLY FOR THAT FEEDER SIZE.



## ELECTRICAL SITE PLAN

SCALE: 1" = 40'

 **KEYED NOTES:**

1. TERMINATE FIBER OPTIC CABLE IN DINRAIL MOUNT FIBER PATCH PANEL.
2. FURNISH AND INSTALL COPPER TO FIBER MEDIA CONVERTER.

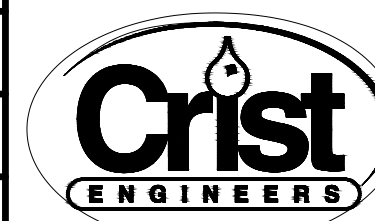
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0 1"

1" = 1"

THIS LINE MEASURES 1"  
WHEN PLOTTED FULL SIZE

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|-----------|-----------|
| DESIGNED: | BB        |
| DRAFTED:  | CD        |
| CHECKED:  | BB        |
| DATE:     | JULY 2025 |



**CRIST ENGINEERS, INC.**  
CONSULTING ENGINEERS

1 EXECUTIVE CENTER COURT  
LITTLE ROCK, ARKANSAS 72211  
TELEPHONE: (501) 664-1552  
FAX: (501) 664-8579  
WWW.CRISTENGINEERS.COM

CITY OF HOT SPRINGS  
OUACHITA WATER TREATMENT PLANT  
PLATE SETTLER MODIFICATIONS

## ELECTRICAL SITE PLAN

JOB NO.

CRI-045

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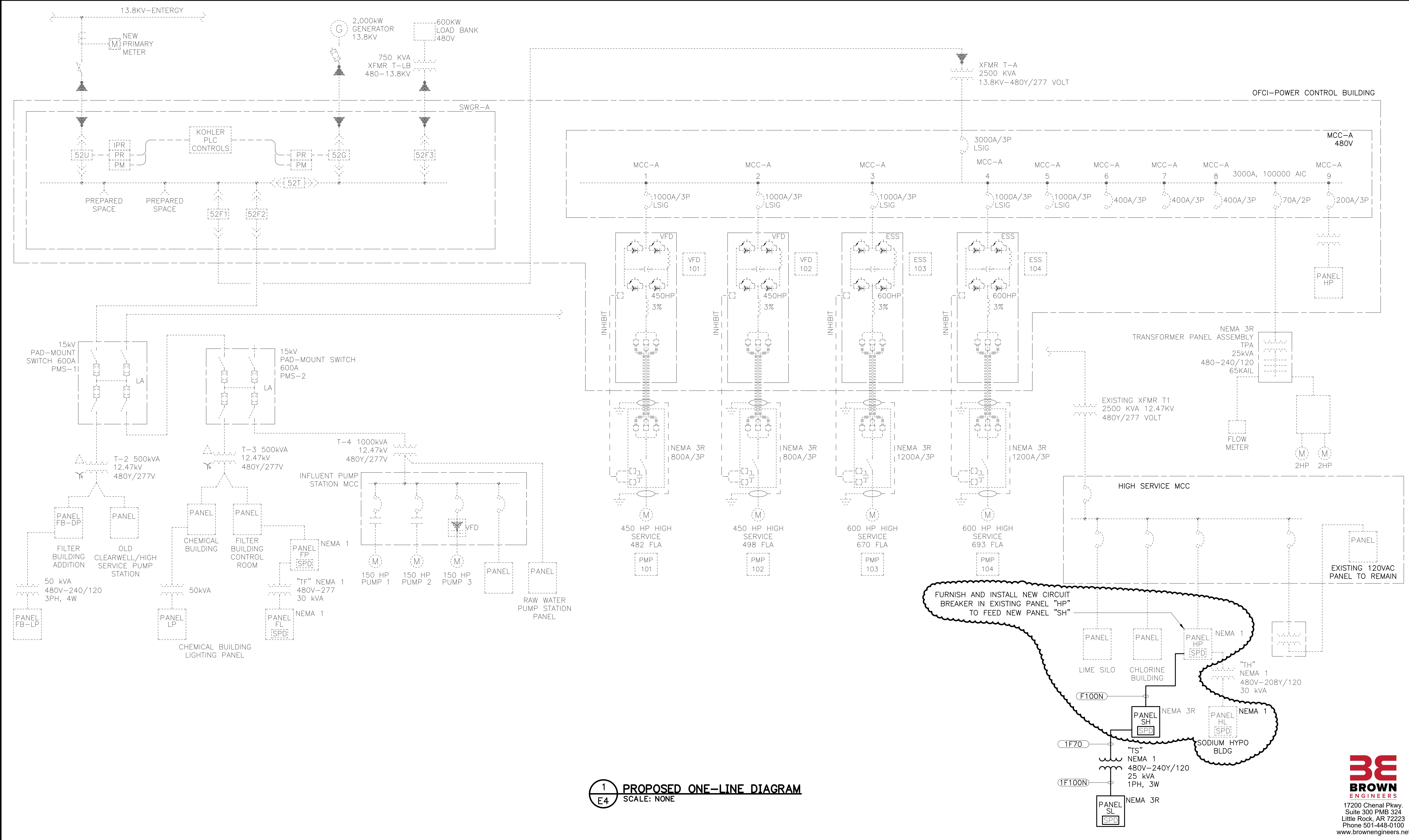
SHEET NO.

E2



17200 Chenal Pkwy.  
Suite 300 PMB 324  
Little Rock, AR 72223  
Phone 501-448-0100  
[www.browngineers.net](http://www.browngineers.net)

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1  
E4  
**PROPOSED ONE-LINE DIAGRAM**  
SCALE: NONE

| REV. NO. | DATE | DRWN | CHKD | REMARKS |
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DRAFTED: CD  
CHECKED: BB  
DATE: JULY 2025



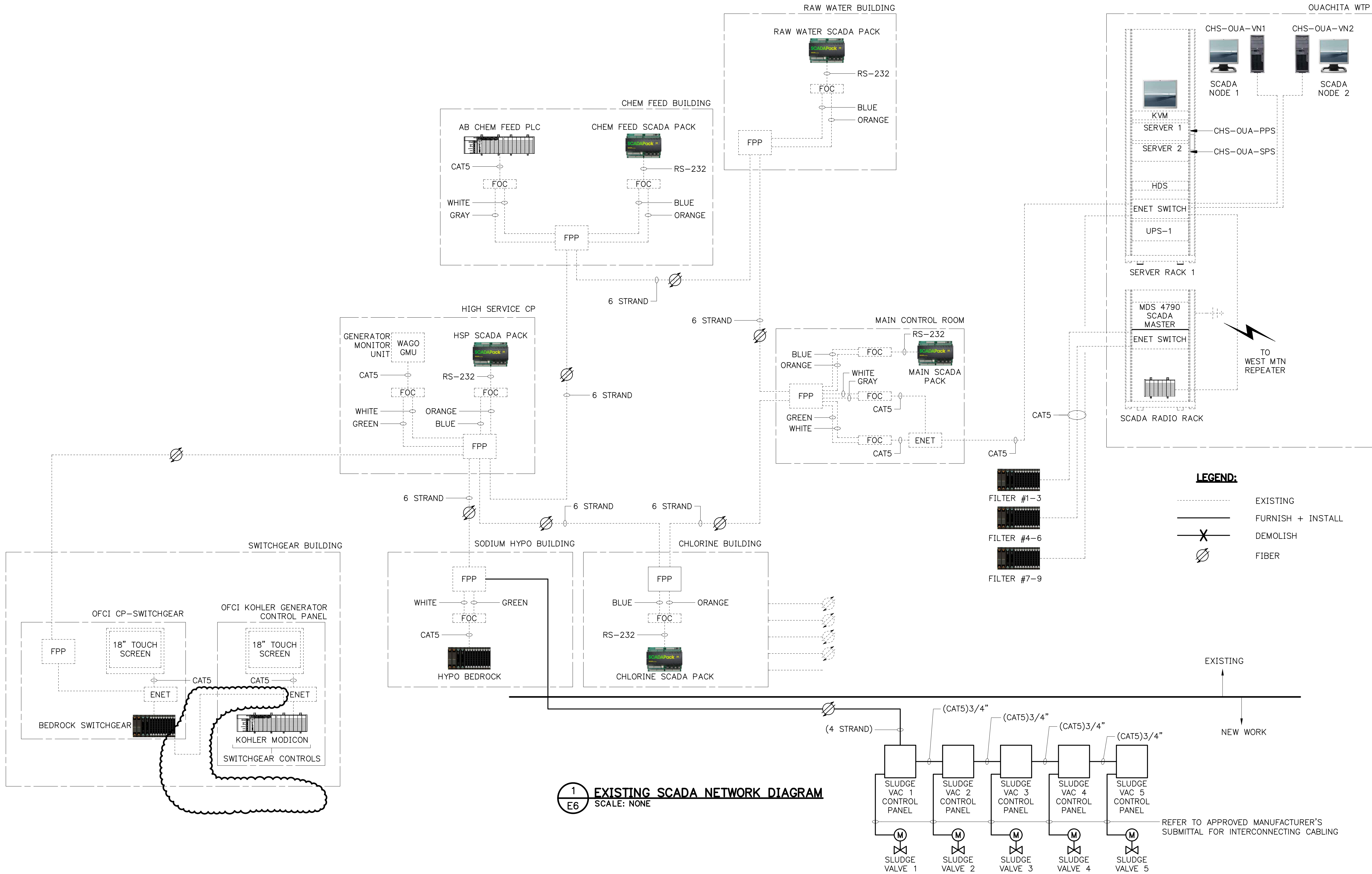
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CONSULTING ENGINEERS  
1 EXECUTIVE CENTER COURT  
LITTLE ROCK, ARKANSAS 72211  
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FAX: (501) 664-8579  
WWW.CRISTENGINEERS.COM

CITY OF HOT SPRINGS  
**OUACHITA WATER TREATMENT PLANT  
PLATE SETTLER MODIFICATIONS**  
  
ELECTRICAL  
ONE-LINE DIAGRAM

JOB NO.  
CRI-045  
  
SHEET NO.  
E4

**BE**  
**BROWN**  
ENGINEERS  
17200 Chenal Pkwy.  
Suite 300 PMB 324  
Little Rock, AR 72223  
Phone 501-449-0100  
www.browngineers.net

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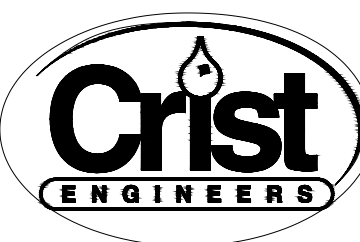
1 EXISTING SCADA NETWORK DIAGRAM  
E6 SCALE: NONE

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| DESIGNED: | BB        |
| DRAFTED:  | CD        |
| CHECKED:  | BB        |
| DATE:     | JULY 2025 |



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CONSULTING ENGINEERS  
1 EXECUTIVE CENTER COURT  
LITTLE ROCK, ARKANSAS 72211  
TELEPHONE: (501) 664-1552  
FAX: (501) 664-8579  
WWW.CRISTENGINEERS.COM

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PLATE SETTLER MODIFICATIONS**  
  
ELECTRICAL  
FIBER OPTIC NETWORK DIAGRAM

|           |         |
|-----------|---------|
| JOB NO.   | CRI-045 |
| SHEET NO. | E6      |

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Suite 300 PMB 324  
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