



Steven M. Clouse WRC Electrical System Improvements Phase II
Solicitation Number: CO-00276
Job No.: 16-6501

ADDENDUM 2
March 11, 2021

To Respondent of Record:

This addendum, applicable to work referenced above, is an amendment to the proposal request, plans and specifications and as such will be a part of and included in the Contract Documents. Acknowledge receipt of this addendum by entering the Addendum number and issue date on the space provided in submitted copies of the Proposal.

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| RESPONSES TO QUESTIONS |
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1. Sheet 20E28 conduit rack between PB/TB-34-A and PBI/TBI-34A on walkway between Tank no 4 & 5 is identified with Keynote 4 as 2-tier support. However, Section 10 20E88 shows it as Type E support. Please revise with correct keynote required.

Response: Refer to "Changes to the Plans," item 1.h.

2. Please confirm whether ALL above grade conduit routed over channels are to be PVC-Coated Aluminum (CRMC) Type. There are drawing requiring conduits attached structures crossing channels to be PVC-Coated, however some that do not. i.e. Sheet 20E79, Section 20J, conduits to be attached to existing bridge and 20E84 conduit to be installed on new channel crossing, does not call be CRMC type whereas remaining channel crossings require conduits to be PVC coated. Note that Section 20J is to be attached to bridge that already contains PVC Coated Conduits.

Response: All conduit on bridges over channels shall be PVC-Coated Aluminum. Refer to "Changes to the Specifications," item 3. Conduit type is not called out on the drawings, so no drawing revisions required.

3. Sheet 00E12 through – 00E14, due to the length of circuits SGA-4P and SGB-4P would require splices along the route. As splices will need to be in the manholes, please clarify statement in Specification Section 16121 3.02 B 1 regarding the proposed above ground splice locations.

Response: No splices are allowed in manholes. All feeders shall be installed without splicing, if possible. Aboveground splices shall be implemented using Medium Voltage Pad-Mounted Cable Switching and Terminating Stations. Refer to "Changes to the Specifications" item 4. Further details will be provided in future Addenda.

4. Sheets 00E33, 00E34 & 00E35 seems to contradict each other regarding the fiber run to the east of FHH-13 to the chlorine facility. Sheet 00E33 indicates new duct bank is need to the existing Manhole on the east side of N/S road to east of O&M Building, Sheet 00E34 seems to indicate the Manhole exist on the west side of road crossing, whereas Sheet 00E35 indicates that the conduit exists to the New FHH-13. Please clarify.

Response: Refer to "Changes to the Plans," item 1.b.

5. Sheet 00E33 & 00E42 Please verify the scale.

Response: Refer to "Changes to the Plans," items 1.a and 1.e.

6. Sheet 00E38, ductbank section shows 8 conduits, but table shows 6. Please clarify which is to correct.

Response: Refer to "Changes to the Plans," item 1.d

7. Please clarify the routing of Fiber Optic between Thickener Bldg.4 NET-BLDG4 and NET-DEW in the dewatering Bldg. Riser diagram on sheet 00E34 and sheet 00E35 seems to show a new fiber optic cable routed in existing conduit (Keynote #1 on sheet 00E34). However, sheet 30E12 indicates this is to be done via existing fiber. If new fiber optic cable is required, please provide the routing required as current drawings are not specific on the routing.

Response: There is no riser diagram on sheet 00E34 and 00E35 does not define the fiber. Refer to Sheet 00E40 - Riser Diagram- Keynote 4: Use existing fiber. Sheet 30E12 indicates an existing fiber.

8. Please verify fiber ductbank F27 should be F26 on riser diagram 00E35.

Response: Refer to "Changes to the Plans," item 1.b.

9. Sheet 00E37 DB Section F11 conduit #2 shows FOC-HW-ELEC; however, on sheet 05N11 & 05N12 shows this fiber to be FOC-HW-MAIN from NET-HW to FOPP-RIO-MAIN. Ductbank section 05P on Sheet 05E03 between FHH-9 to existing manhole north of Main Switchgear Building shows both FOC-HW-MAIN and FOC-HW-ELEC. Please clarify which is correct.

Response: Refer to "Changes to the Plans," item 1.c.

10. Please provide the DB Section 11A as shown on sheet 00E35 between FHH-8 and FHH-9. Note sheet 05E01 shows F11 to be same for ductbank section between HW Elect. Bldg. & and above referenced section. But FOC-MAIN should not show on DB section between FHH-8 and FHH-9.

Response: Refer to "Changes to the Plans," item 1.f.

11. Will SAWS accept Siemens as an approved manufacturer for the LV MCC section 16480 for the SAWS- Steven M Clouse project? Siemens is working on putting together a package & is already approved for the sections below.
- a. 16196 – LV AC SPD'S
 - b. 16425 – LV SWBDS
 - c. 16430 - PAD -MOUNTED TRANSFORMERS
 - d. 16461 - DISTRIBUTION DRY -TYPE TRANSFORMERS
 - e. 16470 – PANELBOARDS
 - f. 16475 – LV ECB'S & DISCONNECT SWITCHES
 - g. 16476 – ATS (RUSSELECTRIC IS APPROVED)

Response: Any request for substitution shall be submitted by the contractor, following the appropriate procedure after award of contract as outlined in the Contract Documents including, but not limited to, section 5.11 of Article V of the General Conditions and section 01300 of the Technical Specifications.

12. Please provide Diesel Generator Specifications for SCADA/IT building.

Response: Refer to "Changes to the Specifications," item 4.

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| CHANGES TO THE SPECIFICATIONS |
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1. Technical Specifications Table of Contents: Remove in its entirety and replace with the attached section.
2. Schedule of Manufacturers and Suppliers: Remove in its entirety and replace with the attached section. This version should be used by Respondents when submitting a proposal.
3. Section 16110 Raceways, Boxes, and Fittings, 3.01.C, Page 16110-11: On table line 2, PVC Coated Aluminum (CRMC) Type, remove the Location entry, "All embedded raceway bends, underground duct bank bends of more than 20 degrees, and all raceway stub-ups to a minimum of six inches above finished floor or grade," and replace with, "All conduits on bridges across channels, embedded raceway bends, underground duct bank bends of more than 20 degrees, and all raceway stub-ups to a minimum of six inches above finished floor or grade."
4. Add Section 16200 Standby Generator Set.
5. Add Section 16335 Medium Voltage Pad-Mounted Cable Switching and Terminating Stations.
6. Section 16600 Underground System: Add paragraph 3.03.C as follows, "In sections where the duct bank is in or crosses existing roadway, the Contractor shall saw cut pavement and repair in accordance with the Civil details."
7. Section 17305.1.01, page 17305-2: Add "J. The ASP shall utilize the PlantPax Process Library p2fQuickstart HMI Application and the PlantPax UM003 Manual based prescriptive development of the PlantPax System for programming development work."
8. Section 17510.2.07.B.1: Add the following item No. 9 to the table:

| Item No. | Description | No of license | Catalog Number |
|-----------------|---|----------------------|-----------------------|
| 9 | PlantPax Process Library p2fQuickstart HMI Application and PlantPax UM003 User Manual based prescriptive development of the PlantPax system | 3 | N/A |

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| CHANGES TO THE PLANS |
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1. Remove the following sheets and replace with the attached sheets:
 - a. 00E33
 - b. 00E35
 - c. 00E37
 - d. 00E38
 - e. 00E42
 - f. 05E01
 - g. 05E03
 - h. 20E28

CLARIFICATIONS

1. Any questions not addressed within this Addendum will be answered in the subsequent Addendum scheduled to be posted on March 16, 2021.

END OF ADDENDUM

This Addendum, including these four (4) pages, is fifty-two (52) pages with attachments in its entirety.

Attachments:

Drawings: 8 pages, 11x17 (HALF-SIZE)
Specifications: 4 sections, total 40 pages


William D. Sako
Gupta & Associates, Inc.
TBPE # F-2593


3/11/2021

SAWS JOB NO 16-6501
STEVEN M. CLOUSE WRC
ELECTRICAL SYSTEM IMPROVEMENTS – PHASE II

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Schedule of Manufacturers and Suppliers

The Contract Documents are based upon the equipment or products available for the manufacturers/suppliers denoted as "a", "b", etc., below. Bidder must indicate in the Bid which manufacturer/supplier the bid was based upon and which bid is intended for use for each item of equipment, listed below by circling one of the listed suppliers/manufacturers. If the Bidder circles more than one listed supplier, he must use the first supplier circled (unless an approved equal is authorized following the award of the construction contract).

| Specification Number | Equipment | Manufacturer or Supplier |
|----------------------|-------------------------------------|---|
| 13120 | Precast Building Prefabricated | a. Lonestar Prestress Mfg. Inc. b. Oldcastle Precast |
| 16195 | Power quality meter | a. GE Multilin PQM-II b. No equal |
| | Phase protection relay | a. Taylor Phase-Guard Model P b. Approved equal |
| | Hourmeter (ETM) | a. Veeder-Root Model 779536-201 b. Approved equal |
| | Undercurrent Relay | a. LittleFuse - ECS Series b. Approved equal |
| 16196 | Low voltage SPD Type 1 & 2 | a. ABB – Industrial Solutions b. Allen-Bradley c. Cutler-Hammer d. Siemens e. Square D f. Approved equal |
| | Low voltage SPD Type 3 | a. Edco SLAC Series b. Phoenix Contact c. Brick Wall Model PQOM20 d. Approved equal |
| 16200 | Standby Generator Set | a. Cummins b. Kohler c. Caterpillar d. Generac |
| 16260 | Uninterruptible Power Supply System | e. Tripp Lite f. No equal |

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| Specification Number | Equipment | Manufacturer or Supplier |
|-----------------------------|---|---|
| 16335 | Medium Voltage Pad-Mounted Cable Switching and Terminating Stations | a. Elliott Industries b. G & W Electric c. Cooper Industries d. S & C Electric |
| 16346 | Medium Voltage Sealed Deadfront Distribution Switchgear | a. S & C Electric b. G & W Electric c. No equal |
| 16425 | Low Voltage Distribution Switchboards | a. ABB – Industrial Solutions b. Eaton/Cutler-Hammer c. Siemens d. Square D |
| 16430 | Pad Mounted Transformer | a. ABB – Industrial Solutions b. Eaton c. Siemens d. Square D e. Virginia Transformer |
| 16461 | Dry-Type Transformers | a. ABB – Industrial Solutions b. Eaton c. Siemens d. Square D |
| 16470 | Panelboards | a. ABB – Industrial Solutions b. Eaton c. Siemens d. Square D |
| 16475 | Breakers, Disconnect Switches, MTS | a. Eaton b. ABB – Industrial Solutions c. Siemens d. Square D |
| 16476 | Low Voltage Automatic Transfer Switches | a. ASCO b. Zenith c. Onan d. Russelectric |

| Specification Number | Equipment | Manufacturer or Supplier |
|-----------------------------|---|---|
| 16480 | Low Voltage Motor Control Centers | a. ABB – Industrial Solutions b. Eaton c. Rockwell d. Square D |
| 16500 | Lighting Systems (Refer to light fixture schedule for manufacturers for each fixture type.) | a. Lithonia b. Solas Ray c. Visionaire d. Approved equal |
| 16600 | Manholes | a. Oldcastle Precast b. Approved equal |
| | Manhole covers | a. East Jordan Iron Works b. Approved equal |
| 16670 | Lightning protection system (complete, including design) | a. Bonded Lightning / Advanced Lightning Technology (Argyle, TX) b. VFC, Inc. (Grapevine, TX) c. Approved equal |
| 17500 | Programmable Logic Controllers | a. Rockwell Automation ControlLogix b. No equal |
| 17510 | Humane Machine Interface | a. Rockwell Automation PlantPax b. No equal |

END OF SECTION



SECTION 16200

STANDBY GENERATOR SET

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install Standby Generator Sets with all appurtenances as shown on the Drawings and specified herein.
- B. Each generator size as shown on the drawings is a minimum size around which the electrical conductors and circuit breakers have been sized. The Contractor shall provide each engine-generator set that meets all the performance criteria, and shall increase the size of the engine generator, if necessary, to meet the specified criteria. If the generator size increases, the Contractor shall increase the breakers, conductors, and all associated equipment, including the automatic transfer switch, to accommodate the larger generator size. All sizing of associated equipment shall be in accordance with the NEC. Submit all required changes specified above to the Engineer/Owner. No changes shall be done to any of the power system components without approval.
- C. The Contractor shall provide fuel for startup and testing. At the completion of startup and testing, the Contractor shall fill the respective generator tank.

1.02 RELATED WORK

- A. No references are made to any other section which may contain work related to any other section. The Contract Documents shall be taken as a whole with every section related to every other section as required to meet the requirements specified. The organization of the Contract Documents into specification divisions and sections is for organization of the documents themselves and does not relate to the division of suppliers or labor which the Contractor may choose to employ in the execution of the Contract. Where references are made to other Sections and other Divisions of the Specifications, the Contractor shall provide such information or additional work as may be required in those references, and include such information or work as may be specified.
- B. Other Divisions
 - 1. The Contractor shall be responsible for examining all Sections of the Specifications and Drawings, and shall determine the power and wiring requirements and shall provide external wiring and raceways, as required to provide a fully functioning power, control and process control systems. If the equipment requires more conductors and/or wiring, due to different equipment being supplied, the Contractor shall furnish the additional conductors, raceways and/or wiring, with no change in the Contract Price, and with no increase in Contract Time.

1.03 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of Division 1, Section 16000 and as specified herein. All cut sheets shall be clearly marked to indicate which products are being submitted for use on this project. Unmarked cut sheets will be cause to reject the submittal and return it for revision.
- B. Provide systems engineering with coordination curves, to demonstrate coordination between proposed breakers and/or fuses submitted, such that protective device coordination is accomplished. Such curves and settings shall be included as a part of these submittals.
- C. Submittals shall also contain information on related equipment to be furnished under this Specification but described in the related Sections listed in the Related Work paragraph above. Incomplete submittals not containing the required information on the related equipment will also be returned without review.
- D. The original equipment manufacturer shall create all equipment shop drawings, including all wiring diagrams, in the manufacturer's Engineering Department. All equipment shop drawings shall bear the original equipment manufacturer's logo, drawing file numbers, and shall be maintained on file in the original equipment manufacturer's archive file system. Photocopies of the Engineer's ladder schematics are unacceptable as shop drawings.
- E. Submit to the Owner/Engineer, complete shop drawings and product data for all components in one package in a single submittal. Submitting the engine-generator, fuel tank, sound enclosure and access platforms in separate packages will not be acceptable and will be returned without review. Failure to submit all components at once may cause a delay in the Contractor's construction schedule because of a delay in receiving approval to release the equipment manufacture. Delays caused by incomplete submittals, incorrect submittals, submittals not meeting these specifications causing excessive resubmittals will not be an acceptable reason for extending the Contract Time or increasing the Contract Price. Provide submittals for the following:
 - 1. Equipment outline drawings showing elevation and plan views, dimensions, weight, anchor details, and required operating clearances.
 - 2. Conduit entrance drawings.
 - 3. Product data sheets and catalog numbers for the engine, AC generator, battery charger, generator set control system, electronic governor system, control stations, meters, relays, pilot lights, circuit breaker, etc. List all options and accessories furnished specifically for this project. Clearly mark each sheet to indicate which items apply and/or those items that do not apply.
 - 4. Provide control systems engineering to produce custom unit elementary drawings showing interconnecting wiring and interlocking between components and to remotely mounted devices. Include and identify all connecting equipment and remote devices on the schematics. The notation

"Remote Device" will not be acceptable. Show wire and terminal numbers. Indicate special identifications for electrical devices per the Drawings.

5. Provide plan and elevation drawings of each Generator Set, with dimensions, exterior and interior views, showing component layouts, controls, terminal blocks, etc.
6. Schematic diagram
7. Nameplate schedule
8. UL Listing of the completed assembly.
9. Component list with detailed component information, including original manufacturer's part number.
10. Conduit entry/exit locations
11. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current
12. Major component ratings including:
 - a. Voltage
 - b. Continuous current
 - c. Interrupting ratings
13. Number and size of cables per phase, neutral if present, ground and all cable terminal sizes.
14. Service and feeder lugs and connectors.
15. Instruction and renewal parts books.
16. Sound enclosure and all items mounted to the sound enclosure (including lighting, electrical panels and raceway). The sound enclosure drawings shall clearly show all access doors and hatches which shall determine the width of the access platform. Provide cut sheets on all items. Cut sheets shall demonstrate that Section 16110 Raceway and 16045 Support Hardware have been met.
17. Provide structural drawings on the access platform including all specified details. Show that the width of the platform allows the sound enclosure doors to open a minimum of 90 degrees. See structural specifications and drawings

for more information. If the Contractor provides a sound enclosure with doors which are wider than shown on the drawings, the Contractor shall modify the width of the access platform and modify the structural slab supporting the platform. Submit details of all required changes to the Engineer for review and approval.

18. Fuel tank and all associated instrumentation including engineering drawings showing dimensions, weights, capacity, materials of construction, finishes for steel components and cut sheets for all instrumentation components provided.
 19. Cut sheets on all conductors provided showing that they are tinned and meet the requirements of Section 16120.
 20. Provide cut sheets on all electronic components and certify that all circuit boards are conformal coated.
- F. Factory Tests. Submittals shall be made for factory tests specified herein.
- G. Field Test Reports. Submittals shall be made for field tests specified herein.
- H. Operation and Maintenance Manuals.
1. Operation and maintenance manuals shall include the following information:
 - a. Manufacturer's contact address and telephone number for parts and service.
 - b. Instruction books and/or leaflets
 - c. Recommended renewal parts list
 - d. Record Documents for the information required by the Submittals above.
 - e. Operating instructions, including periodic generator set operational testing.
 - f. Automatic and manual startup and shutdown sequences.
 - I. The manufacturer shall submit for approval, a training agenda for all training specified herein. Training agenda shall not be submitted until final approval of the Operation and Maintenance Manual.
 - J. If the generator size must be increased to meet the specified performance criteria, and the supporting components of the power system must be changed to support the increase in the generator size, the Contractor shall submit a list of all changes required along with supporting calculations. Submittal of any required changes shall be made to the Engineer/Owner prior to proceeding with the changes.

1.04 REFERENCE CODES AND STANDARDS

A. All products and components shown on the Drawings and listed in this specification shall be designed and manufactured according to latest revision of the following standards (unless otherwise noted):

1. NEMA Standard ICS 2 – 2000 Industrial Control and Systems
2. NFPA 70 – National Electrical Code (NEC)
3. NFPA 70E – Standard For Electrical Safety in the Workplace
4. NFPA 110 for Level 1 Systems.
5. OSHA for rotating parts.
6. NEMA MG1 temperature limits.
7. UL508A
8. CSA282-M1989
9. IEC 8528 part 4
10. Mil – Std 461C part 9
11. IEC Std 801.2, 801.3, 801.5
12. IEEE587
13. ASTM D2794-93
14. ASTM D2247-92
15. UL 2085 - Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids

B. All equipment components and completed assemblies specified in this Section of the Specifications shall bear the appropriate label of Underwriters Laboratories.

1.05 QUALITY ASSURANCE

A. The manufacturer of this equipment shall have produced similar equipment for a minimum period of ten years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

B. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly. All assemblies shall be of the same manufacturer. Equipment that is manufactured by a third party and "brand labeled" shall not be acceptable.

- C. All components and material shall be new and of the latest field proven design and in current production. Obsolete components or components scheduled for immediate discontinuation shall not be used.
- D. For the equipment specified herein, the manufacturer shall be ISO 9001 2000 certified.

1.06 JOBSITE DELIVERY, STORAGE AND HANDLING

- A. Prior to jobsite delivery, the Contractor shall have successfully completed all submittal requirements, and present to the Owner/Engineer upon delivery of the equipment, an approved copy of all such submittals. Delivery of incomplete constructed equipment, or equipment which failed any factory tests, will not be permitted.
- B. Equipment shall be handled and stored in accordance with manufacturer's instructions. Two copies of these instructions shall be included with the equipment at time of shipment, and shall be made available to the Contractor and Owner. The instructions shall include detailed assembly instructions including but not limited to wiring interconnection diagrams, rigging for lifting, skidding, jacking and moving using rolling equipment to place the equipment, bolt torquing requirements for bus and all other components which require the installation of bolted connections, and instructions for storing the equipment prior to energizing.
- C. Protect equipment during shipment, handling, and storage by suitable complete enclosures. Protect equipment from exposure to the elements and keep thoroughly dry.
- D. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Repaint damaged painted surfaces to the satisfaction of the Owner/Engineer.
- E. Equipment shall be immediately installed in its permanent finished location shown on the Drawings, upon delivery to the jobsite. If the equipment cannot be immediately installed, the equipment shall not be delivered to the site, but stored offsite at the Contractor's expense, until such time that the site is ready for permanent installation of the equipment.
- F. Shipping groups shall be designed to be shipped by truck, rail, or ship. Indoor groups shall be bolted to skids. Breakers and accessories shall be packaged and shipped separately.
- G. Where space heaters are provided in equipment, provide temporary electrical power and operate space heaters during storage, and after equipment is installed in permanent location, until equipment is placed in service.

1.07 WARRANTY

- A. The Manufacturer of the alternator shall assume Manufacturer's responsibility for the Generator Set in its entirety, and warrant the equipment to be free from

defects in material and workmanship for three years from date of final acceptance of the equipment. Within such period of warranty, the Manufacturer shall promptly furnish all material and labor necessary to return the equipment to new operating condition. Any warranty work requiring shipping or transporting of the equipment shall be performed by the Manufacturer at no expense to the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
 - 1. Cummins
 - 2. Kohler
 - 3. Caterpillar
 - 4. Generac
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

2.02 RATINGS

- A. The service voltage shall be as shown on the Drawings.
- B. Power: Standby, minimum size as shown on the Drawings, at 0.8 power factor, based on site elevation of 3300 feet and ambient temperatures up to 50°C.
- C. For additional ratings and construction notes, refer to the Drawings.

2.03 PERFORMANCE

- A. Voltage Regulation: Voltage regulation shall be plus or minus 0.5% for any constant load between no load and rated load for both parallel and non-parallel applications. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5%.
- B. Frequency Regulation: Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.5%. The AC voltage waveform shall have not more than 5% total harmonic distortion at full linear load and with not more than 3% in any single harmonic. Telephone influence factor shall be less than 50.
- C. The engine generator set shall be capable of operating up to 30 minutes monthly at no load, for up to 12 months, without damage to the unit.

2.04 ENGINE

- A. Each engine shall be diesel, four-stroke, water-cooled, with a minimum of four cylinders. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Engine shall be certified by the Environmental Protection Agency (EPA) to conform to tier level 2 in effect at the time of manufacture. Two stroke engines are not acceptable. Engine shall be manufactured by one of the following:
 - 1. Caterpillar
 - 2. Cummins
 - 3. Detroit Diesel
 - 4. John Deere
 - 5. Mitsubishi
 - 6. Volvo
 - 7. Approved equal
- B. Engine accessories and features shall include:
 - 1. Governor System: An electronic governor system shall provide automatic isochronous frequency regulation.
 - 2. Radiator and Cooling System: Skid mounted radiator and cooling system rated for full load operation in 122°F (50°C) ambient as measured at the generator air inlet. Radiator shall be provided with a duct adapter flange. The equipment supplier shall fill the cooling system with 50/50-ethylene glycol/water mixture. Rotating parts shall be guarded against accidental contact per OSHA requirements.
 - 3. Electric System: An electric starter capable of three complete cranking cycles without overheating.
 - 4. Lubrication Oil Pump: Positive displacement, mechanical, full pressure, lubrication oil pump.
 - 5. Oil Filters: Full flow lubrication oil filters with replaceable spin on canister elements and dipstick oil level indicator. Oil filters shall be accessible from the side of the engine easily reached through one of the enclosure access doors. Provide drip pan below oil filter to catch oil leaks during filter change.
 - 6. Air cleaner: Replaceable dry element air cleaner with restriction indicator. The air cleaner shall be easily accessible from the side of the generator without climbing on top of the engine.

7. Fuel Lines and Fuel Filter: Provide flexible fuel lines. Fuel filter shall be water separator type and shall be located on the side of the engine for easy access and maintenance. Filters shall not be located on top of the engine.
8. Battery Charging Alternator: Engine mounted battery charging alternator, 45-ampere minimum, and solid state voltage regulator.

2.05 AC GENERATOR

- A. General: Each AC generator shall be; synchronous, four-pole, revolving field, drip-proof construction, pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 125°C, over a 50°C ambient.
- B. Provide a generator circuit breaker as specified herein.
- C. Power: Each generator shall be capable of delivering rated output power (kW) at rated frequency and power factor, at any voltage not more than 5% above or below rated voltage.
- D. Excitation: A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than ten seconds.
- E. Provide 120-volt, single phase anti-condensation heater for each generator set.
- F. All current transformers shall have their secondary leads connected to shorting type terminal blocks.

2.06 CONTROL

- A. General: The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.
- B. Where the control panel contains a programmable logic controller (PLC) or an uninterruptible power supply (UPS), the equipment manufacturer shall furnish factory installed, a dedicated Point of Utilization Surge Protection Device (SPD), as specified in Section 16196, Individual Control Panel and Related Equipment Protection (Type 3).
- C. Mounting: The control shall be mounted on the generator set. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.

D. Standards: The control panel shall be UL508 listed, CSA282 M1989 certified, and meet IEC8528 part 4. All switches lamps and meters shall be oil tight and dust tight, and the enclosure door shall be gasketed. There shall be no exposed points in the control panel (with the door open) that operate in excess of 50 volts. The controls shall meet or exceed the requirements of Mil Std 461C part 9, and IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions. The entire control system shall be tested and meet the requirements of IEEE587 for voltage surge resistance.

E. Features:

1. Mode Select Switch: The AUTO-RUN-OFF Mode Selector Switch shall initiate the following control modes. When in the OFF position, the generator set is disabled, and cannot be started locally or from remote commands. If the generator set is running in the RUN or AUTO positions, turning the selector switch to OFF will cause the generator set to go into the cool down mode, and stop after cool down. When the selector switch is in the Run position, the generator set shall start, and remain running until turned to OFF. If the selector switch is placed in AUTO, the generator set shall start upon a dry contact request from a remote device, and remain running until the selector switch is placed in the OFF position, causing a normal cool down and shutoff.
2. Emergency Stop Switch: Switch shall be Red "mushroom head," push to operate, pull to reset. A protective cover shall be provided to prevent accidental operation. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out until reset,
3. Reset Switch: The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
4. Panel Lamp Switch: Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off ten minutes after the switch is depressed, or after the switch is depressed a second time.
5. Digital Metering Set: Digital metering set, 0.5% accuracy, to indicate generator RMS voltage and current, frequency, output current, output kW, kW hours, and power factor. Generator output voltage shall be available in line to line and line to neutral voltages, and shall display all three-phase voltages (line-to-neutral or line-to-line) simultaneously.
6. Generator Set Alarm Display: The generator set shall be provided with alarm and status indicating lamps to indicate non automatic generator status, and existing alarm and shutdown conditions. The lamps shall be high intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of the following alarm and shutdown conditions on a digital display panel:
 - a. Low oil pressure (alarm)

- b. Low oil pressure (shutdown)
 - c. Oil pressure sender failure (alarm)
 - d. Low coolant temperature (alarm)
 - e. High coolant temperature (alarm)
 - f. High coolant temperature (shutdown)
 - g. Engine temperature sender failure (alarm)
 - h. Low coolant level (alarm or shutdown selectable)
 - i. Fail to crank (shutdown)
 - j. Over crank (shutdown)
 - k. Over speed (shutdown)
 - l. Low DC voltage (alarm)
 - m. High DC voltage (alarm)
 - n. Weak battery (alarm)
 - o. Low fuel day tank (alarm)
 - p. High AC voltage (shutdown)
 - q. Low AC voltage (shutdown)
 - r. Under frequency (shutdown)
 - s. Over current (warning)
 - t. Over current (shutdown)
 - u. Short circuit (shutdown)
 - v. Over load (alarm)
 - w. Emergency stop (shutdown)
 - x. Fuel leak (alarm)
7. Special Alarm or Shutdown Conditions: Provide spare indication points for two additional alarm or shutdown conditions. Labeling of the alarm or shutdown conditions shall be of the same type and quality as the above-specified conditions

8. Engine Status Monitoring: The following information shall be available from a digital status panel on the generator set control:
 - a. Engine oil pressure (psi. or kPA.)
 - b. Engine coolant temperature (degrees F or C)
 - c. Engine oil temperature (degrees F or C)
 - d. Engine speed (rpm)
 - e. Number of hours of operation (hours)
 - f. Number of start attempts
 - g. Battery voltage (DC volts)
9. Electromechanical Hour meter as specified in Section 16195.
10. The control system shall also incorporate a data logging and display provision to allow logging of the last ten warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.
11. A set of Form C dry contacts shall be provided for each genset remote condition specified herein.

2.07 CONTROL FUNCTIONS

- A. Cycle Cranking System: The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for three cranking periods of 15 seconds each, with 15-second rest period between cranking periods.
- B. Idle Mode Control: The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.
- C. Engine Governor Control: The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting. The governor control shall be suitable for use in paralleling applications without component changes.
- D. Time Delay Start: The control system shall include time delay start (adjustable 0 - 300 seconds) and time delay stop (adjustable 0 - 600 seconds) functions.
- E. Sender Failure Monitoring: The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is

capable of discriminating between failed sender or wiring components, and an actual failure conditions.

2.08 ALTERNATOR CONTROL FUNCTIONS

- A. Alternator Control Functions shall include an I/O module for remote trip of a downstream protective relay activated by any of the protective devices listed below.
- B. The alternator protective devices shall include the following protective devices:
 - 1. Generator phase sequence,
 - 2. Over/under voltage (27/59),
 - 3. Over/under frequency (81 O/U)
 - 4. Reverse power (kW)(32RP)
 - 5. Reverse reactive power (kVAR)(32RV)
 - 6. Overcurrent protection (50/51)
- C. Digital voltage Regulation: The generator set shall include an automatic digital voltage regulation system that is matched and prototype tested with the governing system provided. It shall be immune from incorrect operation due to load induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three phase RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of 59 HZ. The voltage regulator shall include adjustments for gain, damping, and frequency roll off. Adjustments shall be broad range, and made via digital raise-lower switches, with alpha-numeric LED readout to indicate setting level.
- D. Output Current: Controls shall be provided to monitor the output current of the generator set and initiate an alarm when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator.
- E. Output Power: Controls shall be provided to monitor the kW load on the generator set, and initiate an alarm condition when total load on the generator set exceeds the generator set rating for in excess of five seconds.
- F. Over/under Voltage Monitor: An AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than ten seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall

occur when the output voltage of the alternator is less than 85% for more than ten seconds.

- G. Battery Monitoring System: A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 25 volts DC or more than 32 volts DC. During engine starting, the low voltage limit shall be disabled, and if DC voltage drops to less than 24 volts for more than two seconds a "weak battery" alarm shall be initiated.

2.09 REMOTE MONITORING AND CONTROL INTERFACE

- A. General: All control and interconnection points from the equipment to the plant control and monitoring system shall be brought to a separate connection box. No field connections shall be made directly to the equipment control devices. Functions to be brought out shall be the manufacturer's standard in addition to the features specified herein.
- B. Discrete control or status functions shall be form C relays with contacts rated at 120 volts AC. Analog signals shall be isolated from each other.
- C. Equipment functions and alarms, to be directly interfaced to the Plant Control and Monitoring System, shall be designed for operation with an Ethernet Connection.

2.10 BASE

- A. The engine generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.

2.11 AUXILIARY EQUIPMENT AND ACCESSORIES

- A. Coolant Heater: Engine mounted, thermostatically controlled, coolant heater(s) for each engine, with power from the Panelboard. The coolant heater shall be installed on the engine with silicone hose connections. Steel tubing shall be used for connections into the engine coolant system wherever the length of pipe run exceeds 12 inches. The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall be installed using quick disconnect couplers to isolate the heater for replacement of the heater element. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss. The coolant heater shall be provided with a thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the coolant heater system from the Panelboard. The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 100°F (40°C) in a 40°F ambient, in compliance with NFPA110 requirements.
- B. Furnish and install lube oil heaters. Power to the heater shall be from the Panelboard.

- C. Vibration Isolators: Vibration isolators, spring/pad type, and quantity as recommended by the generator set manufacturer.
- D. Starting and Control Batteries: Starting battery bank, calcium/lead antimony type, 24-volt DC, sized as recommended by the generator set manufacturer, shall be supplied for each generator set with battery cables and connectors
- E. Exhaust Silencer: Exhaust muffler(s) shall be provided for each engine, size and type as recommended by the generator set manufacturer. The mufflers shall be critical grade. Exhaust system shall be installed according to the generator set manufacturers recommendations and applicable codes and standards. The portion of exhaust pipe and silencers shall be fully insulated with lagging to protect the insulation layer for all portions of the exhaust system which is within the sound enclosure. Fasteners used to secure the lagging shall be 316 stainless steel.

2.12 BATTERY CHARGER

- A. UL listed/CSA certified ten ampere voltage regulated battery charger shall be provided in the engine generator set enclosure. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 volts AC from the Panelboard, 30 volts DC for remote indication of:
 - 1. Loss of AC power red light
 - 2. Low battery voltage red light
 - 3. High battery voltage red light
 - 4. Analog DC voltmeter and ammeter, 12-hour equalize charge timer, AC and DC fuses shall also be provided on the charger.

2.13 OUTDOOR WEATHER-PROTECTIVE HOUSING

- A. Generator set housing shall be provided factory assembled to generator set base and radiator cowling, and shall be of the sound-attenuated type. Housing shall provide ample airflow for generator set operation at rated load in the ambient conditions previously specified. The housing shall have hinged side access doors and rear control door. All doors shall be lockable. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color using a two-step electro-coating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating, which meets the following requirements:
 - 1. Primer thickness: 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.
 - 2. Gloss, per ASTM D523-89, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.

3. Crosshatch adhesion, per ASTM D3359-93, 4B-5B.
4. Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.
5. Salt Spray: per ASTM B117-90, 1000+ hours.
6. Humidity: per ASTM D2247-92, 1000+ hours.
7. Water Soak: per ASTM D2247-92, 1000+ hours.
8. Painting of hoses, hose clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.

B. Sound Attenuation

1. Housing shall be sound attenuating type, producing a noise level not greater than 75 dBa at 7 meters.

2.14 FUEL STORAGE TANK

- A. Provide a dual-wall sub base fuel storage tank. The tank shall be sized to provide 24 hours usable capacity at 100% load. The tank shall be constructed of corrosion resistant steel and shall be double wall concrete lined UL 2085 listed. The equipment, as installed, shall meet all local and regional requirements for above ground tanks. Provide the fuel tank with a continuous level transmitter, and a leak detector. The fuel tank shall be constructed to place the fill spout on the generator end so to facilitate access from the generator enclosure entry door on the side of the generator closest to the access road as shown on the Drawings.

2.15 VIBRATION ISOLATOR

- A. Furnish and install spring type vibration-isolators between the sub-base tank and the generator set. A minimum of six isolators shall be used, properly sized for the generator set supplied.

2.16 SERVICE AND FEEDER LUGS AND CONNECTORS

- A. All service and feeder lugs and connectors shall be copper and shall be crimped type, with standard industry tooling. Lugs and connectors shall match the wire size where used, and shall be clearly identified and color coded on the connector. All connections shall be made for stranded wire and shall be made electrically and mechanically secured. The lugs and connectors shall have a current carrying capacity equal to the conductors for which they are rated and meet UL 486 requirements for 75°C. Lugs larger than #8 AWG shall be two-hole long barrel lugs with NEMA spacing. The lugs shall be of closed end construction to exclude moisture migration into the cable conductor.

2.17 CIRCUIT BREAKERS

- A. Furnish and install a generator mounted molded case circuit breaker of the rating and size as indicated on the drawing. The circuit breaker shall meet the specification in Section 16475 Low Voltage Enclosed Circuit Breakers and Disconnect Switches. The Circuit breaker shall be one of the listed manufacturers, and shall not be a special breaker which is not commonly available from stock.
- B. The circuit breakers interrupting rating shall not be less than the maximum asymmetrical short circuit output of the generator.

2.18 SPARE PARTS

- A. Provide the following spare parts in the quantities specified:
 - 1. Two air cleaner elements of each type.
 - 2. Two Fuses of each type.
 - 3. One Radiator hoses of each type.
 - 4. Two Fuel filters of each type.
 - 5. Two Oil filters of each type.
 - 6. One Belt of each type.

2.19 FACTORY TESTING

- A. The standby generator shall be completely assembled, wired, and adjusted at the factory and shall be given the manufacturer's routine shop tests and any other additional operational test to insure the workability and reliable operation of the equipment.
- B. Factory test equipment and test methods shall conform with the latest applicable requirements of ANSI, IEEE, UL, and NEMA standards.

PART 3 - EXECUTION

3.01 MANUFACTURER'S REPRESENTATIVE

- A. Provide the services of a qualified factory-trained manufacturer's field engineer to assist the Contractor in installation and start-up of each type of the equipment specified below for a period of not less than two working days, with not less than one working day per standby generator. The manufacturer's field engineer shall provide technical direction and assistance to the Contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.

3.02 EXAMINATION

- A. Examine installation area to assure there is enough clearance to install the equipment.

- B. Concrete pads shall be installed as shown on the Structural Drawings.
- C. Check concrete pads and baseplates for uniformity and level surface.
- D. Verify that the equipment is ready to install.
- E. Verify field measurements are in conformance with the manufacturer's recommendations.

3.03 INSTALLATION

- A. The Contractor shall install all equipment per the manufacturer's recommendations and Contract Drawings.
- B. Install the generator set with sub – base fuel tank on the concrete pad as shown on the drawings. Install the vibro-isolators between the sub – base fuel tank and the generator set. Installation shall be in accordance with the manufacturer's recommendations.
- C. Install required safety labels.

3.04 FIELD QUALITY CONTROL

- A. Inspect installed equipment for anchoring, alignment, grounding and physical damage.
- B. Check tightness of all accessible electrical connections. Minimum acceptable values are specified in manufacturer's instructions.

3.05 FIELD ADJUSTING

- A. Adjust all circuit breakers, switches, access doors, operating handles for free mechanical and electrical operation as described in manufacturer's instructions.

3.06 EQUIPMENT START-UP

- A. Operate unit to demonstrate ability to operate continuously without vibration, jamming, leakage or overheating and to perform specified functions, after installation and after manufacturer's Engineer's check of installed equipment.
- B. Comply with manufacturer's operating and maintenance instructions during start up and operation.
- C. Promptly correct improper installation of equipment.
- D. Cooperate with supplier of equipment at time of start up and in making of all final adjustments necessary to place equipment in satisfactory working order. Startup shall not commence without the presence of the manufacturer's Engineer.

3.07 FIELD TEST

- A. Upon completion of the installation and as soon as conditions permit, the emergency power supply system including the engine driven generator, electrical circuits, controls, transfer switch and other devices shall be tested in the presence of the Owner/Engineer by the Contractor and the service representative for the manufacturer of the engine driven generator unit to assure that the system functions as specified. The test shall be conducted in accordance with the Owner's process needs at a time of day or day of the week as directed by the Owner in order to manually load the generator with actual plant loads. The time may be any time of the day or night and the day of the week may be any day as selected by the Owner. No increase in Contract Price will be accepted for after-hours testing.
- B. Prior to scheduling the test, notify the Owner/Engineer in writing that all requirements and provisions of the Contract Documents have been fulfilled, that all apparatus shall be clean, properly adjusted and ready for operation and that the Instruction Manuals, parts lists and record drawings have been submitted.
- C. The manufacturers' Engineer shall make such changes in wiring or connections and such adjustments, repairs or replacements necessary to make the circuit, device or control system function as specified and otherwise comply with the Contract Documents.
- D. As part of the field test, the automatic shutdown devices shall be tested and the respective values recorded at which the devices will stop the engine. Any adjustments required shall be made in the devices to make the operating values correspond to those recommended by the engine manufacturer and as recorded during the stop test.
- E. After a two-hour test has been completed, additional testing shall be performed to demonstrate the emergency power supply system's ability to meet the automatic starting, load transfer and motor starting requirements.
- F. If the emergency power supply system fails to fulfill the performance requirements of this specification, corrective action shall be taken and the system retested to assure full compliance. All expenses associated with the field tests, including any corrective action, shall be borne to the Contractor.
- G. The Contractor shall provide all fuel and all engine fluids to perform all required testing. All fluid levels and fuel shall be filled to full following testing, and shall be turned over to the Owner filled when the project has been completed and the unit is turned over to the Owner for their use. If the Owner experiences an emergency condition and causes the engine generator to run prior to final competition, then the fuel and engine fluids used will be the responsibility of the Owner to replenish.
- H. The field testing shall include a demonstration of the generator tripping due to an engine or generator fault condition initiated by the package engine- generator controls and shall include a trip of the generator differential relay if present.

3.08 CLEANING

- A. Remove all rubbish and debris from inside and around the motor controllers. Remove dirt, dust, or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint free rags. Do not use compressed air.

3.09 EQUIPMENT PROTECTION AND RESTORATION

- A. Touch-up and restore damaged surfaces to factory finish, as approved by the manufacturer. If the damaged surface cannot be returned to factory specification, the surface shall be replaced.

3.10 MANUFACTURER'S CERTIFICATION

- A. A qualified factory-trained manufacturer's representative shall personally inspect the equipment at the jobsite and shall certify in writing that the equipment has been installed, adjusted, and tested, in accordance with the manufacturer's recommendations, including all settings designated in the Power System Study.
- B. The Contractor shall provide three copies of the manufacturer's representative's certification.

3.11 TRAINING

- A. Provide manufacturer's services for training of plant personnel in operation and maintenance of the Standby Generator Sets furnished under this Section.
- B. The training for each type of equipment shall be for a period of not less than one eight-hour day.
- C. The cost of training program to be conducted with Owner's personnel shall be included in the Contract Price. The training and instruction, insofar as practicable, shall be directly related to the system being supplied.
- D. Provide detailed O&M manuals to supplement the training course. The manuals shall include specific details of equipment supplied and operations specific to the project.
- E. The training session shall be conducted by a manufacturer's qualified representative. Training program shall include instructions on the assembly, circuit breaker, engine, alternator, protective devices, metering, and other major components.
- F. The Owner reserves the right to videotape the training session for the Owner's use.

END OF SECTION



SECTION 16335

MEDIUM VOLTAGE PAD-MOUNTED CABLE SWITCHING AND TERMINATING STATIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install assemblies of medium voltage pad-mounted cable switching and terminating stations, together with appurtenances, complete and operable, as specified herein and as shown on the Contract Drawings.

1.02 RELATED WORK

- A. No references are made to any other section which may contain work related to any other section. The Contract Documents shall be taken as a whole with every section related to every other section as required to meet the requirements specified. The organization of the Contract Documents into specification divisions and sections is for organization of the documents themselves and does not relate to the division of suppliers or labor which the Contractor may choose to employ in the execution of the Contract. Where references are made to other Sections and other Divisions of the Specifications, the Contractor shall provide such information or additional work as may be required in those references, and include such information or work as may be specified.

B. Other Divisions

- 1. The Contractor shall be responsible for examining all Sections of the Specifications and Drawings, and shall determine the power and wiring requirements and shall provide external wiring and raceways, as required to provide a fully functioning power, control and process control systems. If the equipment requires more conductors and/or wiring, due to different equipment being supplied, the Contractor shall furnish the additional conductors, raceways and/or wiring, with no change in the Contract Price, and with no increase in Contract TimeSection 160010 Electrical – General Provisions

1.03 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of Division 1, Section 160010 and as specified herein.
- B. Submittals for equipment and materials, furnished under this Section of the Specifications, will not be accepted prior to approval of the Power System Study specified under Section 16105 Submittals made prior to such approval will be returned unreviewed.
- C. Submittals shall also contain information on related equipment to be furnished under this Specification but described in the related Sections listed in the Related

Work paragraph above. Incomplete submittals not containing the required information on the related equipment will also be returned unreviewed.

- D. The original equipment manufacturer shall create all equipment shop drawings, including all wiring diagrams, in the manufacturer's Engineering department. All equipment shop drawings shall bear the original equipment manufacturer's logo, drawing file numbers, and shall be maintained on file in the original equipment manufacturer's archive file system. Photocopies of the Engineer's ladder schematics are unacceptable as shop drawings.
- E. Submit to the Owner/Engineer, shop drawings and product data, for the following:
 - 1. Provide plan and elevation drawings of each enclosure, with dimensions, exterior and interior views, showing component layouts, terminal blocks, etc.
 - 2. Schematic diagram
 - 3. Nameplate schedule
 - 4. UL Listing of the completed assembly.
 - 5. Component list with detailed component information, including original manufacturer's part number.
 - 6. Conduit entry/exit locations
 - 7. Assembly ratings including:
 - a. Short-circuit rating
 - b. Voltage
 - c. Continuous current
 - 8. Major component ratings including:
 - a. Voltage
 - b. Continuous current
 - c. Interrupting ratings
 - 9. Number and size of cables per phase, neutral if present, ground and all cable terminal sizes.
 - 10. Instruction and renewal parts books.
- F. Factory Tests. Submittals shall be made for factory tests specified herein.
- G. Field Test Reports. Submittals shall be made for field tests specified herein.
- H. Operation and Maintenance Manuals.

1. Operation and maintenance manuals shall include the following information:
 - a. Manufacturer's contact address and telephone number for parts and service.
 - b. Instruction books and/or leaflets
 - c. Recommended renewal parts list
 - d. Record Documents for the information required by the Submittals paragraph above.

1.04 REFERENCE CODES AND STANDARDS

- A. The equipment in this specification shall be designed and manufactured according to latest revision of the following standards (unless otherwise noted):
 1. ANSI/IEEE C57.12.28, Pad-Mounted Equipment - Enclosure Integrity
 2. NFPA 70E – Standard for Electrical Safety in the Workplace

1.05 QUALITY ASSURANCE

- A. The manufacturer of this equipment shall have produced similar equipment for a minimum period of ten years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- B. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly. All assemblies shall be of the same manufacturer. Equipment that is manufactured by a third party and "brand labeled" shall not be acceptable.
- C. All components and material shall be new and of the latest field proven design and in current production. Obsolete components or components scheduled for immediate discontinuation shall not be used.
- D. Equipment submitted shall fit within the space shown on the Drawings. Equipment which does not fit within the space is not acceptable.
- E. For the equipment specified herein, the manufacturer shall be ISO 9001 2000 certified.
- F. Equipment submitted shall fit within the space shown on the Drawings. Equipment which does not fit within the space is not acceptable.

1.06 JOBSITE DELIVERY, STORAGE AND HANDLING

- A. Prior to jobsite delivery, the Contractor shall have successfully completed all submittal requirements, and present to the Owner/Engineer upon delivery of the equipment, an approved copy of all such submittals. Delivery of incomplete

constructed equipment, or equipment which failed any factory tests, will not be permitted.

- B. Equipment shall be handled and stored in accordance with manufacturer's instructions. Two copies of these instructions shall be included with the equipment at time of shipment, and shall be made available to the Contractor and Owner.
- C. Shipping groups shall be designed to be shipped by truck, rail, or ship. Indoor groups shall be bolted to skids. Each switching or terminating station shall be bolted to a solid top wood pallet to prevent the forks of a forklift truck from entering the open bottom of the equipment to prevent hidden damage. The equipment shall be wrapped to prevent finish damage.
- D. Equipment shall be installed in its permanent finished location shown on the Drawings within 30 calendar days of arriving onsite. If the equipment cannot be installed within 30 calendar days, the equipment shall not be delivered to the site, but stored offsite, at the Contractor's expense, until such time that the site is ready for permanent installation of the equipment.

1.07 WARRANTY

- A. The Manufacturer shall warrant the equipment to be free from defects in material and workmanship for two years from date of final acceptance of the equipment. Within such period of warranty the Manufacturer shall promptly furnish all material and labor necessary to return the equipment to new operating condition. Any warranty work requiring shipping or transporting of the equipment shall be performed by the Manufacturer, at no expense to the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
 - 1. Elliott Industries
 - 2. G & W Electric
 - 3. Cooper Industries
 - 4. S & C Electric
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

2.02 RATINGS

A. The equipment described in this specification shall be designed for operation on the voltage systems as shown on the Drawings. Each circuit component shall have the following ratings:

1. Maximum Voltage 15KV
2. BIL Rated 95kV
3. Continuous Current As shown
4. Short-Circuit Current, At Rated Maximum kV 31.5kA

2.03 CONSTRUCTION

A. General

1. The switching stations described in this specification shall contain factory assembled and operational tested equipment and accessories and be self-supporting in a manner to be installed on a level concrete pad.
2. Refer to Drawings for: actual layout and location of equipment and components; current ratings of devices, bus bars, components; protective relays, voltage ratings of devices, components and assemblies; and other required details.
3. Switching station arrangements shall be as shown on the Drawings.

4. Nameplates

a. External

- 1) Furnish nameplates for each device as indicated in drawings. All nameplates shall be laminated plastic, black lettering on a white background, attached with stainless steel screws. There shall be a master nameplate that indicates equipment ratings, manufacturer's name, shop order number and general information. Cubicle nameplates shall be mounted on the front face, on the rear panel and inside the assembly, visible when the rear panel is removed.

b. Control

- 1) Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

c. Special

- 1) Identification nameplates shall be white with black letters, caution nameplates shall be yellow with black letters, and warning nameplates shall be red with white letters.

- d. The manufacturer shall not remove, reuse, alter, or replace original equipment nameplates or equipment tags associated with equipment or components supplied by the manufacturer's suppliers and sub-suppliers.

B. Live Terminal Cable Terminating Station

1. Enclosure Construction

- a. The enclosure shall be tamper resistant, all-welded construction, utilizing 12-gauge minimum, 316 stainless steel. Corner plates and braces shall be used as necessary to assure rigidity. The enclosure top shall be cross-kinked to provide watershed and rigidity. The enclosure shall be open bottom with a minimum one-inch flange inside, all around. The door(s) shall be furnished with a stainless steel door holder that will latch the door open 100 degrees and 140 degrees and resist accidental closing. Door(s) shall be provided with provisions for padlocking and a recessed Penta or Hex head security bolt to prevent unauthorized entry, coordinated to prevent installation of the padlock until the security bolt is tightened when closing the door(s) and to prevent a wrench from operating the security bolt until the padlock is removed when opening the door(s). The security bolt shall be made captive with a stainless steel washer compressed to an obround shape to severely discourage removal. Hinges shall be stainless steel with stainless steel pins not less than 0.3125-inch diameter and shall be welded to both the enclosure and the door(s) to maintain door alignment for the life of the equipment. The enclosure shall be non-ventilated to minimize the entrance of airborne contamination, insects, rodents or reptiles. Removable lift provisions, adequate to withstand handling with normal utility equipment, shall be provided on the outside of the enclosure. Threaded openings for lift provision bolts shall be blind holes to prevent the entrance of wire or other foreign objects into the enclosure when lift provisions are removed.

2. Bus and Bus Mountings

- a. Bus shall be tin plated copper with all burrs and sharp corners removed prior to installation. It shall be punched with seven sets of two 0.5625-inch diameter holes on 1.75-inch centers to accommodate both two-hole and four-hole NEMA Standard cable terminal lugs. A minimum of two insulators shall be provided for each bus. The insulators shall be cycloaliphatic epoxy and shall be mounted in a manner which shall allow field replacement with standard tools without removal of cables which may be bolted to the bus. Insulators and bus bars shall be installed with stainless steel mounting hardware to provide long life and reduced maintenance. All components shall be arranged to allow visual inspection without de-energizing or removing the equipment from service.

3. Barriers

- a. Phase and ground barriers shall be provided to assure correct phase-to-phase and phase-to-ground clearances for proper operation at rated voltage. These barriers shall be glass reinforced polyester (NEMA GPO-3 class material) not less than 0.1875 inch thick.
- b. A removable insulating barrier with a "DANGER – HIGH VOLTAGE" warning sign, shall be located inside the door(s) as recommended in Rule 381G of ANSI Standard C2 (National Electrical Safety Code). The door safety barriers shall be constructed of 0.25-inch clear polycarbonate (Lexan or equal); and shall completely close the door opening and be provided with a non-conductive safety latch requiring a positive action to remove the barrier. Handles and other hardware extending through this door safety barrier shall be non-conductive material. Handles shall be keyed to prevent rotation for secure handling. Complete visual inspection of the internal components shall be possible without removing the door safety barrier.

4. Grounding Provisions

- a. Two high-conductivity bronze, eyebolt type, ground lugs which accept #6 thru #2/0 copper conductor shall be installed in the cable terminating compartment (located on each side of the door opening in an accessible position).

5. Accessory Equipment

- a. A nameplate shall be installed inside one enclosure door. It shall be located at the top corner farthest from the enclosure when the door is open. The nameplate shall provide Type of Equipment, Model Number, Amps Continuous, kV Maximum, BIL, Serial Number, Date Manufactured and Weight of Equipment. Four anchor bolt brackets shall be supplied with each cable terminating station to provide a means of clamping the equipment to the concrete pad. One "Caution - Keep Out - High Voltage" warning sign shall be provided on the exterior of each door.]

2.04 FACTORY TESTING

- A. The following standard factory tests shall be performed on the circuit breaker element provided under this Section. All tests shall be in accordance with the latest version of ANSI standards.
 1. One-minute dielectric test per ANSI standards.
 2. Final inspections and quality checks.
- B. Factory test equipment and test methods shall conform to the latest applicable requirements of ANSI, IEEE, UL, and NEMA standards.
- C. The manufacturer shall provide three certified copies of factory test reports as specified herein.

PART 3 - EXECUTION

3.01 MANUFACTURER'S REPRESENTATIVE

- A. Provide the services of a qualified factory-trained manufacturer's trained representative to assist the Contractor in installation and start-up of the equipment specified under this Section for a period of not less than one working day. The manufacturer's representative shall provide technical direction and assistance to the Contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.
- B. The Contractor shall provide three copies of the manufacturer's field start-up report.

3.02 INSTALLER'S QUALIFICATIONS

- A. Installer shall be specialized in installing medium voltage metal clad switchgear with minimum five years documented experience.

3.03 EXAMINATION

- A. Examine installation area to assure there is enough clearance to install the equipment.
- B. Check concrete pads for uniformity and level surface.
- C. Verify that medium voltage equipment is ready to install.
- D. Verify field measurements are as instructed by manufacturer.

3.04 INSTALLATION

- A. The Contractor shall install all equipment per the manufacturer's recommendations and Contract Drawings.
- B. Contractor shall be responsible for applying tape insulation to each cable termination.
- C. Installed required safety labels.

3.05 FIELD QUALITY CONTROL

- A. Inspect installed equipment for anchoring, alignment, grounding and physical damage.
- B. Check tightness of all accessible electrical connections. Minimum acceptable values are specified in manufacturer's instructions.

3.06 FIELD ADJUSTING

- A. Adjust all access doors, operating handles for free mechanical and electrical operation as described in manufacturer's instructions.

3.07 FIELD TESTING

- A. Megger and record phase to phase and phase to ground insulation resistance of each bus section. Megger for 1 minute for each measurement at minimum voltage of 5000 VDC. Measured Insulation resistance shall be at least 1000 megohms.
- B. Where test reports show unsatisfactory results, the Owner/Engineer may require the removal of all defective or suspected materials, equipment and/or apparatus, and their replacement with new items, all at no cost to the Owner. The Contractor shall bear all costs for any retesting.]

3.08 CLEANING

- A. Remove all rubbish and debris from inside and around the cabinet. Remove dirt, dust, or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint free rags. Do not use compressed air.

3.09 EQUIPMENT PROTECTION AND RESTORATION

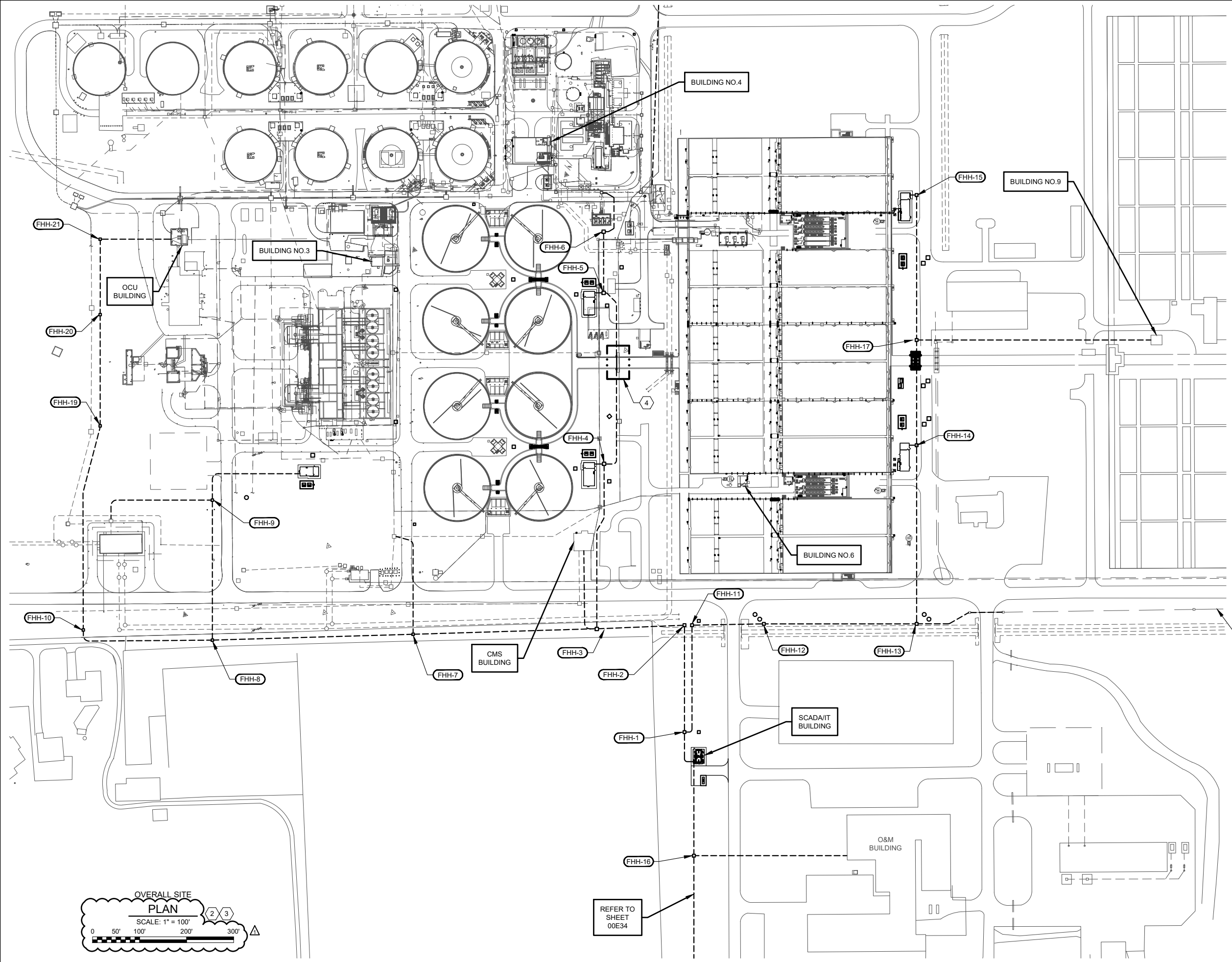
- A. Touch-up and restore damaged surfaces to factory finish, as approved by the manufacturer. If the damaged surface cannot be returned to factory specification, the surface shall be replaced.

3.10 MANUFACTURER'S CERTIFICATION

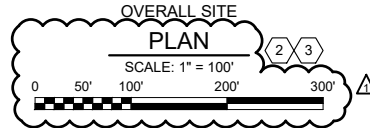
- A. A qualified factory-trained manufacturer's representative shall personally inspect the equipment at the jobsite and shall certify in writing that the equipment has been installed, adjusted, and tested, in accordance with the manufacturer's recommendations, including all settings designated in the Power System Study.
- B. The Contractor shall provide three copies of the manufacturer's representative's certification.

END OF SECTION

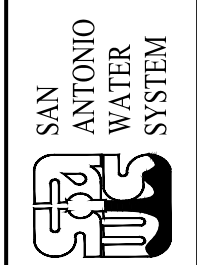
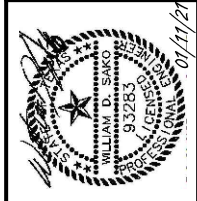
3/5/2021 5:44 PM \\DAL-GAI\WAD01\proj\files\1951_SAWS_Dos Rios WRC Electrical System Improvements - Phase II\Drawings\Des Rios Phase II\Electrical\Working\1951_00E33.dwg Emmanuel Rangeli



- GENERAL NOTES:**
1. FIELD VERIFY AND COORDINATE EXACT LOCATION OF DUCTBANKS WITH EXISTING UNDERGROUND UTILITIES. ADJUST AS REQUIRED FOR ROUTING OF THE UNDERGROUND DUCTBANK.
 2. NOT ALL UTILITIES AND UNDERGROUND DUCTBANK ARE SHOWN ON THIS DRAWING.
 3. THE CONTRACTOR SHALL UTILIZE SUE SERVICE TO DETERMINE UNDER GROUND UTILITIES.
- NOTES:**
- 1 REFER TO SHEET 00E34 FOR CONTINUATION AND NOTES FOR EXISTING DUCTBANK.
 - 2 REFER TO SHEET 00E35 FOR RISER DIAGRAM.
 - 3 REFER TO SHEET 00E36, 00E37, 00E38 FOR DUCTBANK SECTIONS.
 - 4 REFER TO SHEET 00E43 FOR DETAILS.



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| REV. NO. | DATE | DRWN | ER | ADDENDUM NO.2 | REMARKS |
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| 1 | 03/06/21 | | | | |

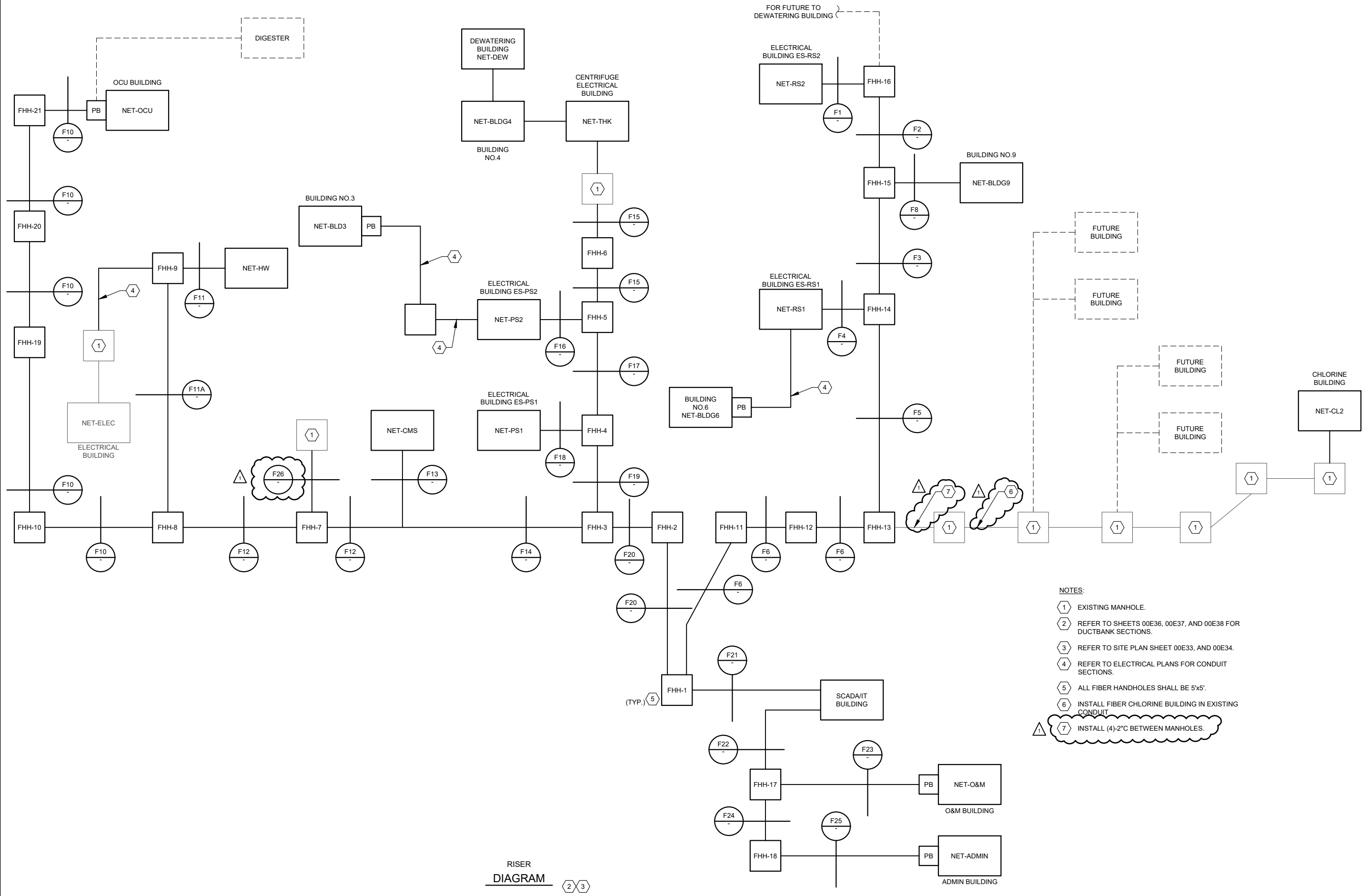
SAN ANTONIO WATER SYSTEM
STEVEN M. CLOUSE WRC
ELECTRICAL SYSTEM IMPROVEMENTS PHASE II
ELECTRICAL

OVERALL FIBER ROUTING PLAN

DESIGNED BY: W.SAKO
DRAWN BY: E.RANGEL
SHEET CHKD BY: V.K. GUPTA
APPROVED BY: W.SAKO
DATE: JANUARY 2021
SAWS JOB NO.: 16-6501
FILE NAME: 1951_00E33

SHEET NO.
00E33
57 OF 500

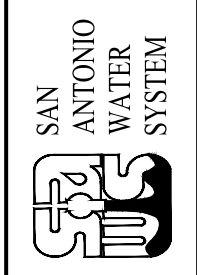
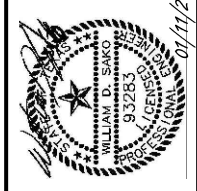
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RISER
DIAGRAM 2 3

- NOTES:**
- 1 EXISTING MANHOLE.
 - 2 REFER TO SHEETS 00E36, 00E37, AND 00E38 FOR DUCTBANK SECTIONS.
 - 3 REFER TO SITE PLAN SHEET 00E33, AND 00E34.
 - 4 REFER TO ELECTRICAL PLANS FOR CONDUIT SECTIONS.
 - 5 ALL FIBER HANDHOLES SHALL BE 5'x5'.
 - 6 INSTALL FIBER CHLORINE BUILDING IN EXISTING CONDUIT.
 - 7 INSTALL (4)-2" BETWEEN MANHOLES.

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| | | | |
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| 03/06/21 | ER | ADDENDUM NO.2 | REMARKS |
| REV. NO. | DATE | DRWN | REMARKS |

ONE INCH AT FULL SIZE IF NOT ONE INCH SCALE ACCORDINGLY

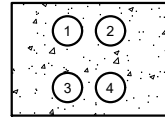
SAN ANTONIO WATER SYSTEM
STEVEN M. CLOUSE WRC
ELECTRICAL SYSTEM IMPROVEMENTS PHASE II
ELECTRICAL

**FIBER OPTIC
OVERALL RISER DIAGRAM**

DESIGNED BY: V.K. GUPTA
DRAWN BY: E. RANGEL
SHEET CHKD BY: V.K. GUPTA
APPROVED BY: W. SAKO
DATE: JANUARY 2021
SAWS JOB NO.: 16-6501
FILE NAME: 1951_00E35

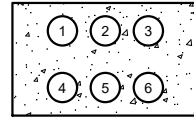
SHEET NO.
00E35
59 OF 500

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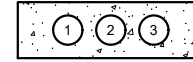
DUCTBANK
SECTION **F9**
NOT TO SCALE

| TABLE FOR SECTION F9 | | | |
|----------------------|---------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-OCU | 2" C | TO SCADA BUILDING |
| 2 | SPARE | 2" C | PULLSTRING |
| 3 | SPARE | 2" C | PULLSTRING |
| 4 | SPARE | 2" C | PULLSTRING |



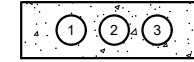
DUCTBANK
SECTION **F12**
NOT TO SCALE

| TABLE FOR SECTION F12 | | | |
|-----------------------|---------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-OCU | 2" C | TO SCADA BUILDING |
| 2 | FUTURE SPARE | 2" C | DIGESTER COMPLEX |
| 3 | FOC-SCADA-HW | 2" C | TO SCADA BUILDING |
| 4-6 | SPARE | 2" C | PULLSTRING |



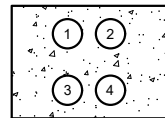
DUCTBANK
SECTION **F15**
NOT TO SCALE

| TABLE FOR SECTION F15 | | | |
|-----------------------|---------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-THK | 2" C | TO SCADA BUILDING |
| 2 | SPARE | 2" C | PULLSTRING |
| 3 | SPARE | 2" C | PULLSTRING |



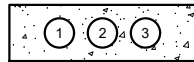
DUCTBANK
SECTION **F18**
NOT TO SCALE

| TABLE FOR SECTION F18 | | | |
|-----------------------|---------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-PSI | 2" C | TO SCADA BUILDING |
| 2 | SPARE | 2" C | PULLSTRING |
| 3 | SPARE | 2" C | PULLSTRING |



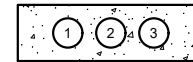
DUCTBANK
SECTION **F10**
NOT TO SCALE

| TABLE FOR SECTION F10 | | | |
|-----------------------|------------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-OCU | 2" C | TO SCADA BUILDING |
| 2 | DIGESTER COMPLEX | 2" C | FUTURE SPARE |
| 3 | SPARE | 2" C | PULLSTRING |
| 4 | SPARE | 2" C | PULLSTRING |



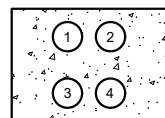
DUCTBANK
SECTION **F13**
NOT TO SCALE

| TABLE FOR SECTION F13 | | | |
|-----------------------|---------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-CMB | 2" C | TO SCADA BUILDING |
| 2 | SPARE | 2" C | PULLSTRING |
| 3 | SPARE | 2" C | PULLSTRING |



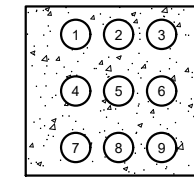
DUCTBANK
SECTION **F16**
NOT TO SCALE

| TABLE FOR SECTION F16 | | | |
|-----------------------|---------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-PS2 | 2" C | TO SCADA BUILDING |
| 2 | SPARE | 2" C | PULLSTRING |
| 3 | SPARE | 2" C | PULLSTRING |



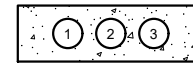
DUCTBANK
SECTION **F11**
NOT TO SCALE

| TABLE FOR SECTION F11 | | | |
|-----------------------|--------------|--------------|------------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-HW | 2" C | TO SCADA BUILDING |
| 2 | FOC-HW-MAIN | 2" C | TO ELECTRICAL BUILDING |
| 3 | SPARE | 2" C | PULLSTRING |
| 4 | SPARE | 2" C | PULLSTRING |



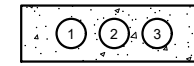
DUCTBANK
SECTION **F14**
NOT TO SCALE

| TABLE FOR SECTION F14 | | | |
|-----------------------|------------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-OCU | 2" C | TO SCADA BUILDING |
| 2 | DIGESTER COMPLEX | 2" C | FUTURE SPARE |
| 3 | FOC-SCADA-HW | 2" C | TO SCADA BUILDING |
| 4-6 | SPARE | 2" C | PULLSTRING |
| 7 | FOC-SCADA-CMB | 2" C | TO SCADA BUILDING |
| 8-9 | SPARE | 2" C | PULLSTRING |



DUCTBANK
SECTION **F17**
NOT TO SCALE

| TABLE FOR SECTION F17 | | | |
|-----------------------|---------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-PS2 | 2" C | TO SCADA BUILDING |
| 2 | FOC-SCADA-THK | 2" C | TU SCADA BUILDING |
| 3 | SPARE | 2" C | PULLSTRING |
| 4 | SPARE | 2" C | PULLSTRING |



DUCTBANK
SECTION **F11A**
NOT TO SCALE

| TABLE FOR SECTION F11A | | | |
|------------------------|--------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-HW | 2" C | TO SCADA BUILDING |
| 2 | SPARE | 2" C | PULLSTRING |
| 3 | SPARE | 2" C | PULLSTRING |

NOTES:

- ① REFER TO SHEET 00E33 FOR SITE PLAN.
- ② REFER TO SHEET 00E35 FOR FIBER RISER DIAGRAM AND CONDUIT SECTION NUMBER.

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SAN ANTONIO WATER SYSTEM

| REV. NO. | DATE | DRWN | ER | ADDITIONAL NO.2 | REMARKS |
|----------|----------|------|----|-----------------|---------|
| A | 03/06/21 | | | | |

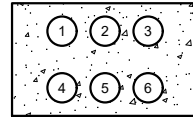
SAN ANTONIO WATER SYSTEM
STEVEN M. CLOUSE WRC
ELECTRICAL SYSTEM IMPROVEMENTS PHASE II
ELECTRICAL

**FIBER OPTIC
FIBER DUCTBANK SECTION - II**

DESIGNED BY: T.HERNANDEZ
DRAWN BY: S.HERNANDEZ
SHEET CHKD BY: V.K. GUPTA
APPROVED BY: W.SAKO
DATE: JANUARY 2021
SAWS JOB NO.: 16-6501
FILE NAME: 1951_00E37

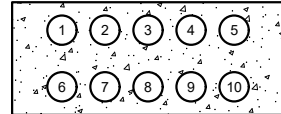
SHEET NO.
00E37
61 OF 500

3/5/2021 5:44 PM \\DAL-GAI-WAD01\proj-files\1951_SAWS_Dos Rios WRC Electrical System Improvements - Phase II\Drawings\Des Rios Phase II\Electrical\Working\1951_00E38.dwg Emmanuel Rangel



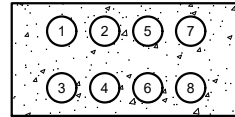
DUCTBANK
SECTION **F19**
NOT TO SCALE

| TABLE FOR SECTION 19 | | | |
|----------------------|---------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-PS1 | 2"C | TO SCADA BUILDING |
| 2 | FOC-SCADA-PS2 | 2"C | TO SCADA BUILDING |
| 3 | FOC-SCADA-THK | 2"C | TO SCADA BUILDING |
| 4 | SPARE | 2"C | PULLSTRING |
| 5 | SPARE | 2"C | PULLSTRING |
| 6 | SPARE | 2"C | PULLSTRING |



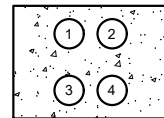
DUCTBANK
SECTION **F20**
NOT TO SCALE

| TABLE FOR SECTION F20 | | | |
|-----------------------|---------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-PS1 | 2"C | TO SCADA BUILDING |
| 2 | FOC-SCADA-PS2 | 2"C | TO SCADA BUILDING |
| 3 | FOC-SCADA-THK | 2"C | TO SCADA BUILDING |
| 4 | FOC-SCADA-CMB | 2"C | TO SCADA BUILDING |
| 5 | FOC-SCADA-HW | 2"C | TO SCADA BUILDING |
| 6 | FOC-SCADA-OCM | 2"C | TO SCADA BUILDING |
| 7 | SPARE FUTURE | 2"C | DIGESTER COMPLEX |
| 8 | SPARE | 2"C | PULLSTRING |
| 9 | SPARE | 2"C | PULLSTRING |
| 10 | SPARE | 2"C | PULLSTRING |



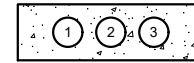
DUCTBANK
SECTION **F21**
NOT TO SCALE

| TABLE FOR SECTION 21 | | | |
|----------------------|---|--------------|---|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-RS1, FOC-SCADA-RS2, FOC-SCADA-CHL2, FOC-SCADA-HW, FOC-SCADA-OCU | 4"C | FIBER FROM FIRST STAGE AERATION 122 HEADWORK OCU BUILDING |
| 2 | DEWATERING BUILDING COMPRESSOR BUILDING DIGESTER BUILDING | 4"C | CONDUIT FOR FUTURE FIBER |
| 3 | SECOND STAGE AERATION BASIN, SECOND STAGE AERATION BASIN FILTER BUILDING | 4"C | CONDUIT FOR FUTURE FIBER |
| 4 | FOC-SCADA-PS1, FOC-SCADA-PS2, FOC-SCADA-THK, FOC-SCADA-CMB | 4"C | FIBER FROM PRIMARY CLARIFIER 122 -THICKENER -CMB BUILDING |
| 5 | SPARE | 4"C | PULLSTRING |
| 6 | SPARE | 4"C | PULLSTRING |
| 7 | SPARE | 4"C | PULLSTRING |
| 8 | SPARE | 4"C | PULLSTRING |



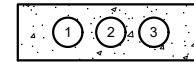
DUCTBANK
SECTION **F22**
NOT TO SCALE

| TABLE FOR SECTION F22 | | | |
|-----------------------|-----------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-O&M | 2"C | TO SCADA BUILDING |
| 2 | FOC-SCADA-ADMIN | 2"C | TO SCADA BUILDING |
| 3 | SPARE | 2"C | PULLSTRING |
| 4 | SPARE | 2"C | PULLSTRING |



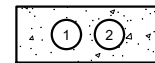
DUCTBANK
SECTION **F23**
NOT TO SCALE

| TABLE FOR SECTION F23 | | | |
|-----------------------|---------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-O&M | 2"C | TO SCADA BUILDING |
| 2 | SPARE | 2"C | PULLSTRING |
| 3 | SPARE | 2"C | PULLSTRING |



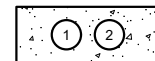
DUCTBANK
SECTION **F24**
NOT TO SCALE

| TABLE FOR SECTION F23 | | | |
|-----------------------|-----------------|--------------|-------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-ADMIN | 2"C | TO SCADA BUILDING |
| 2 | SPARE | 2"C | PULLSTRING |
| 3 | SPARE | 2"C | PULLSTRING |



DUCTBANK
SECTION **F25**
NOT TO SCALE

| TABLE FOR SECTION F25 | | | |
|-----------------------|-----------------|--------------|----------------------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | FOC-SCADA-ADMIN | 2"C | TO SCADA BUILDING |
| 2 | SPARE | 2"C | FHH14 TO NETWORK ENCLOSURE |



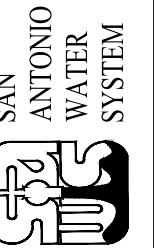
DUCTBANK
SECTION **F26**
NOT TO SCALE

| TABLE FOR SECTION F26 | | | |
|-----------------------|-------------|--------------|-------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | SPARE | 2"C | PULLSTRING |
| 2 | SPARE | 2"C | PULLSTRING |

NOTES:

- 1 REFER TO SHEET 00E33 FOR SITE PLAN.
- 2 REFER TO SHEET 00E35 FOR FIBER RISER DIAGRAM AND CONDUIT SECTION NUMBERS.

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Email: gaito@gaingroup.com



| REV. NO. | DATE | DRWN | ER | APP'D | REMARKS |
|----------|----------|------|----|-------|----------------|
| 1 | 03/06/21 | | | | ADDED DIM NO.2 |

ONE INCH AT FULL SIZE IF NOT ONE INCH SCALE ACCORDINGLY

SAN ANTONIO WATER SYSTEM
STEVEN M. CLOUSE WRC
ELECTRICAL SYSTEM IMPROVEMENTS PHASE II
ELECTRICAL

**FIBER OPTIC
FIBER DUCTBANK SECTION - III**

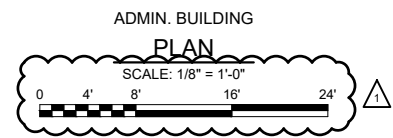
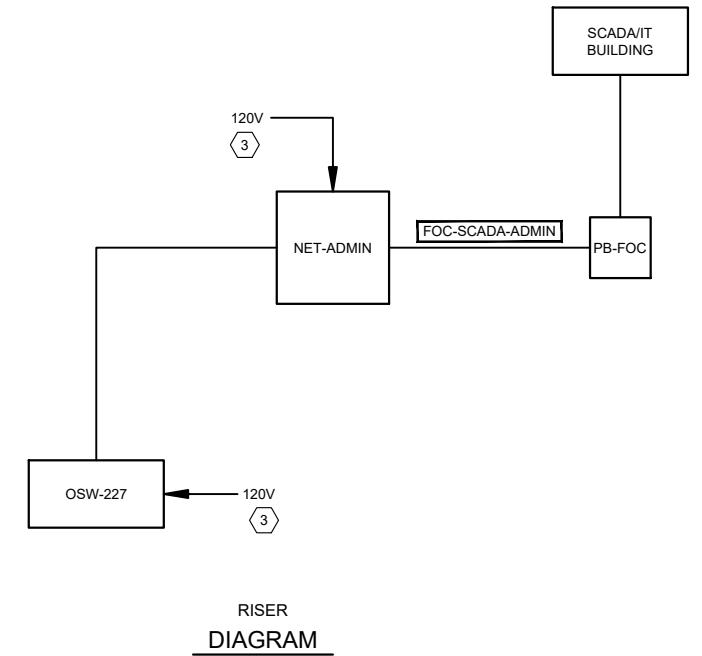
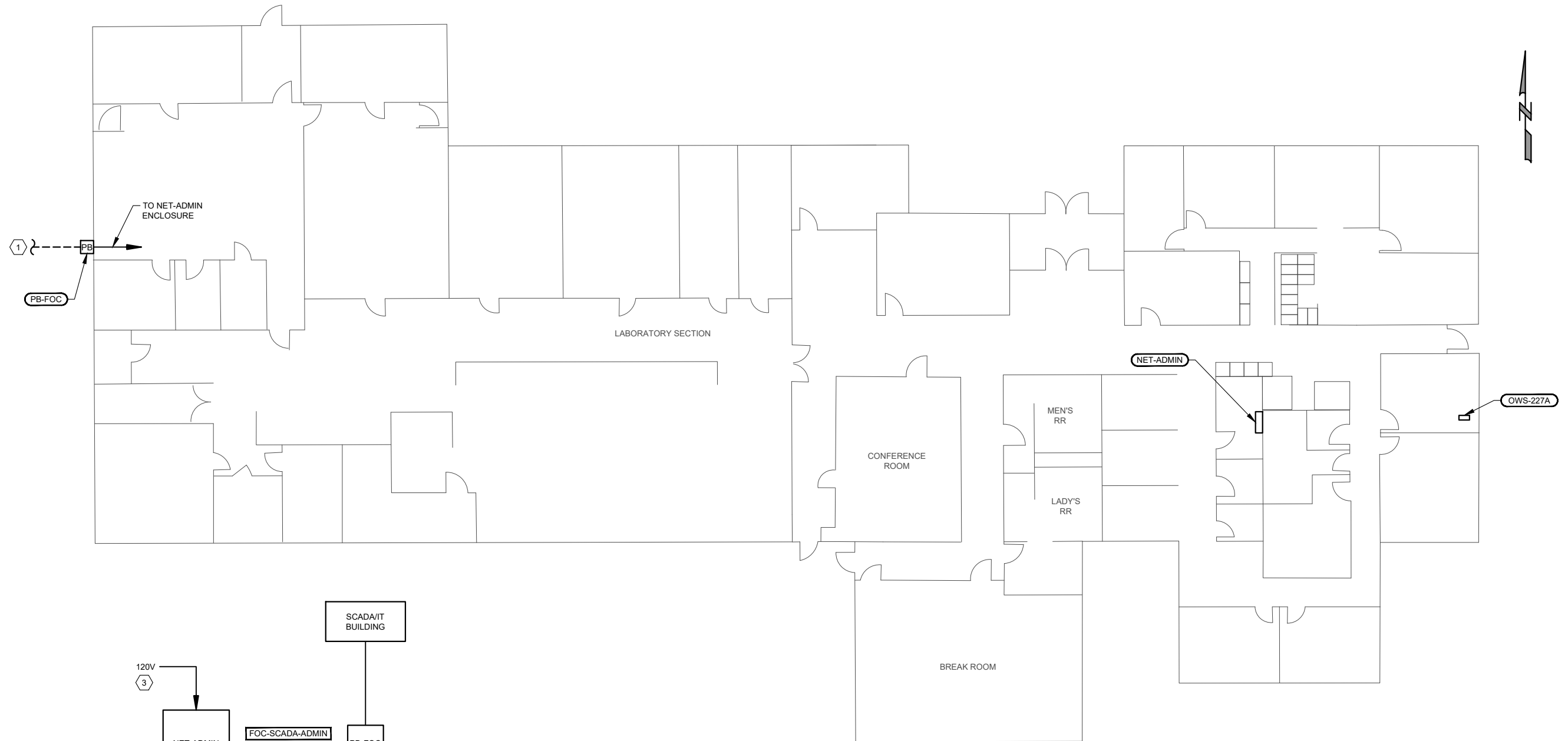
DESIGNED BY: T.HERNANDEZ
DRAWN BY: S.HERNANDEZ
SHEET CHKD BY: V.K. GUPTA
APPROVED BY: W.SAKO
DATE: JANUARY 2021
SAWS JOB NO.: 16-6501
FILE NAME: 1951_00E38

SHEET NO.
00E38
62 OF 500

3/5/2021 5:45 PM \\DAL-GAI\WAD01\proj\files\1951_SAWS_Dos Rios WRC Electrical System Improvements - Phase II\Drawings\Dos Rios Phase II\Electrical\Working\1951_00E42.dwg Emmanuel Rangal

NOTES:

- 1 REFER TO SHEET 00E34 FOR CONDUIT ROUTING.
- 2 LOCATION OF THE NETWORK ENCLOSURE SHALL BE ADJUSTED IN THE FIELD, BASED ON SPACE AVAILABLE.
- 3 PROVIDE 120V POWER FROM EXISTING 120V SOURCE IN THE AREA. INSTALL 3#12, 3/4" C.
- 4 ALL WORK SHALL BE COORDINATED WITH THE OWNER.



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SAN ANTONIO WATER SYSTEM

| REV. NO. | DATE | DRWN | ER | ADDENDUM NO.2 | REMARKS |
|----------|----------|------|----|---------------|---------|
| A | 03/06/21 | | | | |

ONE INCH AT FULL SIZE IF NOT ONE INCH SCALE ACCORDINGLY

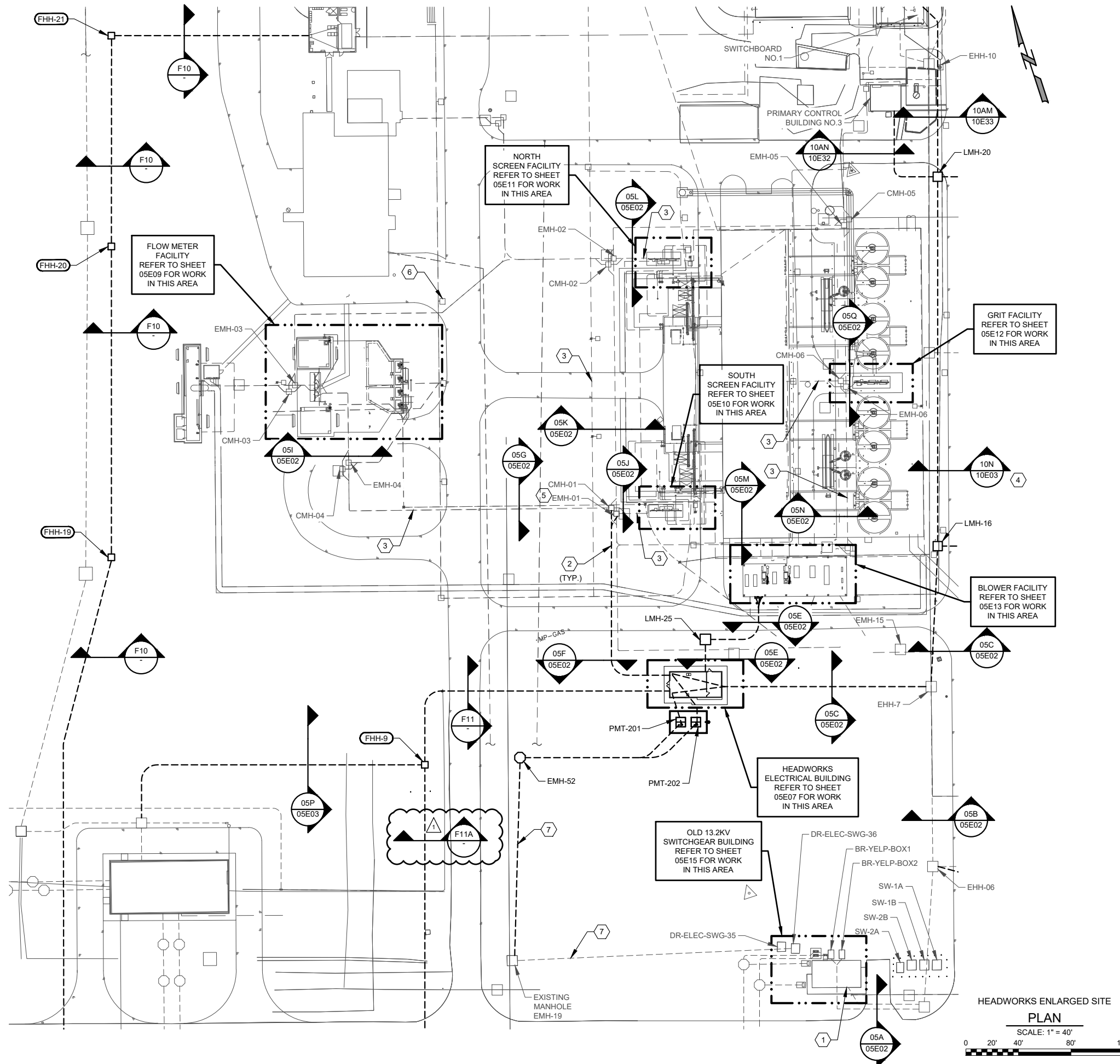
SAN ANTONIO WATER SYSTEM
STEVEN M. CLOUSE WRC
ELECTRICAL SYSTEM IMPROVEMENTS PHASE II
ELECTRICAL

**ADMINISTRATION BUILDING
ELECTRICAL PLAN**

DESIGNED BY: V.K. GUPTA
DRAWN BY: E. RANGEL
SHEET CHKD BY: V.K. GUPTA
APPROVED BY: W.SAKO
DATE: JANUARY 2021
SAWS JOB NO.: 16-6501
FILE NAME: 1951_00E42

SHEET NO.
00E42
66 OF 500

3/5/2021 5:45 PM \\DAL-GAI\WAD01\proj\files\1951_SAWS_Dos Rios WRC Electrical System Improvements - Phase II\Drawings\Des Rios Phase II\Electrical\Working\1951_05E01.dwg Emmanuel Rangel



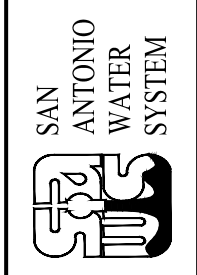
GENERAL NOTES:

1. FIELD VERIFY AND COORDINATE EXACT LOCATION OF DUCTBANKS WITH ALL EXISTING UNDERGROUND UTILITIES. ADJUST AS REQUIRED.

NOTES:

- 1 EXISTING POWER PANEL HV-SWGR.
- 2 RUN NEW DUCTBANK PARALLEL TO EXISTING DUCTBANK.
- 3 ROUTE WIRE FROM EXISTING MANHOLE TO THE EXISTING EQUIPMENT USING EXISTING DUCTBANKS.
- 4 REFER TO THE 10 SERIES FOR DUCTBANK INFORMATION AND ROUTING.
- 5 PROVIDE A MINIMUM OF SIX REBAR DOWELS DRILLED INTO EXISTING MANHOLE AND CONNECT TO REBAR IN NEW DUCTBANK.
- 6 VERIFY ROUTING AND LOCATION OF DUCTBANKS ASSOCIATED WITH THE LIGHT POLES. REFER FROM NEW LIGHTING PANEL. REFER TO SHEET 05E04 FOR PANEL INFORMATION.
- 7 REFER TO SHEET 00E12 FOR DETAILS.

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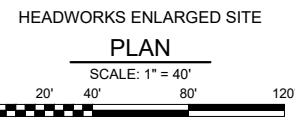
| REV. NO. | DATE | DRWN | ER | ADDITIONAL NO.2 | REMARKS |
|----------|----------|------|----|-----------------|---------|
| 1 | 03/08/21 | | | | |

ONE INCH AT FULL SIZE IF NOT ONE INCH SCALE ACCORDINGLY

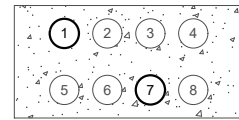
SAN ANTONIO WATER SYSTEM
STEVEN M. CLOUSE WRC
ELECTRICAL SYSTEM IMPROVEMENTS PHASE II
ELECTRICAL
HEADWORKS
SITE PLAN - MODIFICATION

DESIGNED BY: T. HERNANDEZ
DRAWN BY: E. RANGEL
SHEET CHKD BY: V.K. GUPTA
APPROVED BY: W. SAKO
DATE: JANUARY 2021
SAWS JOB NO.: 16-6501
FILE NAME: 1951_05E01

SHEET NO.
05E01
95 OF 500

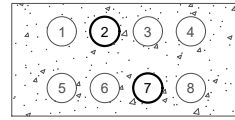


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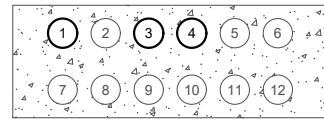
DUCTBANK
SECTION **05K**
05E10

| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
|-------------|----------------|--------------|-------------------------------|
| 1 | MCSG2-6P | 3"C | POWER TO DP-102 |
| 2 | SPARE | 3"C | - |
| 3 | SPARE | 3"C | - |
| 4 | SPARE | 2"C | - |
| 5 | LCP-101C | 2"C | EXISTING POWER |
| 6 | MCC-SG-1-FBO1C | 2"C | EXISTING POWER |
| 7 | FOC-HW-BS1&2 | 2"C | FIBER FROM LCP-101 TO EB-HW-1 |
| 8 | SPARE | 2"C | - |



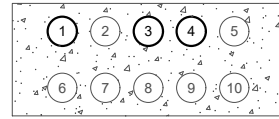
DUCTBANK
SECTION **05L**
05E11

| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
|-------------|--------------|--------------|-------------------------------|
| 1 | SPARE | 3"C | - |
| 2 | MCSG2-6P | 3"C | POWER TO DP-102 |
| 3 | SPARE | 3"C | - |
| 4 | SPARE | 2"C | - |
| 5 | LCP-103C | 2"C | EXISTING POWER |
| 6 | SPARE | 2"C | - |
| 7 | FOC-HW-BS1&2 | 2"C | FIBER FROM LCP-101 TO EB-HW-1 |
| 8 | SPARE | 2"C | - |



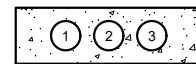
DUCTBANK
SECTION **05M**
05E01

| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
|-------------|----------------|--------------|-------------------------------|
| 1 | MCSG1-5P | 3"C | POWER TO DP-201 |
| 2 | MCC-SG-2-01P | 3"C | - |
| 3 | MCSG2-5P | 3"C | POWER TO DP-202 |
| 4 | FOC-HW-GRIT | 2"C | FIBER FROM PLC-200 TO EB-HW-1 |
| 5 | SPARE | 2"C | - |
| 6 | SPARE | 2"C | - |
| 7 | MCC-SG-1-FB02C | 2"C | EXISTING FIBER |
| 8 | SPARE | 2"C | - |
| 9 | SPARE | 2"C | - |
| 10 | SPARE | 2"C | - |
| 11 | SPARE | 2"C | - |
| 12 | SPARE | 2"C | - |



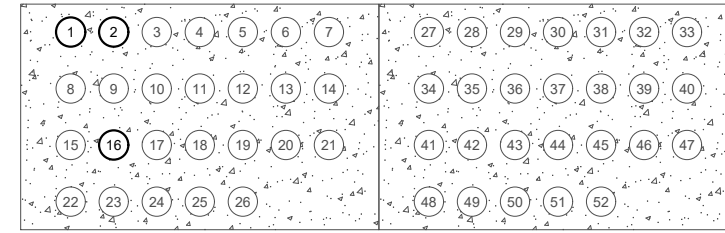
DUCTBANK
SECTION **05N**
05E01

| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
|-------------|----------------|--------------|-------------------------------|
| 1 | MCSG1-5P | 3"C | POWER TO DP-201 |
| 2 | - | 3"C | - |
| 3 | MCSG2-5P | 3"C | POWER TO DP-202 |
| 4 | FOC-HW-GRIT | 3"C | FIBER FROM PLC-200 TO EB-HW-1 |
| 5 | SPARE | 3"C | - |
| 6 | SPARE | 2"C | - |
| 7 | MCC-SG-1-FB02C | 2"C | EXISTING FIBER |
| 8 | SPARE | 2"C | - |
| 9 | SPARE | 2"C | - |
| 10 | SPARE | 2"C | - |



DUCTBANK
SECTION **05P**
E05-03

| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
|-------------|-------------|--------------|--|
| 1 | SPARE | 2"C | - |
| 2 | FOC-HW-MAIN | 2"C | FIBER OPTIC FROM EB-HW-1 TO MAIN SWITCHGEAR BUILDING |
| 3 | SPARE | 2"C | - |



DUCTBANK
SECTION **05O**
05E12

| TABLE FOR SECTION 05O | | | | TABLE FOR SECTION 05O | | | |
|-----------------------|-------------|--------------|-------------------------------|-----------------------|-------------|--------------|----------------|
| CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION | CONDUIT NO. | CONDUIT TAG | CONDUIT SIZE | DESCRIPTION |
| 1 | MCSG1-5P | 3-1/2"C | POWER TO DP-201 | 26 | LCP202-04P | 1-1/2"C | EXISTING POWER |
| 2 | MCSG2-5P | 3"C | POWER TO DP-202 | 27 | LCP203-06P | 1-1/2"C | EXISTING POWER |
| 3 | LCP202-01P | 1-1/2"C | EXISTING POWER | 28 | LCP203-05P | 1-1/2"C | EXISTING POWER |
| 4 | LCP202-02P | 1-1/2"C | EXISTING POWER | 29 | LCP204-05P | 1-1/2"C | EXISTING POWER |
| 5 | LCP202-03P | 1-1/2"C | EXISTING POWER | 30 | LCP204-06P | 1-1/2"C | EXISTING POWER |
| 6 | LCP202-04P | 1-1/2"C | EXISTING POWER | 31 | LCP204-01P | 1-1/2"C | EXISTING POWER |
| 7 | LCP202-06P | 1-1/2"C | EXISTING POWER | 32 | LCP204-02P | 1-1/2"C | EXISTING POWER |
| 8 | LCP202-05P | 1-1/2"C | EXISTING POWER | 33 | LCP204-03P | 1-1/2"C | EXISTING POWER |
| 9 | LCP201-05P | 1-1/2"C | EXISTING POWER | 34 | LCP204-04P | 1-1/2"C | EXISTING POWER |
| 10 | LCP201-06P | 1-1/2"C | EXISTING POWER | 35 | DP202-07P | 1-1/2"C | EXISTING POWER |
| 11 | LCP201-01P | 1-1/2"C | EXISTING POWER | 36 | LCP203-07P | 1-1/2"C | EXISTING POWER |
| 12 | LCP201-02P | 1-1/2"C | EXISTING POWER | 37 | LCP203-08P | 1-1/2"C | EXISTING POWER |
| 13 | LCP201-03P | 1-1/2"C | EXISTING POWER | 38 | LCP204-07P | 1-1/2"C | EXISTING POWER |
| 14 | LCP202-04P | 1-1/2"C | EXISTING POWER | 39 | LCP204-08P | 1-1/2"C | EXISTING POWER |
| 15 | LCP202-07P | 1-1/2"C | EXISTING POWER | 40 | DP202-05P | 1-1/2"C | EXISTING POWER |
| 16 | FOC-HW-GRIT | 2"C | FIBER FROM PLC-200 TO EB-HW-1 | 41 | DP202-06P | 1-1/2"C | EXISTING POWER |
| 17 | SPARE | 2"C | - | 42 | DP201-05P | 1-1/2"C | EXISTING POWER |
| 18 | SPARE | 2"C | - | 43 | DP201-06P | 1-1/2"C | EXISTING POWER |
| 19 | LCP202-08P | 1-1/2"C | EXISTING POWER | 44 | LP201-4 | 1-1/2"C | EXISTING POWER |
| 20 | LCP202-07P | 1-1/2"C | EXISTING POWER | 45 | LP201-6 | 1-1/2"C | EXISTING POWER |
| 21 | LCP201-07P | 1-1/2"C | EXISTING POWER | 46 | DP202-08P | 1-1/2"C | EXISTING POWER |
| 22 | LCP201-08P | 1-1/2"C | EXISTING POWER | 47 | DP201-09P | 1-1/2"C | EXISTING POWER |
| 23 | LCP203-01P | 1-1/2"C | EXISTING POWER | 48 | SPARE | 2"C | - |
| 24 | LCP203-02P | 1-1/2"C | EXISTING POWER | 49 | SPARE | 2"C | - |
| 25 | LCP203-03P | 1-1/2"C | EXISTING POWER | 50 | SPARE | 2"C | - |
| | | | | 51 | LP201-9 | 1-1/2"C | EXISTING POWER |
| | | | | 52 | LP201-11 | 1-1/2"C | EXISTING POWER |

NOTES:
1 EXISTING DUCTBANKS. FIELD VERIFY LOCATION AND CONDITIONS.

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SAN ANTONIO WATER SYSTEM

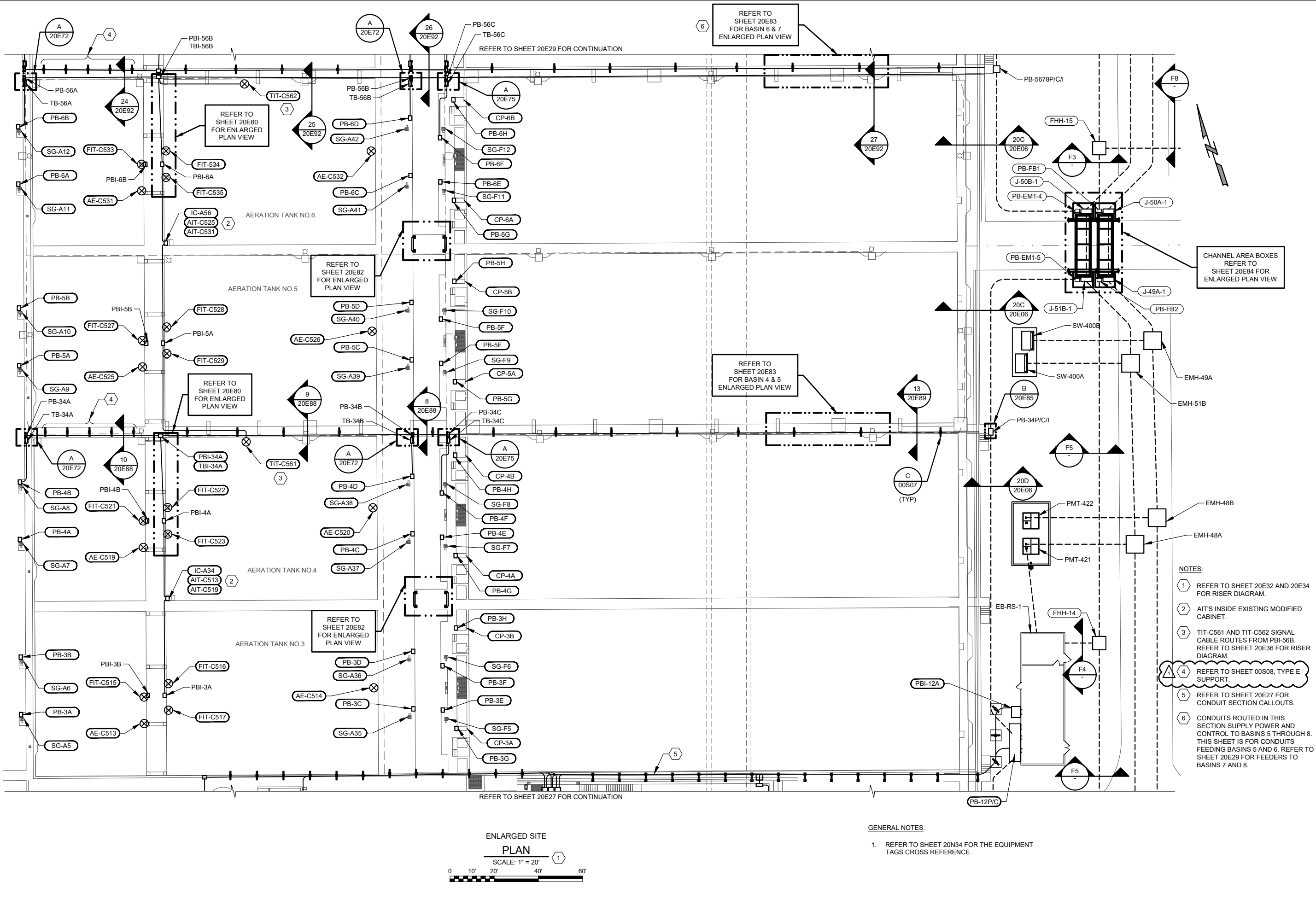
| REV. NO. | DATE | DRWN | ER | ADDED/IMD NO.2 | REMARKS |
|----------|----------|------|----|----------------|---------|
| A | 03/06/21 | | | | |

SAN ANTONIO WATER SYSTEM
STEVEN M. CLOUSE WRC
ELECTRICAL SYSTEM IMPROVEMENTS PHASE II
HEADWORKS
DUCTBANK SECTIONS - II

DESIGNED BY: T.HERNANDEZ
DRAWN BY: S.HERNANDEZ
SHEET CHKD BY: V.K. GUPTA
APPROVED BY: W.SAKO
DATE: JANUARY 2021
SAWS JOB NO.: 16-6501
FILE NAME: 1951_05E03

SHEET NO.
05E03
97 OF 500

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ENLARGED SITE PLAN
SCALE: 1" = 20'
0 10' 20' 40' 60'

- GENERAL NOTES:**
- 1. REFER TO SHEET 20N34 FOR THE EQUIPMENT TAGS CROSS REFERENCE.

- NOTES:**
- 1 REFER TO SHEET 20E32 AND 20E34 FOR RISER DIAGRAM.
 - 2 AIT'S INSIDE EXISTING MODIFIED CABINET.
 - 3 TIT-C561 AND TIT-C562 SIGNAL CABLE ROUTES FROM PBI-56B. REFER TO SHEET 20E36 FOR RISER DIAGRAM.
 - 4 REFER TO SHEET 00S08, TYPE E SUPPORT.
 - 5 REFER TO SHEET 20E27 FOR CONDUIT SECTION CALLOUTS.
 - 6 CONDUITS ROUTED IN THIS SECTION SUPPLY POWER AND CONTROL TO BASINS 5 THROUGH 8. THIS SHEET IS FOR CONDUITS FEEDING BASINS 5 AND 6. REFER TO SHEET 20E29 FOR FEEDERS TO BASINS 7 AND 8.

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SAN ANTONIO WATER SYSTEM

| REV. NO. | DATE | DRWN | ER | ADDDITION NO.2 | REMARKS |
|----------|----------|------|----|----------------|---------|
| A | 03/08/21 | | | | |

SAN ANTONIO WATER SYSTEM
STEVEN M. CLOUSE WRC
ELECTRICAL SYSTEM IMPROVEMENTS PHASE II
FIRST STAGE AERATION TANKS NO.3 THROUGH NO.6 ENLARGED SITE PLAN

DESIGNED BY: E. CLEMENT
DRAWN BY: E. RANGEL
SHEET CHKD BY: V.K. GUPTA
APPROVED BY: W. SAKO
DATE: JANUARY 2021
SAWS JOB NO.: 16-6501
FILE NAME: 1951_20E28

SHEET NO.
20E28
323 OF 500