

MAY 22, 2018

ADDENDUM NO. 3
TO THE CONTRACT DOCUMENTS

SYRACUSE HANCOCK INTERNATIONAL AIRPORT
REHABILITATION OF DEICING STORAGE FACILITIES

FAA AIP PROJECTS NO. 3-36-0114-XXX-18

SYRACUSE REGIONAL AIRPORT AUTHORITY
IFB REFERENCE #2018-02

TO ALL HOLDERS OF THE CONTRACT DOCUMENTS:

This addendum is part of the Contract Documents in accordance with the provisions of the Agreement and Information for Bidders.

A. CONTRACT TECHNICAL SPECIFICATIONS:

1. Section 01 57 05, Part 3.6A.8.b, after the words “than the frequency...”
 - a. Delete: “specified in Section 01 41 26,”
Insert: “shown in the Contract Drawings, the...”
2. Section 28 00 05
 - a. Delete: Section 28 00 05 in its entirety
Insert: Attached Section 28 00 05
3. Section 40 61 13
 - a. Delete: Section 40 61 13 in its entirety
Insert: Attached Section 40 61 13
4. Section 40 70 05
 - a. Delete: Section 40 70 05 in its entirety. **Data Sheets after Page 40 70 05-12 to remain.**
Insert: Attached Section 40 70 05

B. IN THE CONTRACT DRAWINGS

1. Contract Drawing M-200
 - a. Insert: Attached Figure 2: “CONTROL BUILDING PLUMBING DETAIL”

2. Contract Drawing E-003
 - a. Delete: Contract Drawing E-003 in its entirety
Insert: Attached Contract Drawing E-003
3. Contract Drawing E-004
 - a. Delete: Contract Drawing E-004 in its entirety
Insert: Attached Contract Drawing E-004
4. Contract Drawing E-005
 - a. Delete: Contract Drawing E-005 in its entirety
Insert: Attached Contract Drawing E-005
5. Contract Drawing E-006
 - a. Delete: Contract Drawing E-006 in its entirety
Insert: Attached Contract Drawing E-006
6. Contract Drawing E-203
 - a. Delete: Contract Drawing E-203 in its entirety
Insert: Attached Contract Drawing E-203
7. Contract Drawing E-402
 - a. Delete: Sheet E-402 in its entirety
Insert: Attached Sheet E-402

C. CLARIFICATIONS

1. Question: Section 01 57 05, Para 3.6.A.8.b references Section 01 41 26 – Stormwater Pollution Prevention Plan and Permit. We are unable to locate this section in the bid documents.

Answer: A Stormwater Pollution Prevention Plan and Permit is being developed by Arcadis and once approved, will be provided to the Awarded Contractor. In addition, the frequency of Contractor inspections is listed on Contract Drawing G-200, Note 7. Refer to Section A., Item 1 of this addendum.

2. Question: The revised tank specification section 33 16 13.16, paragraph 1.5.B.1.c.1 provided with Addendum No. 1 references a downdrag load on the piles. Please provide the magnitude of this load and identify which piles will be affected. Please also provide the magnitude of any seismic induced downdrag loads due to settlements.

Answer: As clarified within Addendum No. 2, the downdrag loading on piles will depend on several factors. The contractor's professional engineer for the Delegated Design foundation system shall make his/her own determination on the magnitude of downdrag and what specific piles are affected.

Sincerely,

Arcadis of New York



John C. Perriello, PE
Project Manager



SECTION 28 00 05

ELECTRONIC SECURITY SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
1. CONTRACTOR shall provide all labor, material, equipment and incidentals as shown, specified and required to furnish, install, test and place into satisfactory operation a Security System as specified herein. This system shall be comprised of an Internet Protocol Television (IPTV) Surveillance System and a Gate Security Access Control Management (SACM) System.
- B. CONTRACTOR shall employ the services of IK Systems, Inc with proven experience in the field. IK Systems, Inc shall assume full responsibility for the selection of equipment and components required. Specifically, this shall include defining the required system components, preparing detailed system schematics, interconnecting wiring diagrams, field debugging, calibrating, and configuring the system as well as instructing plant personnel on the care and use of the system.
- C. The IPTV and SACM systems provided shall be turnkey system solutions, wherein each component is seamlessly integrated with the overall system. The IPTV System shall employ common controls communications protocol and video signal formats throughout. The SACM System shall employ common controls communications protocol and access control data formats throughout.
- D. The SACM system provided by CONTRACTOR under this Section must be compatible with the HID ProxCard cards that are employed throughout the OWNER'S facilities. CONTRACTOR shall coordinate final procurement of actual cards with the OWNER.
- E. Related Sections:
1. Division 26, Electrical.

1.2 REFERENCES

- A. Standards referenced in this Section are listed below:
1. American National Standards Institute, (ANSI).
 2. Factory Mutual, (FM).
 3. Institute of Electrical and Electronic Engineers, (IEEE).
 4. National Electrical Code, (NEC).
 5. National Electrical Manufacturers Association, (NEMA).
 6. Underwriters' Laboratories, Inc., (UL).

1.3 QUALITY ASSURANCE

- A. In order to ensure standardization, proper interfacing and compatibility, it is required that all equipment offered under this Section be furnished by a single Supplier who shall provide all equipment required for a proper installation and coordinate all Shop Drawings.
- B. The IK Systems, Inc shall be responsible for providing all components and software for the surveillance and access control systems.
- C. All items of equipment, including wire and cable, shall be compatible.
- D. IK Systems, Inc shall provide on-site manufacturer's representatives to oversee installation and to verify that installation of all equipment is in compliance with manufacturer requirements. IK Systems, Inc shall provide a written report verifying that the installation is complete, fully functional, and in compliance with all manufacturer requirements.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Product Data:
 - a. Manufacturer's literature, illustrations, specifications and engineering data including: general arrangement, outline drawings, dimensions, materials, size, weight, and performance data.
 - 2. Shop Drawings:
 - a. Fabrication, assembly, and installation drawings.
 - b. Complete riser diagrams clearly labeling all conduit and wire.
 - c. Layout drawings with conduit and equipment numbers.
- B. Informational Submittals: Submit the following:
 - 1. Certificates:
 - a. Certificates of Compliance/Manufacture.
 - 2. Supplier Instructions:
 - a. Installation Instructions.
 - 3. Source Quality Control Submittals:
 - a. Submit reports for all required shop tests.
 - 4. Site Quality Control Submittals:
 - a. Submit reports for all required field-tests
 - b. Submit reports for all manufacturer's site visits
- C. Closeout Submittals: Submit the following:
 - 1. Operation and Maintenance Manuals:
 - a. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation and spare parts information.
 - b. Furnish operation and maintenance manuals in conformance with the requirements of Section 01 78 23, Operation and Maintenance Data.

2. Software:
 - a. Software Manuals.
- D. Maintenance Materials Submittals: Furnish the following:
1. Spare Parts:
 - a. Manufacturer recommended spare parts and maintenance materials.
 2. Tools:
 - a. List of all special tools required for routine maintenance.

1.5 DELIVERY AND PRODUCT STORAGE

- A. Security, process monitoring and access control equipment shall be delivered, stored and handled in accordance with Division 01, General Requirements, the manufacturer’s instructions, and the following.
1. Security, process monitoring and access control equipment shall be inspected by CONTRACTOR for shipping damage or loose parts when received. Evidence of water, which may have entered equipment during transit, shall be checked.
 2. Equipment shall be stored in a clean, dry location in which a uniform temperature is maintained. Equipment shall be protected with coverings and maintain air circulation.
 3. Where dampness or condensation may be encountered, heaters shall be provided for equipment to prevent moisture damage.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. IK Systems, Inc shall provide installation, startup and training for the security system equipment per section 1.1 above. Build of materials should include but not limited to the following.

Quantity	Equipment	Description
1	Lockable Weatherproof NEMA enclosure	20”x16”x11” with thermostat-controlled heater and 120Vac Duplex receptacle (Gate)
1	Lockable Weatherproof NEMA enclosure	14”x12”x7” with thermostat-controlled heater & 120Vac Duplex receptacle (Airport Terminal)
1	8-port PoE+ Managed Network Switch	Extreme temperature rated with 24V power supply (Gate)
1	5-Port PoE+ Managed Network Switch	Extreme temperature rated with 24V power supply (Airport)
1	Genetec Sy-8200CKE1A	Edge EVO EH400-K Access Controller – Single Door
1	Genetec Sy-82360	Edge EVO EWM-M Wiegand

Quantity	Equipment	Description
		Expansion Module for 3 rd card reader
3	Genetec Advantage for 1 Synergis Pro Reader	1 Year
3	HID MultiClass RPK40 Proximity Reader	Include Keypad
1	GRI Gate Contact Mounting Kit	
3	48" Black Security Pedestal, Gooseneck style furnished and installed by CONTRACTOR	Includes 12" x 12" black square housing and pedestal hood (Installed by others.)
2	Long Range Point-to-Point Wireless Antenna	
2	1 Gbps Ethernet Ports	With 450+ Mbps TCP/IP throughput, selectable channel width (10/20/30/40/50/60/80 MHz), pole-mount and passive PoE adapter
2	Axis Q3709-PVE	Outdoor 180 degree multi-sensor 4K camera with pole mount kit and surge protector
2	Axis Q6155-E	Outdoor PTZ 1080P camera with pole mount kit, surge protector and 60 watt midpan
4	Genetec Enterprise Camera	License and Failover License
4	Genetec Advantage	For 1 enterprise camera for 1 year
1	Freight and installation of all above equipment. Includes installation of control wiring and configuration of gate controls, optimization and configuration of cameras in Genetec Security Center.	CONTRACTOR shall be responsible for installation of card reader gooseneck, 120Vac and higher voltage cable with terminations, underground conduit for power and control conductors, security pole with concrete foundation, concrete equipment pads, and control panel supports.

Note: Gate Access and Security System at Airport shall be furnished and installed by others.

2.2 ETHERNET CABLE

- A. Ethernet cable shall be in accordance to specification 26 05 23, Instrumentation and Communication Cable.

2.3 SPARE PARTS

- A. CONTRACTOR shall furnish and deliver the spare parts as outlined below, all of which shall be identical and interchangeable with similar parts furnished under this specification.
- B. The following shall constitute the minimum spare parts:
 - 1. Two IPTV cameras with zoom lens.
 - 2. Two pan and tilt drive units.
 - 3. Two SACM card readers.
 - 4. One SACM card access controller.
 - 5. One power supply for each type provided.
- C. Spare parts shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the OWNER at the conclusion of the Project.

PART 3 - EXECUTION

3.1 INSPECTION

- A. CONTRACTOR shall examine the conditions under which the Work is to be installed and notify the ENGINEER, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

- A. Installation:
 - 1. Install in conformance with the requirements of National Electrical Code.
 - 2. Install all security equipment at the locations as shown and in accordance with the manufacturer's recommendations.
 - 3. CONTRACTOR shall ensure that adequate strain relief is provided in the installation of cameras to prevent premature damage to cables caused by continual flexing in pan/tilt applications.
 - 4. The IPTV and SACM Systems shall be installed and wired completely as required for a fully functional system by CONTRACTOR who shall utilize the services of a manufacturer-trained and authorized Security System Supplier.

3.3 FIELD TESTING

- A. After installation of the equipment, controls and all appurtenances, CONTRACTOR shall field test the equipment for system operation and conformance to the specified performance parameters.

- B. CONTRACTOR, under the observation of the ENGINEER, shall provide the services of factory-trained technicians to perform the following:
1. Check and approve the installation of all components of the IPTV monitoring system and all cable connections between various components prior to placing the components into operation.
 2. Conduct a complete system checkout and adjust cameras, check operational functions of all of the equipment supplied under this Contract. All problems encountered shall be promptly corrected to prevent any delays in start-up.
 - a. Check full range of travel for camera pan and tilt as well as speed of travel. Check shall be executed from system controller and shall include tilt up and down, pan right and left and preset.
 - b. Check full range of lens function, including iris open, close, focus far, near, zoom telephoto and wide angle.
 3. CONTRACTOR shall provide all test equipment necessary to perform the testing during system checkout and testing.
 4. CONTRACTOR shall be responsible for initial system operation and shall make any changes, adjustments or replacements of any or all components, within the warranty period, if required, until the equipment supplied performs satisfactorily as intended.
 5. CONTRACTOR shall furnish to the ENGINEER certified copies of set-up and adjustment reports for all specified devices.
 6. CONTRACTOR shall furnish the ENGINEER an installation and inspection report certifying that all equipment has been installed correctly and is operating properly. The report shall be signed by the authorized representatives of CONTRACTOR and the system supplier.

3.4 SYSTEM TRAINING

- A. Provide four classes of 16 hours each of on-site system training covering operations and maintenance of the equipment to plant operations and maintenance personnel.

3.5 MANUFACTURER'S FIELD SERVICES

- A. CONTRACTOR shall arrange with the equipment manufacturer to provide direct supervision of all final connections between equipment and the wiring system.
- B. CONTRACTOR shall furnish the services of a qualified manufacturer's service representative to assist in the installation of security system equipment, check the installation before it is placed into operation, assist in the performance of field tests, observe and assist initial operations and train the plant operations and maintenance staff in the care, operation and maintenance of the equipment.
- C. Reports: CONTRACTOR shall submit a report from the manufacturer of each visit to the Site. CONTRACTOR shall provide complete information on time, schedule, tasks performed, persons contacted, problems corrected, test results, training, instruction, and all other pertinent information.

- D. The Security System Supplier shall advise the OWNER of a local authorized distributor of the equipment supplied which stocks standard replacement parts. CONTRACTOR shall provide authorized distributor's name, address, telephone number and fax number to the OWNER.
- E. Service shall be provided by a factory-trained and certified manufacturer's representative and shall maintain all equipment furnished under this Section.
- F. Service provided shall include the following:
 - 1. Quarterly Service: Service intervals shall be quarterly consisting of three days of eight on-site hours for each quarterly service. Prior to the visits, the Supplier shall contact the OWNER and inquire as to problems encountered with the security system. Service visits shall be scheduled at times agreeable to the OWNER at least one week in advance. The quarterly service shall include, but is not limited to, the following:
 - a. Provide manufacturer's recommended maintenance.
 - b. Inspect all security system devices provided under this Section for proper operation and functionality.
 - c. Perform necessary cleaning and service that is scheduled on a quarterly basis in accordance with the approved Operations and Maintenance Manual. Provide all expendable materials as necessary.
 - d. Review and provide recommendations concerning OWNER'S operations.
 - e. Replace or repair any defective security system device listed under this Section that is determined to be a result of an equipment malfunction or failure. The cause of failure shall be jointly agreed upon by OWNER, CONTRACTOR, and ENGINEER.
 - f. Provide a detail field report to the OWNER and ENGINEER.
 - 2. Technical Support: Technical support shall be provided between the hours of 7 AM and 3 PM, Monday through Friday when requested by the OWNER. Technical support shall include, but not limited to, the following:
 - a. Telephone Technical Support: At a minimum, four calls of one hour each monthly.
 - 3. CONTRACTOR shall include in the lump sum bid, 40 hours of service per year after the acceptance by the OWNER of any piece of equipment furnished under this Section to be provided by the security system supplier for emergency repair as directed by the ENGINEER, in writing.

++ END OF SECTION ++

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SECTION 40 61 13

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope:
1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish, install, calibrate, test, start-up and place in satisfactory operation a complete process monitor system (PCS).
 2. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, factory test, install, calibrate, test, start-up and place into satisfactory operation all process control panels and enclosures.
 3. The process instrumentation and control Work includes, but is not limited to, the following:
 - a. Panels and panel-mounted instruments and devices.
 - b. Field-mounted instruments and devices.
- B. PCS shall monitor and display process and equipment operation information.
- C. The Contract Documents describe the required PCS and PCS functions and operational requirements.
- D. Coordination:
1. Process Controls:
 - a. Providing instruments and controls are part of the Work by instrumentation and controls (I&C) Subcontractor. CONTRACTOR's I&C Subcontractor shall configure the instrumentation.
 - b. Some panels and equipment are furnished under other Specification Sections under this Contract. Coordinate with Suppliers of these panels and equipment to provide fully functional system in accordance with the Contract Documents and that interfaces with central computer system.
 - c. Input/output list identifies inputs and outputs required and is part of this Section. Input/output list is for coordinating signals between equipment provided by other Suppliers, and identifying signals to be programmed by CONTRACTOR's configuration Subcontractor. Provide Work for CONTRACTOR-furnished control options not on the input/output list at no additional cost to OWNER.
 2. To centralize responsibility, I&C materials and equipment provided under this Contact shall be furnished by a single Supplier.

1.2 REFERENCES

- A. Standards referenced in this Section are:
1. ANSI/ASQ Z1.4, Sampling Procedures and Tables For Inspection By Attributes.
 2. ISA 5.4, Instrument Loop Diagrams.
 3. ISA 20, Specification Forms for Process Measurement & Control Instruments, Primary Elements & Control Valves.
 4. NFPA 79, Electrical Standard for Industrial Machinery.

1.3 QUALITY ASSURANCE

- A. Qualifications:
1. Supplier:
 - a. Shall be financially sound with at least five years of continuous experience in designing, implementing, supplying, and supporting process control systems for deicing storage facilities comparable to PCS required for the Project, relative to hardware, software, cost, and complexity.
 - b. Shall have record of successful process control system equipment installations. Upon ENGINEER's request, submit record of experience for at least five projects, each with the following information: project name, owner name and contact information, name and contact information for contractor, name and contact information for engineer or architect, approximate and contract value of process control systems Work for which Supplier was responsible,
 - c. Shall have at time of Bid experienced engineering and technical staff capable of designing, supplying, implementing, and supporting the instrument and control system and complying with submittal and training requirements of the Contract Documents.
 - d. Shall be capable of training operations and maintenance personnel in PCS applications, and in operating, programming, and maintaining the control system and equipment.
 - e. Shall have UL-approved panel shop.
 - f. Offer standard courses in general process control applications, programming, and maintenance of the PCS and equipment at a facility specifically utilized for training. Training facility shall have been in operation continuously for the previous two years, minimum.
 - g. Possess a thorough, working knowledge of deicing storage processes and control philosophy in accordance with standard practices of the industry.
 - h. Possess and maintain a documented program of failure analysis.
 2. Manufacturers:
 - a. Manufacturers of instrumentation and control equipment furnished for the PCS shall be experienced producing similar equipment and shall have the following qualifications:

- 1) Shall manufacture instrumentation and control system components that are fully-developed, field-proven, and of standardized designs.
- 2) Shall have system of traceability of manufactured unit through production and testing in accordance with ANSI/ASQ Z1.4.
- 3) Shall have guaranteed availability clause (99.99 percent, minimum for one year) for microprocessor-based components and appurtenances.
- 4) Shall have documented product safety policy relevant to materials and equipment proposed for the Work.

B. Component Supply and Compatibility:

1. PCS components shall be furnished by a single Supplier who shall have responsibility for furnishing a complete and integrated system.
2. Supplier who shall have responsibility for adequacy and performance of all items furnished.
3. Supplier shall prepare, or shall review and approve, all Shop Drawings and other submittals for the PCS.

C. Pre-submittal Conference

1. Schedule and conduct a pre-submittal conference for the PCS within 60 days after the Contract Times commence running.
2. Required Attendance for Pre-submittal Conference: CONTRACTOR, I&C Subcontractor, I&C Supplier, ENGINEER, and OWNER. Pre-submittal conference will be 4 hours. Conference will be held at Engineer's Trailer 6991 Thompson Rd Syracuse, NY 13202 unless otherwise acceptable to the entities attending.
3. Purpose of pre-submittal conference is to review manner in which I&C Subcontractor and I&C Supplier intend to comply with requirements of the Contract Documents relative to PCS submittals before submittals are prepared.
4. Bring to pre-submittal conference list of proposed personnel committed to assignment to the Project. List shall include I&C Subcontractor project manager, project engineer, field representative, local service representative, and sales representative(s); and similar personnel for I&C Supplier. Indicate addresses of personnel not based at Subcontractor's and Supplier's office nearest to the Site.
5. Prepare items listed below for presentation at pre-submittal conference. Submit information to ENGINEER two weeks prior to pre-submittal conference.
 - a. List of materials and equipment required for PCS, and manufacturer and model proposed for each item.
 - b. List of currently-known requests for interpretations of which CONTRACTOR, I&C Subcontractor, and I&C Supplier are currently aware.
 - c. List of proposed exceptions to the Contract Documents along with brief explanation of each.

- d. Proposed PCS network architecture diagram.
 - e. Sample of each type of process control submittal required by the Contract Documents. These may be submittals prepared for other projects.
 - f. Flow chart showing steps to be taken in preparing and coordinating PCS submittals.
 - g. General outline of types of tests to be performed to verify that all sensors and transducers, instruments, and digital processing equipment are functioning properly.
- D. Standards, Codes and Regulations:
- 1. Construction of panels and the installation and interconnection of all equipment and devices mounted within shall comply with applicable provisions of the following standards, codes and regulations:
 - a. National Fire Protection Association 79, Annex "D" Standards, (NFPA).
 - b. National Electrical Code, (NEC).
 - c. National Electrical Manufacturer's Association Standards, (NEMA).
 - d. American Society for Testing and Materials, (ASTM).
 - e. Operational Safety and Health Administration Regulations, (OSHA).
 - f. Underwriters' Laboratory, Inc., (UL).
 - g. State and Local code requirements.
 - h. Where any conflict arises between codes or standards, the more stringent requirement shall apply.
 - 2. All materials and equipment shall be new and all panels shall be built in an Underwriters' Laboratory, Inc. (UL) approved panel shop and bear the UL label.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
- 1. Shop Drawings:
 - a. Field Instruments:
 - 1) Manufacturer's product name and complete model number of devices proposed for use, including manufacturer's name and address.
 - 2) Instrument tag number in accordance with the Contract Documents.
 - 3) Data sheets and manufacturer's catalog literature. Provide data sheets in accordance with ISA 20 and annotated for features proposed for use. For instruments not included in ISA 20, submit data sheets using a format similar to ISA 20.
 - 4) Description of construction features.
 - 5) Performance and operation data.
 - 6) Installation, mounting, and calibration details; instructions and recommendations.
 - 7) Service requirements.

- 8) Dimensions of instruments and details of mating flanges and locations of closed tanks, pipe sizes for insertion instruments, and upstream/downstream straight run pipe lengths required.
 - 9) Range of each device and calibration information
 - 10) Descriptions of materials of construction and listing of NEMA ratings for equipment
- b. Panels, Consoles, and Cabinets:
- 1) Layout drawings that include:
 - a) Front, rear, and internal panel views to scale.
 - b) Tag number and functional name of components mounted in and on panel, console, or cabinet, as applicable.
 - c) Product information on panel components.
 - d) Nameplate location and legend including text, letter size and colors to be used.
 - e) Location of anchorage connections.
 - f) Location of external wiring and piping connections.
 - g) Mounting and installation details, coordinated with actual application.
 - h) Proposed layouts and sizes of operator interface graphic display panels and alarm annunciator panels.
 - i) Calculations substantiating panel heating and cooling provisions proposed.
 - j) Subpanel layouts and mounting details for items located inside control panels.
 - 2) Product information on panel components including:
 - a) Manufacturer's product name and complete model number of devices being provided, including manufacturer's name and address.
 - b) Instrument tag number in accordance with the Contract Documents.
 - c) Data sheets and catalog literature. Submit data sheets as shown in ISA 20 and annotated for features proposed for use. For instruments not included in ISA 20, submit data sheets with format similar to ISA 20.
 - d) Description of construction features.
 - e) Performance and operation data.
 - f) Installation, mounting, and calibration details; instructions and recommendations.
 - g) Service requirements
 - 3) Wiring and piping diagrams, including the following:
 - a) Name of each panel, console, or cabinet.
 - b) Wire sizes and types.
 - c) Pipe sizes and types.
 - d) Terminal strip and terminal numbers.
 - e) Wire color coding.

- f) Functional name and manufacturer's designation for components to which wiring and piping are connected.
 - g) Lightning and surge protection grounding.
 - 4) Electrical control schematics in accordance with NFPA 79. Control schematics shall be in accordance with convention indicated in Annex D of NFPA 79. Standardized wiring diagrams that do not accurately reflect actual wiring to be furnished are unacceptable. Tables or charts for describing wire numbers are unacceptable.
 - 5) Stock list or bill of materials for each panel including tag number, functional name, manufacturer's name, model number and quantity for components mounted in or on the panel or enclosure.
 - 6) Detail showing anchorage plan of wire bundles between subpanels and front panel mounted devices.
 - c. Field wiring and piping diagrams, include the following:
 - 1) Wire and pipe sizes and types.
 - 2) Terminal numbers at field devices and in panels.
 - 3) Fiber optic termination designations in the field and in panels.
 - 4) Color coding.
 - 5) Conduit numbers in which wiring will be located.
 - 6) Locations, functional names, and manufacturer's designations of items to which wiring or piping are connected.
 - d. Complete point-to-point interconnection wiring diagrams of field wiring associated with the system. Diagrams shall include the following:
 - 1) Field wiring between each equipment item, panel, instruments, and other devices, and wiring to control stations, panelboards, and motor starters. Some of this equipment may be specified in other Divisions. CONTRACTOR is responsible for providing complete point-to-point interconnection wiring diagrams for control and monitoring of that equipment.
 - 2) Numbered terminal block and terminal identification for each wire termination.
 - 3) Identification of assigned wire numbers for interconnections. Assign each wire a unique number.
 - 4) Schedule showing the wiring numbers and the conduit number in which the numbered wire is installed.
 - 5) Junction and pull boxes through which wiring will be routed.
 - 6) Identification of equipment in accordance with the Contract Documents.
2. Product Data:
- a. Product data for field instruments in accordance with requirements for Shop Drawings in this Section.
 - b. Product data for panels, consoles, and cabinets in accordance with requirements for Shop Drawings in this Section.

- c. Product data for field wiring and piping provided for instrumentation and control service and not included under other Sections or contracts.
 - 3. Samples:
 - a. Color charts for finish paint for metallic panels. Provide full range of paint manufacturer's standard and custom colors. Color selection will be by ENGINEER.
 - b. Color charts for fiberglass-reinforced panels. Provide full range of panel manufacturer's standard and custom colors. Color selection will be by ENGINEER.
 - 4. Factory Acceptance Test Procedure: Submit proposed procedures for factory testing required to comply with the Contract Documents. Test procedure shall include the following:
 - a. Visual inspection of components and assembly.
 - b. Description of hardware operational testing.
 - c. Description of software demonstration.
 - d. Description of testing equipment to be used.
 - e. Sign-off sheets to be used at time of testing.
- B. Informational Submittals: Submit the following:
- 1. Documents to be submitted prior to pre-submittal conference, in accordance with Article 1.3 of this specification.
 - 2. System Software Documentation: Submit preliminary software documentation not later than 28 days prior to scheduled start of factory testing. Software documentation shall include the following:
 - a. Complete printed copies of all programming.
 - b. Complete listing of external and internal I/O address assignments, register assignments and preset constant values with function point descriptions. List unused/undefined I/O and data table registers available.
 - 3. Manufacturer's Instructions:
 - a. Shipping, handling, storage, installation, and start-up instructions.
 - b. Templates for anchorage devices for materials and equipment that will be anchored to concrete or masonry.
 - 4. Source Quality Control Submittals:
 - a. Results of factory testing.
 - 5. Special Procedure Submittals:
 - a. Notification to OWNER and ENGINEER at least 14 days before readiness to begin system checkout at the Site. Schedule system checkout on dates acceptable to OWNER and ENGINEER.
 - b. Written procedure for system checkout. Submit not less than 90 days prior to starting system checkout.
 - c. Ninety days prior to starting system checkout submit written procedure for start-up.
 - 6. Field Quality Control Submittals:

- a. Submit the following prior to commencing system checkout and start-up.
 - 1) Completed calibration sheets for each installed instrument showing five-point calibration (zero, 25, 50, 75, 100 percent of span), signed by factory-authorized serviceman.
 - b. Field calibration reports
 - c. Field testing reports.
 - 7. Supplier's Reports:
 - a. Installation inspection and check-out report.
 - b. Submit written report of results of each visit to Site by Supplier's service technician, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
 - 8. Qualifications Statements:
 - a. I&C Subcontractor.
 - b. Manufacturers, when required by ENGINEER.
- C. Closeout Submittals: Submit the following:
 - 1. Operations and Maintenance Data:
 - a. Submit in accordance with Section 01 78 23, Operation and Maintenance Data.
 - b. Include complete up-to-date system software documentation. Provide hardcopy and electronic copies.
 - 2. Record Documentation:
 - a. Prepare and submit record documents in accordance with Section 01 78 39, Project Record Documents.
 - b. Revise all PCS Shop Drawings to reflect as-built conditions in accordance with the following.
 - 1) Use "as-built" updates of approved Shop Drawings and submittals in operation and maintenance manuals.
 - 2) Half-size black line prints of wiring diagrams applicable to each control panel shall be placed in clear plastic envelopes inside a suitable print pocket or container inside each control panel.
 - 3) Submit drawings of the point-to-point interconnection wiring diagrams updated to reflect final as-built equipment information and as-installed field installation information.
- D. Maintenance Materials Submittals: Submit the following:
 - 1. Spare Parts and Test Equipment
 - a. General
 - 1) Furnish the spare parts and test equipment in accordance with the Contract Documents, identical to and interchangeable with similar materials and equipment provided for the PCS under the Contract.
 - 2) Provide source quality control for spare parts as part of factory testing prior to shipment of process control system equipment.

- 3) For process sensors and other analog instruments, Supplier shall submit a separate quotation for recommended list of spare parts and test equipment. Separately list and price each item recommended. Spare parts quotation shall include a statement that prices quoted are valid for a period of one year from date of equipment installation and that Supplier understands that OWNER reserves the right to purchase none, any, or all parts quoted. Upon request, Supplier shall submit documentation that stock of spare parts and test equipment is obtainable within 48 hours of receipt of OWNER's order.
- b. Furnish the following spare parts:
 - 1) Five of each type of input/output relay for each quantity of forty or fraction thereof provided under the Contract.
 - 2) One replacement power supply for each type and size provided under the Contract.
 - 3) One-year supply of all expendable or consumable materials.
 - 4) One per quantity of five or fraction thereof of gauges, indicators, and switches provided, complete with diaphragm seals, filled and ready to use.
 - 5) One per quantity of ten or fraction thereof provided, per range of field instruments including insertion type instruments. No spares are required for inline instruments such as magnetic flow meters that include flow tubes through which flow is conveyed.
 - 6) Twelve of each type and size of fuse used in instruments.
 - 7) One per ten (two, if fewer than twenty) of each type of panel mounted instrument including lights, pushbuttons and PLC equipment.
 - c. Furnish the following test equipment:
 - 1) All special calibration equipment required for system calibration.
 - 2) One portable flow meter calibrator
2. Software:
 - a. Submit copies of programming and configuration files developed specifically for the Project in accordance with Section 01 78 23, Operations and Maintenance Data.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prior to packaging, each manufacturer or Supplier shall securely attach tag number and instructions for proper field handling and installation to each instrument.
- B. Instruments and devices shall not be assembled in the panels until all product information and system Shop Drawings for respective components have been approved.

1.6 IDENTIFICATION TAGS

- A. All panel instruments and devices shall have an identification tags meeting the requirements specified in Section 40 70 05 - 1.7.B.

PART 2 – PRODUCTS

2.1 PCS – GENERAL PROVISIONS FOR PRODUCTS

A. General:

1. All electrically-powered equipment and devices shall be suitable for operation on 115-volt plus-or-minus 10 percent, 60 Hertz plus-or-minus two Hertz power. If different voltage or closer regulation is required, provide suitable regulator or transformer.
2. Provide appropriate power supplies for all two-wire transmitters, loops for monitoring discrete inputs and necessary outputs. Install power supplies mounted in enclosures, and install in appropriate control room or field panel.
3. Power supplies shall be suitable for minimum of 130 percent of the maximum simultaneous current draw.
4. Provide power on-off switch or air circuit breaker for each item requiring electrical power.
5. Provide isolation transformers, line voltage regulators and power distribution panels for the distributed digital portions of the PCS to eliminate electrical noise and/or transients entering on the primary power line.
6. Unless otherwise shown or indicated in the Contract Documents, control system shall be furnished to use 4 to 20 mADC analog signals.
7. Provide signal converters and repeaters where required. Analog inputs to distributed control system shall be through appropriate repeaters to provide signal isolation where series-looped with other devices and to allow loop to maintain integrity even when distributed control system is out of service. Power supplies shall adequate for signal converter and repeater loads.
8. Signals shall be isolated from ground.
9. Signals shall not have a transient DC voltage exceeding 300 volts over one millisecond nor a DC component over 300 volts.
10. PCS and associated input/output wiring will be used in a facility environment where there can be high-energy AC fields, DC control pulses, and varying ground potentials between the sensors/transducers or input contact locations and PCS components. PCS shall be adequate to provide proper protection against interferences from all such possible situations.
11. Instrumentation and PCS components shall be heavy-duty types, suitable for continuous service in a deicing storage environment. Furnish products that are currently in production at the time products are shipped from the factory. All equipment furnished shall be of modular construction and be capable of

field expansion through installation of plug-in circuit cards and additional cabinets as necessary. Logic and control loops shall be fail-safe.

12. Instrumentation and other PCS components shall return automatically to accurate measurement within 15 seconds upon restoration of power after a power failure, and when transferred to standby power supply.
13. Provide surge protection for instruments and all other PCS components that could be damaged by electrical surges.
14. Field-mounted instruments and PCS components shall be suitable for installation in humid and corrosive service conditions. Field-mounted instrument enclosures, junction boxes, and appurtenances shall comply with NEMA 4X requirements, unless otherwise shown or specified.
15. Relays with interconnections to field devices shall be wired through terminal blocks. Terminals as part of the relay base are unacceptable.
16. Panel mounted instruments, switches, and other devices shall be selected and arranged to present a pleasing coordinated appearance. Front-of-panel-mounted devices shall be of the same manufacturer and model line.
17. All components furnished, including field-mounted and rear-of-panel instruments, shall be tagged with the item number and nomenclature as shown and the instrument index in the Contract Documents or, as applicable, the "data sheets" that are part of the Contract Documents.
18. Ranges and scales specified in the Contract Documents shall be coordinated to suit equipment actually furnished. Range, scale, and set point values specified in other Sections of Division 40 are for initial setting and configuration. Coordinate specified values with actual equipment furnished to implement proper and stable process action as systems are placed in operation.
19. Field-mounted devices shall be treated with an anti-fungus spray.
20. Field-mounted devices shall be protected from exposure to freezing temperatures.

B. Environmental Conditions:

1. PCS and its components shall be designed and constructed for continuous operation under the following temperature and humidity conditions:
 - a. Equipment and Devices Installed in Control Building:
 - 1) Ambient Temperature: 60 degrees F to 80 degrees F normal range; and 40 degrees F to 105 degrees F occasional maximum extremes.
 - 2) Relative Humidity: 80 percent, normal; 95 percent maximum.
 - b. Equipment and devices installed at indoor locations (other than control rooms) for digital processing equipment hardware, control panels, and instruments:
 - 1) Ambient Temperature: 40 degrees F to 120 degrees F.
 - 2) Relative Humidity: 98 percent maximum.
 - c. Equipment and Devices Installed Outdoors:
 - 1) Ambient Temperature: -10 degrees F to 120 degrees F.
 - 2) Relative Humidity: 100 percent maximum.

- C. Refer to Sections 40 60 05 through 40 70 05 for product requirements for materials and equipment that are part of the PCS.

2.2 UNINTERRUPTIBLE POWER SYSTEM

- A. Uninterruptible Power System (UPS) shall be furnished to provide a reliable source of uninterruptible power with no break in AC output power during a complete or partial interruption of incoming line power. UPS shall include audio/visual alarms. UPS shall be UL listed.
- B. Rating: 120 VAC, 60 Hz, 1.4KVA/1.0KW minimum to provide uninterrupted conditioned power, fully loaded conditions for 15 minutes.
- C. Description: On line dual track power conditioner and true (0 ms transfer time) uninterruptible power supply providing isolation, line regulation and conditioning, using sealed 48 VDC maintenance free batteries and switch mode power supply for uninterrupted power with 0.5 to 0.7 power factor and 2.7 to 3.5 crest factor.
- D. Required Features:
 - 1. Lighting and Surge Protection: Inherent 2000: One spike attenuation.
 - 2. Regulation: One to three percent load regulation with less than 2pF effective coupling capacitance for line to load.
 - 3. Output Waveform: Computer grade sine wave with three percent maximum single harmonic and five percent maximum total harmonic distortion.
 - 4. Output Frequency: 60 Hz \pm 0.5 Hz.
 - 5. Operating Temperature: 1°C to 40°C.
 - 6. Relative Humidity: Five to 90 percent non-condensing.
 - 7. Computer Interface: RS232 port for display of 22 meter functions and 15 alarm functions.
 - 8. Input Protection: Independent battery charger fuse and DC fuses.
 - 9. Output Protection: Inherently current limited ferro-resonant transformer.
 - 10. Battery Charger: Two-step charger, 8 A and 2 A.
 - 11. AC Input: 120 VAC, 60Hz, single phase, +15 percent, -20 percent.
 - 12. AC Output: 120 VAC, 60Hz, single phase, +3 percent, -3 percent.
- E. Products and Manufacturers: Provide one of the following:
 - 1. Best Power Technology, Ferrups FE Series.
 - 2. Or equal.

2.3 PUSHBUTTONS AND INDICATING LIGHTS

- A. General:
 - 1. Pushbuttons and indicating lights shall be supplied by one manufacturer and be of the same series or model type.
 - 2. Type:
 - a. Heavy duty, oil tight.

3. Provide legend plate for indication of pushbutton or light function (e.g., "OPEN-CLOSED", "HAND-OFF-AUTO").
 4. Mounting: Flush mounted on control panel front, unless otherwise noted.
 5. NEMA rated to match panel in which mounted.
- B. Pushbuttons (Standard or Illuminated):
1. Type: Provide momentary lighted and/or unlighted, single and/or dual type pushbuttons as required to perform intended functions specified and shown.
 2. Contacts: Comply with the requirements specified for selector switches.
- C. Indicating Lights:
1. Type: Compact, integral transformer type.
 2. Lamps: Six volt, long life (20,000 hours minimum).
 3. Common, push to test circuitry shall be provided for each panel to simultaneously test all indicating lights on the panel using a single pushbutton.
- D. Button and Lens Colors:
1. Provide as indicated in the drawings.
- E. Products and Manufacturers: Provide one of the following:
1. Cutler-Hammer, Type E30.
 2. Allen Bradley, Series 800.
 3. Or equal.

2.4 DIGITAL INDICATOR

- A. General: The digital indicator shall accept an analog input and convert it to scaled numerical characters for digital display and also provide up to two alarm outputs.
- B. Required Features:
1. Display Height: 0.56-inch.
 2. Display Capacity: Four digits with decimal point position jumper selectable.
 3. Display Type: Seven segment, red LED.
 4. Accuracy: ± 0.05 percent.
 5. Analog Input: 4 to 20 mADC.
 6. Excitation Output: 15 VDC for powering transmitter.
 7. Analog Output: Proportional 4 to 20 mADC.
 8. Alarm Output: Dual with two 2 A relays.
 9. Temperature Range: 0°C to 60°C.
 10. Power: 120 VAC, + 10 to -15 percent, five watts.
 11. Enclosure: NEMA 4 splash proof.
- C. Products and Manufacturers: Provide one of the following:
1. Newport Electronics, Model Q9000E.

2. Precision Digital, Model PD690.
3. Or equal.

2.5 CONTROL RELAY

- A. Type: General purpose, plug-in type rated for continuous duty.
- B. Construction Features:
 1. Coil Voltages: 24 VDC or 120 VAC, as required.
 2. Contacts:
 - a. Silver cadmium oxide rated not less than 5 A resistive at 120 VAC or 24 VDC continuous.
 - b. For switching low energy circuits (less than 200 mA) fine silver, gold flashed contacts rated not less than 3 A resistive at 120 VAC or 28 VDC continuous shall be provided.
 3. Relays to have clear plastic dust cover.
 4. Relays to have pilot light to show energized coil.
 5. Relays to be UL recognized.
- C. Products and Manufacturers: Provide one of the following:
 1. Square D Company, Type R and/or Type K.
 2. IDEC, RU Series.
 3. Or equal.

2.6 ELECTRONIC HORN

- A. General: The horn shall be of the multi-tone electronic audible type.
- B. Required Features:
 1. Internal volume control.
 2. Field selection of up to 16 different tones.
 3. Power: 120 VAC or 24 VDC (provide power supply as required).
 4. Operating Temperature: 32 to 120°F.
 5. Enclosure Rating: NEMA 4X.
- C. Products and Manufacturers: Provide one of the following:
 1. Panalarm, Model NTZ.
 2. Or equal.

2.7 PANELS AND ENCLOSURES

- A. General:
 1. Panels and enclosures shall meet the NEMA requirements for the type specified.
 2. Sizes shown are estimates. CONTRACTOR shall furnish panels and enclosures amply sized to house all equipment, instruments, front panel

mounted devices, power supplies, power distribution panels, wiring, tubing and other components installed within, as required.

B. Construction Features:

1. Control panels located inside control or electrical room areas shall be NEMA 4X rated.
 - a. Panels shall be Type 316L stainless steel construction with a minimum thickness of 12-gage for all surfaces (except those areas requiring reinforcement) having a smooth brushed finish.
 - b. Provide handle-operated, oil-tight, key-lockable three-point stainless steel latching system with rollers on latch-rods for easy door closing.
 - c. Rolled lip around three sides of door and along top of enclosure opening.
 - d. Hasp and staple for padlocking.
 - e. Provide a clear plastic, gasketed lockable hinged door to encompass all non-NEMA 4 front of panel instruments.
 - f. Provide 3-inch high channel base assembly, with solid bottom, drilled to mate the panel to its floor pad.

C. Electrical Systems:

1. Power Source and Internal Power Distribution:
 - a. General: Control panel power supply source, type, voltage, number of circuits and circuit ratings shall be as shown.
 - b. Panels shall be provided with an internal 120 VAC power distribution panel with number of circuits and separate circuit breakers sized as required to distribute power to the panel components. Distribution panel shall contain two spare breakers, minimum.
2. Wiring:
 - a. Internal wiring shall be Type MTW and THW stranded copper wire with thermoplastic insulation rated for 600 V at 90°C for single conductors, color coded and labeled with wire identification.
 - b. For DC panel signal wiring, use No. 18 minimum AWG shielded.
 - c. For DC power wiring, use No. 12 minimum AWG. For AC signal and control wiring, use No. 16 minimum AWG. For wiring carrying more than 15 A, use sizes required by NEC standards.
 - d. Separate and shield low voltage signal wiring from power and control wiring by a minimum of 6-inches.
 - e. Group or bundle parallel runs of wire using covered troughs. Maximum bundle size to be 1-inch. Troughs shall have 40 percent spare capacity.
 - f. Install wire troughs along horizontal or vertical routes to present a neat appearance. Angled runs are not acceptable.
 - g. Adequately support and restrain all wiring runs to prevent sagging or other movement.
 - h. Terminate all field wiring using forked, insulated, crimp-on connectors (soldered type not acceptable) at 600 V rated barrier type terminal

strips with screwed connections and permanently affixed numeric identifiers beside each connection. Identifiers to be self-stick plastic tape strips with permanent type, machine printed numbers. For DC field signal wiring, terminal strips shall be capable of handling No. 12 wiring (minimum). Provide Phoenix Contact, Entelec or Allen Bradley.

- i. All wiring shall be installed such that if wires are removed from any one device, power will not be disrupted to any other device.
 - j. All alarms generated external to the panel, spare alarm, and repeat contacts shall be wired out to terminal blocks.
 - k. For internal component-to-component wiring only, compression type terminal blocks are acceptable.
 - l. Provide spare terminals equal in number to 20 percent of the terminals used for each type of wiring (e.g., DC signal and AC power).
 - m. Provide a separate terminal for grounding each shielded cable.
 - n. Use separate 5/16-inch diameter copper grounding studs for instrument signal cable shields and AC power.
 - o. Where wires pass through panel walls, provide suitable bushings to prevent cutting or abrading of insulation.
 - p. Provide circuit breakers to protect each circuit, with no more than six instruments on a single circuit.
 - q. Provide complete wiring diagram showing "as-built" circuitry. Diagram shall be enclosed in transparent plastic and placed in easily accessible pocket built into panel door.
4. Surge Protection:
- a. General: Surge protection shall be provided to protect the electronic instrumentation system from surges propagating along the signal and power supply lines. The protection systems shall be such that the protection level shall not interfere with normal operation, but shall be lower than the instrument surge withstand level, and be maintenance free and self-restoring. Instruments shall be housed in suitable metallic cases, properly grounded. Ground wires for all surge protectors shall be connected to a good earth ground and where practical each ground wire run individually and insulated from each other. These protectors shall be mounted within the instrument enclosure or a separate junction box (compatible with the area designation) coupled to the enclosure.
 - b. The units shall be as manufactured by Telecommunication Industries, Inc., Joslyn, or equal.

PART 3 – EXECUTION

3.1 PCS – GENERAL PROVISIONS FOR EXECUTION

- A. Refer to Sections 40 60 05 through 40 70 05 for execution requirements for the PCS.

3.2 INSTALLATION

- A. Install and interconnect all equipment, devices, electrical hardware, instrumentation and controls and process controller components into and out of and among the enclosures as indicated on the Drawings.

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SECTION 40 70 05

PRIMARY SENSORS AND FIELD INSTRUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, adjust and place into satisfactory operation all primary sensors and field instruments shown and specified herein.
2. Contract Documents illustrate and specify functional and general construction requirements of the sensors and field instruments and do not necessarily show or specify all components, wiring, piping and accessories required to make a completely integrated system. CONTRACTOR shall provide all components, piping, wiring, accessories and labor required for a complete, workable, and integrated system.
3. CONTRACTOR shall be responsible for installing in-line flow elements (magnetic flow meter flow tubes) and for providing taps in the process piping systems for installation of other flow, pressure, and temperature sensing instrumentation.

B. Coordination: Coordinate with other suppliers for installation of all items specified herein and required to ensure the complete and proper interfacing of all components and systems.

C. Related Sections:

1. Section 40 61 13, Process Control System General Provisions.
2. Section 40 61 23, Process Control System Startup and Field Testing.
3. Section 40 61 26, Process Control System Training.
4. Section 40 05 05, Exposed Piping Installation.

1.2 QUALITY ASSURANCE

A. Comply with the requirements of Section 40 61 13, Process Control System General Provisions.

B. Acceptable Manufacturers:

1. Furnish primary process measurement devices by the named manufacturers or equal equipment by other manufacturers.
2. The named manufacturers have been specified to establish the standard of quality and performance of the equipment to be supplied.

3. Obtain all sensors and field instruments of a given type from the same manufacturer.
 4. The primary sensors and field devices shall be interchangeable with similar function existing primary sensors and field devices to minimize spare parts inventory.
- C. Manufacturers' Responsibilities and Services:
1. Design and manufacture the primary process measurement devices in accordance with the applicable general design requirements specified in Section 40 61 13, Process Control System General Provisions, and the detailed Specifications herein.
 2. Field supervision, inspection, start-up and training in accordance with the requirements of Section 40 61 23, Process Control System Startup and Field Testing, and Section 40 61 26, Process Control System Training.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Comply with the requirements specified in Section 40 61 13, Process Control System General Provisions.
- B. Primary process measurement devices shall not be delivered to the Site until all product information and system Shop Drawings for the sensors and instruments have been approved by the ENGINEER.

1.4 SUBMITTALS

- A. Comply with the requirements specified in Section 40 61 13, Process Control System General Provisions.

1.5 CHEMICAL SERVICE

- A. Where a primary element is designated for chemical service, all wetted components and appurtenances for that primary element shall be resistant to corrosion by that chemical. Chemicals referred to commonly as "caustic", "sodium hypochlorite", "hydrochloric acid", "ferric chloride", and "methanol" shall mean the following:
 1. "CAUSTIC": Sodium hydroxide (NaOH), 50 percent solution, Specific Gravity = 1.53.

1.6 MATERIALS OF CONSTRUCTION FOR WETTABLE PARTS

- A. Provide compatible materials of construction for primary sensors and field instrument (wetted) parts that come in contact with the process fluids listed in the Instrument Index.

1.7 IDENTIFICATION TAGS

A. Performance Requirements:

1. Tag numbers of sensors and field instruments shall be as shown and as specified. For items not shown or specifically tagged, the item tag number shall be established by the system supplier. All instruments, whether field or panel mounted, shall have an identification tag.
2. Information to be permanently engraved onto the tag shall include the identifying tag number, manufacturer, model number, service, and range.
3. The tags shall be fastened to the device with self-tapping stainless steel screws. Where fastening with screws cannot be accomplished the tags shall be permanently attached to the device by a circllet of stranded stainless steel wire rope and clamp.
4. All sensors and field instruments mounted on or within control panels and enclosures shall have the identification tag installed so that the engravings are easily visible to service personnel. Panel mounted devices shall have the tag attached to the rear of the device.

B. Construction Features:

1. Tags shall be engraved with 3/16-inch letters and constructed as follows.
 - a. 3/32-inch thick laminated phenolic for engraving composed of core, laminated on both sides with a matte (non-glare) finish cover sheet.
 - b. Core to be black; cover sheet to be white.
 - c. Mounting holes to be centered on width and 1/4-inch from each end.

1.8 FILLING LIQUID

- A. Use silicone except for process fluids containing chlorine. When the process fluid contains chlorine, the filling liquid shall be Halocarbon 63 or Fluorolube 63.

PART 2 - PRODUCTS

2.1 PROCESS TAPS, SENSING LINES AND ACCESSORIES

A. Water Pressure Sensing Lines and Accessories for Flow and Pressure Transmitters:

1. Material: Copper Water Tube, ASTM B-88, Type L, drawn temper or annealed.
2. Pressure Rating: 150 psi.
3. Size: 1/2-inch O.D. for water.
4. Connections: Brass Compression Type, "Swagelok" by Crawford, or equal.
5. Shut-off Valves:
 - a. Type: Ball.
 - b. Pressure Rating: 150 psi.
 - c. Body, Ball and Stem: Brass.
 - d. Packing: High Density TFE.
 - e. Handle: Nylon with metal travel stops.

- f. Support Rings: TFE coated brass.
 - g. End Connections: Removable "Swagelok", or equal.
 - h. Model: Whitey 45 Series for water, or equal.
6. Manifolds:
- a. Type: 5-valve and 3-valve meter manifolds.
 - b. Materials: Type 316 stainless steel body, bonnets and stems; delrin seats; teflon packing.
 - c. Products and Manufacturers: Provide one of the following:
 - 1) Anderson-Greenwood.
 - 2) Or equal.
- B. Pressure Tap Sensing Lines and Accessories for Pressure Gauges and Pressure Switches:
1. For Process Sensing Taps in Ductile Iron, Steel and Stainless Steel Piping Systems:
 - a. Material and Fittings: Type 304 stainless steel pipe (ASTM A 312) and threaded fittings and adapters (ASTM A 403).
 - b. Sizes: 1/2-inch minimum for main sensing piping and 1/4-inch gauge and switch connections.
 - c. Pressure Rating: Equal to or greater than the applicable system test pressure as specified in the Exposed Piping Schedule in Section 40 05 05, Exposed Piping Installation.
 - d. Accessories:
 - 1) For applications not requiring diaphragm seals, provide separate 1/2-inch Type 316 stainless steel threaded ball valve for each gauge and switch.
 - 2) For applications requiring diaphragm seals, provide a separate 1/2-inch threaded Type 316 stainless steel ball valve for seal process side shutoff.
 2. For Process Sensing Taps in Copper and Thermoplastic Piping Systems:
 - a. Pipe Material and Fittings: Use same type of pipe material and fittings as that used in the process piping system. PVC pipe and fittings shall be provided in accordance with the requirements of Section 40 05 31, Thermoplastic Process Pipe.
 - b. Sizes: 1/2-inch minimum for main process sensing piping and 1/4-inch for gauge and switch connections.
 - c. Pressure Rating: Equal to or greater than the applicable system test pressure as specified in Section 40 05 05, Exposed Piping Installation.
 - d. Accessories:
 - 1) For copper piping system taps with or without seals, provide a separate 1/2-inch minimum threaded brass or bronze ball valve for each gauge and switch.
 - 2) For PVC piping systems with or without diaphragm seals, provide a separate 1/2-inch threaded ball valve for process sensing line shutoff.

2.2 LEVEL (PRESSURE) TRANSMITTER – DIRECT MOUNTED DIAPHRAGM SEAL TYPE

- A. Type: Solid State two-wire differential capacitance or resonant wire type transmitter with direct mounted pressure diaphragm seals for measurement of liquid level. For non-pressurized tanks, only one (high-side) remote seal shall be required with the low side open to atmospheric pressure.
- B. Function: Measure level as shown and as specified in the Instrument Index. The transmitter shall display the monitored level value and shall output a 4 to 20 mADC signal proportional to the monitored level.
- C. Performance Requirements:
 - 1. Range: As specified in the Instrument Index.
 - 2. Positive Over Range Protection: At least 1.25 times the maximum span limit.
 - 3. Local Indication: As specified in the Instrument Index.
 - 4. Transmitter Accuracy (includes linearity, repeatability and hysteresis): ± 0.25 percent of calibrated span.
 - 5. Linearity: ± 1 percent of calibrated span.
 - 6. Repeatability: 0.05 percent of calibrated span.
 - 7. Hysteresis: 0.05 percent of calibrated span.
 - 8. Stability over 6-month period: ± 0.25 percent of maximum span.
 - 9. Supply Voltage Effect: Output change of less than .005 percent of calibrated output span per one-volt change in supply voltage.
 - 10. Combined Process and Ambient Temperature Effect: Less than 8-inches water change per 100 degrees F average (combined) temperature change, plus 2.5-inches water per additional five feet of capillary (when used with DC 200 silicone fill).
 - 11. Output:
 - a. Isolated direct acting 4 to 20 mADC.
 - b. Digital process variable signal superimposed on 4 to 20 mADC signal without compromising loop integrity.
- D. Construction Features:
 - 1. Measuring elements protected by sealing diaphragm.
 - 2. Calibration Adjustments:
 - a. Zero: Adjustable in electronics compartment.
 - b. Span: Coarse and fine adjustments in electronics compartment.
 - 3. Zero Elevation and Suppression: The extent that the amount of suppression plus the calibrated span does not exceed the upper range limits of the sensor.
 - 4. Damping: Internal adjustable.
 - 5. Built-in electrical surge and RFI protection.
 - 6. Direct Mounted Pressure Diaphragm Seals:
 - a. Size and Type: Three-inch ANSI Class 150 flanged with flush diaphragm.
 - b. Diaphragm Seal (Process Wetted) Materials: See Diaphragm Seal specification included in this Section.

- c. Diaphragm Seal Housing, Flanges and Bolting (non-process wetted) Materials: See Diaphragm Seal specification included in this Section.
 - d. Capillary Tubing:
 - 1) Material: Armored Type 316 stainless steel.
 - 2) Length: As required to extend from remote seal to transmitter (five feet minimum; 25 feet maximum).
7. Fill Fluids:
 - a. Remote Seal and Capillary: See Article 1.8.
 - b. Transmitter Sensor Cell: See Article 1.8.
 8. Transmitter Sensor Diaphragms and Process Wetted Parts: Type 316 stainless steel.
 9. Transmitter Sensor Non-Process Wetted Parts:
 - a. Sensor Body and Bolting Materials: Type 316 stainless steel.
 - b. O-rings Seals: Viton.
 10. Transmitter Electronics Housing: NEMA 4X rated and Buna-N O-rings sealed threaded cover constructed of die-cast, low-copper aluminum finished with an epoxy paint system.
 11. Indicator: Provide remote indicator with range in engineering units.
 12. Electrical Conduit Connection: 1/2-inch NPT.
 13. Process Connections: 1/4-inch NPT with adapters for connection to remote seals via capillary tubing.
 14. Type 316 stainless steel mounting bracket and fastening hardware suitable for mounting transmitter on flat vertical surface or 2-inch diameter pipe.
 15. Hand held interface with keyboard and LED display capable for easily configuring and testing the transmitter.
- E. Products and Manufacturers: Provide one of the following:
1. Emerson-Rosemount, Model 3051L with Emerson-Rosemount model 751 signal display.
 2. Or equal.

2.3 PRESSURE GAUGE – BOURDON TUBE

- A. Type: Bourdon Tube Pressure Element Type, Liquid Filled Gauge (for pressure ranges of 15 psi and greater and vacuum ranges to 30-inches Hg):
- B. Performance Requirements:
 1. Range: As specified in the Instrument Index.
 2. Accuracy: ± 0.5 percent of span (ANSI B40.1 Grade 2A).
- C. Construction Features:
 1. Case:
 - a. Solid front design constructed of glass filled polyester.
 - b. Color: Black.
 2. Size: 4-1/2-inch.
 3. Ring: Threaded, glass filled polyester.
 4. Window: Glass.

5. Dial: White with black markings.
6. Filling Liquid: See Article 1.8.
7. Overpressure protection: Full blowout back.
8. Bourdon Tube and Socket:
 - a. Type 316 stainless steel.
 - b. Heliarc welded, unless otherwise specified.
9. Movement:
 - a. Type 300 series stainless steel.
 - b. Rotary geared with Teflon S coating, or cam and roller type.
 - c. Built-in overload and underload movement stops.
10. Connection: 1/4-inch male NPT, bottom.
11. Mounting: Stem Mount.
12. Calibration:
 - a. Adjustable pointer.
 - b. Externally accessible zero adjustment.

D. Accessories:

1. Pressure Snubber: Sintered stainless steel snubber threaded into gauge socket or in external stainless steel housing with 1/4-inch NPT male and female connections.
2. Process Isolation: Provide ball valves for process isolation in accordance with the requirements of Article 2.1, above.

E. Products and Manufacturers: Provide one of the following:

1. Ashcroft, Duragage 1279 Series.
2. Wika Process Gauge 232.
3. Or equal.

2.4 DIAPHRAGM SEAL

A. General:

1. Furnish diaphragm seals for pressure gauges at locations shown and as specified.
2. The complete diaphragm seal assembly, including gage, or transmitter, shall be factory assembled, filled and calibrated to the ranges setpoints specified prior to shipment.
3. System Supplier Manufacturer shall be responsible for assuring that fill volumes and sensitivities of the supplied seals and diaphragms are suitable to provide the required gage, switch or transmitter accuracy over the specified measurement range or at switch setpoints.
4. Location and orientation of the gauges, and seal assemblies shall be coordinated with the actual piping and equipment installations so that gages and indicators shall be easily read and accessed for maintenance by plant personnel.

5. Where field mounting and orientation conflicts arise due to incomplete coordination with field changes in the process piping and equipment installation, assemblies shall be relocated, re-oriented, re-assembled and re-calibrated as directed by the ENGINEER.

B. Construction Features:

1. Instrument Connection: 1/4-inch NPT.
2. Process Connection: 1/2-inch NPT.
3. Flushing Connection: 1/4-inch NPT.
4. Top Housing Materials: Type 316 stainless steel.
5. Process Side Housing Materials:
 - a. Type 316L stainless steel for metallic piping.
 - b. PVC or CPVC to match non-metallic piping.
6. Bolting Materials: Type 316 stainless steel.
7. Diaphragm, O-Rings, and Gasket Materials:

<u>Process Fluid</u>	<u>Diaphragm</u>	<u>O-Ring</u>	<u>Gasket</u>
Sodium Hydroxide	Teflon	Teflon	Teflon

8. Filling Liquid: See Article 1.8.
9. Working Pressure Rating: Equal to or greater than the attached gage or switch operating pressure specified in Exposed Piping Schedule in Section 40 05 05, Exposed Piping Installation, whichever is greater.

C. Accessories:

1. Provide fill/bleed screw to permit filling of instrument and diaphragm seal.
2. Provide a clean-out ring which holds the diaphragm captive in the upper housing to allow the upper housing assembly to be removed for recalibration or cleaning of the process side housing without the loss of filling liquid or change in calibration.

D. Products and Manufacturers: Provide one of the following:

1. Helicoid, Type 100 HAC.
2. Or equal.

2.5 MAGNETIC FLOWTUBE AND TRANSMITTER

- A. Type: Flowtube with pulsed DC Magnetic Flow Transmitter.
- B. Function: Monitor liquid flows as shown and as specified in the Instrument Index. The transmitter shall display the monitored flow value and shall output a 4 to 20 mADC signal proportional to the monitored flow.
- C. Performance Requirements:
 1. Range: As specified in the Instrument Index.
 2. Local Indication: As specified in the Instrument Index.

3. Accuracy (with analog output):
 - a. ± 0.5 percent of flow rate, or better, over a range from 1 fps to 31 fps.
 - b. ± 0.005 fps, or better, at flows below 1 fps.
 - c. Accuracy unaffected by changes in fluid velocity, density, pressure, temperature or conductivity (above minimum conductivity limits).
 - d. System accuracy shall be proven by submittal of flow test curves of the actual meters being furnished.
 - 1) Test curves shall show a minimum of ten equally spaced flow points. Tests shall be performed using water and a weight or volume tank. A "master meter" used as a reference standard is not acceptable. The test setup shall be submitted and approved prior to testing.
4. Repeatability: ± 0.15 percent of flow rate, or ± 0.0015 fps, whichever is greater.
5. Drift: Complete zero stability.
6. Minimum Fluid Conductivity Limit: Five microsiemens per centimeter or less.
7. Minimum Pre-amp Input Impedance: 1012 ohms.
8. Power:
 - a. 120 VAC ± 10 percent, 60 Hz, ± 3 Hz power supply.
 - b. Power Consumption shall not exceed 50 watts for flowtube and transmitter combined.
9. Output:
 - a. 4 to 20 mADC, direct acting and isolated, into 0 to 1000 ohms.
 - b. High accuracy, field adjustable scaled pulse output (0.1 to 10 Hz or greater) to drive local totalizer.
10. Operating Temperature: Suitable for operation with process fluid temperature from 0° to 140°F.
11. Pressure Rating: Greater than or equal to test pressure specified in Section 40 05 05, Exposed Piping Installation, for appropriate piping system.

D. Construction Features

1. Flowtube:
 - a. Type: Lined metal flowtubes.
 - b. Interchangeability: Ratio of flow velocity to voltage reference signals generated identical for all meter sizes to permit interchangeability with transmitter without requiring circuit modifications.
 - c. Tube Material: Type 304 stainless steel.
 - d. Electrode:
 - 1) Conical or elliptical shaped.
 - 2) Material: To be compatible with the process fluid as indicated in the Instrument Index.
 - e. Lining: To be compatible with the process fluid as indicated in the Instrument Index.
2. Enclosure:
 - a. Materials and Rating:
 - 1) Cast low-copper aluminum alloy or fabricated sheet steel.

- 2) NEMA 6 rated.
- 3) Capable of withstanding accidental submergence in 30 feet of water for 48 hours.
- b. Finish: Finish exterior, except for flange faces, with a high build epoxy paint.
- c. End Connections: ANSI Class 150 suitable for mating with pipe specified.
- d. Electrical Connections: 3/4-inch NPT tapped holes for power conduit fitting and signal conduit fittings.
- 3. Pulsed DC Magnetic Flow Transmitter:
 - a. Materials and Rating:
 - 1) Die cast, low-copper aluminum alloy.
 - 2) NEMA 4 rated.
 - b. Solid state construction.
 - c. Local Indication:
 - 1) 3-1/2 digit minimum LCD meter with field selectable engineering units.
 - 2) Seven-digit electromechanical totalizer or eight digit electronic LCD totalizer with reset and lithium battery backup. Totalizer shall be integral with transmitter and visible through viewing window, or shall be externally mounted in a separate NEMA 4X enclosure or conduit with viewing window and installed adjacent to the transmitter.
 - d. Pulse and analog outputs galvanically isolated from input and earth ground.
 - e. Automatic zeroing feature making it unnecessary to zero the instrument before or after placing it in operation.
 - f. Pre-calibrated span adjustment providing continuous span adjustment over entire range.
 - g. Range Adjustment: Direct reading thumbwheel switches or calibrated potentiometer, continuously adjustable for full scale settings from 1 to 31 feet per second.
 - h. Signal Conditioning: Adjustable damping circuit with response times of 1 to 25 seconds minimum.
 - i. Low Flow Cutoff: Provide automatic low flow cutoff circuitry to stop pulse output and local totalization when flow drops below 0.5 percent \pm 0.2 percent of the calibrated upper range valve.

E. Accessories:

- 1. Mounting:
 - a. Provide complete Type 316 stainless steel mounting hardware.
 - b. All transmitter and driver electronics shall be remotely mounted from the flow tubes at locations shown.
 - c. Type of mounting (wall, support frame or pipe stand) as required.
- 2. Shielded cable assemblies of sufficient length for connection between flowtube and transmitter electronics.

3. Type 316 stainless steel grounding rings for flowtubes.
4. Type 316 stainless steel grounding straps.
5. NEMA 4X rated 120 VAC power on-off selector switch as specified in Article 2.2, above.
6. A spool piece for replacement of each different size flow tube where no bypass piping is provided.
7. One calibrator suitable to calibrate all flow tubes provided.

F. Products and Manufacturers: Provide one of the following:

1. Emerson-Rosemount 8750W
2. Or equal.

2.6 LEVEL SWITCH - FLOAT TYPE

A. Type: Direct acting, pear shaped, eccentric weighted, displacement type liquid level sensor.

B. Construction Features:

1. Float Body: Hollow hermetically sealed, rigidly molded of polypropylene containing mechanical switch and eccentric metal weight.
2. Mechanical Switch: SPDT switch rated 16 amps resistive at 120 VAC and five amps resistive at 30 VDC.
3. Weight: Weight to cause sensor to hang straight down from cable when not immersed and only allow float to pivot when immersed in liquid.
4. Electrical Cable:
 - a. Heavy duty, three conductor, flexible and submersible cable, sheathed in PVC and connected to float and switch with watertight seal.
 - b. Length furnished to be sufficient to extend to junction box.

C. Products and Manufacturers: Provide one of the following:

1. Flygt, Model ENM-10.
2. Or equal.

2.7 SPARE PARTS AND TEST EQUIPMENT

A. Furnish and deliver the spare parts and test equipment as outlined below, identical to and interchangeable with similar parts furnished under this Section.

B. Spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.

C. The following shall constitute the minimum spare parts:

1. Five of each type input-output relay for each 40 or less furnished for this Contract.
2. One replacement power supply for each type and size furnished for this Contract.

3. A one-year supply of all expendable materials.
 4. One per five of gauges, indicators and/or switches used in field complete with diaphragm seals, filled and ready for use.
 5. Provide one per ten, or part thereof, per range of field instruments including all insertion type instruments. No spares are required for in-line instruments such as magnetic flow meters that include flow tubes through which the flow passes.
 6. One dozen of each type and size of fuse used in instruments.
- D. The following shall constitute the minimum test and calibration equipment.
1. All special calibration equipment required for system calibration.
 2. One portable flow meter calibrator, for magnetic flow meter use only.
- E. All spare parts shall have been operated and tested in the factory as part of factory testing prior to shipment of the control system.
- F. For process sensors and all other analog instruments, the supplier shall submit a separate quotation for a recommended list of spare parts and test equipment. Each item recommended shall be listed and priced separately. The spare parts quotation shall contain a statement that the prices quoted are firm for a period of one year from the installation date of the equipment, and that the supplier understand that the OWNER reserves the right to purchase none, any, or all of the parts quoted. The supplier is required to show that a stock of spare parts and test-equipment is obtainable within a 48-hour period.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. CONTRACTOR shall require the system supplier to furnish the services of qualified factory-trained servicemen to assist in the installation of the instrumentation and control system equipment.
- B. Install each item in accordance with manufacturer's recommendations and in accordance with the Contract Documents. Transmitters and instruments, which require access for periodic calibration or maintenance, shall be mounted so they are accessible while standing on the floor. Care shall be taken in the installation to ensure sufficient space is provided between instruments and other equipment or piping to allow for easy removal and servicing.
- C. All items shall be mounted and anchored using stainless steel hardware, unless otherwise noted.
- D. All field instruments shall be rigidly secured to walls, stands or brackets as required by the manufacturer and as shown.

- E. Conform to all applicable provisions of the NEMA standards, NEC and local, State and Federal codes when installing the equipment and interconnecting wiring.

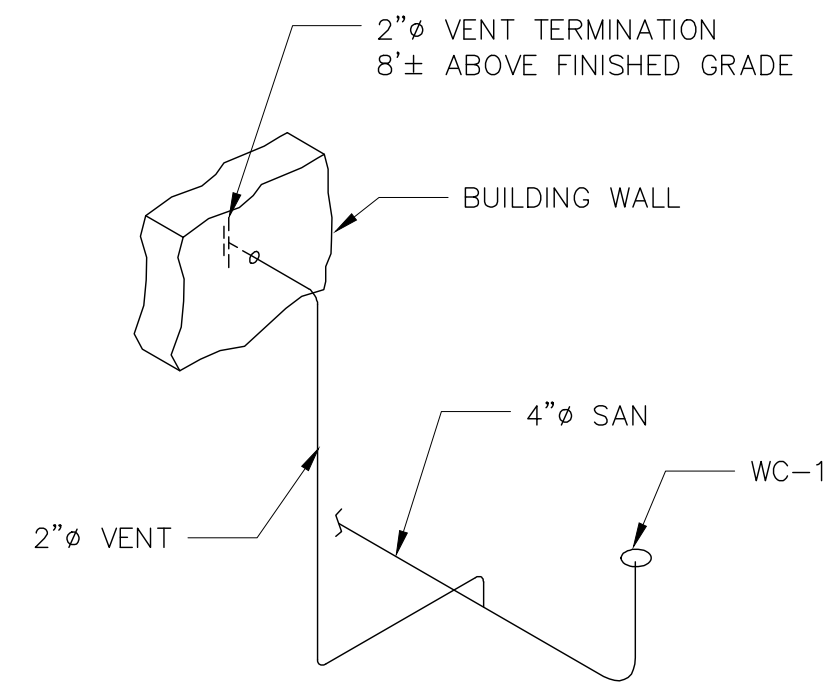
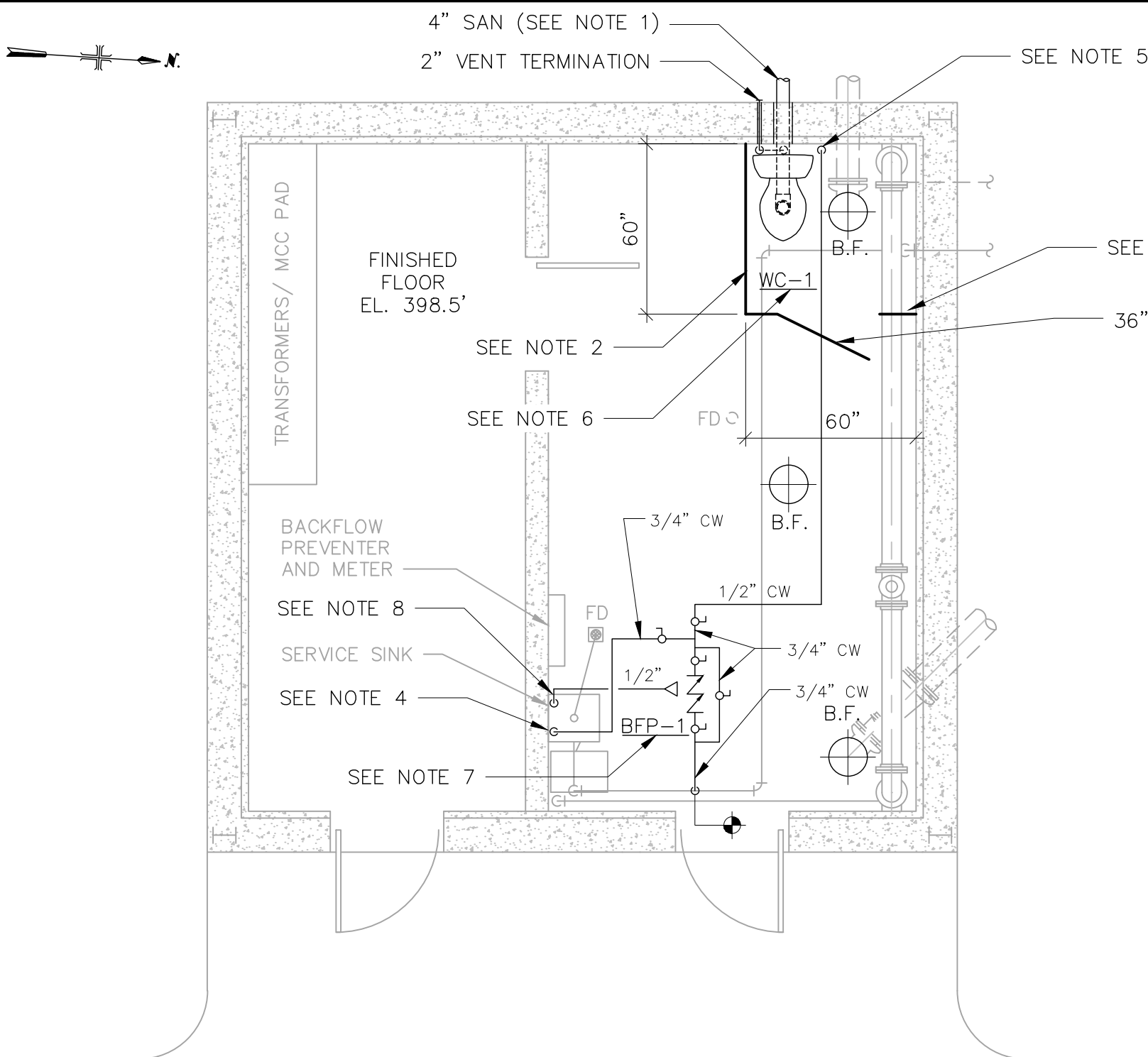
3.2 START-UP, CALIBRATION, TESTING, AND TRAINING

- A. Comply with the requirements of Section 40 61 13, Process Control System General Provisions, Section 40 61 23, Process Control System Startup and Field Testing, and Section 40 61 26, Process Control System Training.

++ END OF SECTION ++

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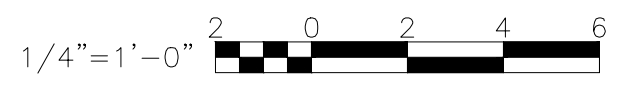
WC-1 RISER DIAGRAM

NOT TO SCALE

NOTES:

1. CORE DRILL OPENING FOR ROUTING OF NEW 4" SANITARY INVERT AT EL. 395.5±. FIELD VERIFY REQUIRED ELEVATION AS SHOWN ON CONTRACT DRAWING G-102. REFER TO WC-1 RISER DIAGRAM.
2. PROVIDE SOLID PLASTIC POLYMER PARTITION COMPLETE WITH 36" DOOR AND ALL ASSOCIATED NON-TAMPER HARDWARE REQUIRED FOR A COMPLETE INSTALLATION. BEIGE COLOR, BY GLOBAL PARTITIONS OR APPROVED EQUAL.
3. CUT PARTITION AROUND 8" PIPE. PIPE AT APPROXIMATELY 1.5' ABOVE FINISHED FLOOR.
4. DISCONNECT AND CAP EXISTING CW SUPPLY TO SERVICE SINK AND WATER HEATER FROM HYDRANT WATER SUPPLY, PROVIDE NEW 3/4" CW SUPPLY TO SERVE THE SERVICE SINK FAUCET AND WATER HEATER.
5. 1/2" CW DOWN TO WC-1 TANK FEED. PROVIDE ISOLATION BALL VALVE AT BASE OF RISER. CONNECT TO WC WITH FLEX TUBE AT FILL INLET.
6. WATER CLOSET, WC-1 SHALL BE WHITE VITREOUS CHINA, 1.6 GPH; KOHLER MODEL K-3505-TR OR EQUAL. PROVIDE ELONGATED SEAT AND BOLT CAPS.
7. BACK FLOW PREVENTER, BFP-1 SHALL BE, REDUCE PRESSURE ZONE (RPZ), 3/4" SIZE, LEAD FREE FOR POTABLE WATER USE, WATTS MODEL LFO09M3QT OR EQUAL. PROVIDE IN-DIRECT DRAIN CONNECTION.
8. ROUTE 1/2" DRAIN OVER TO SERVICE SINK FOR IN-DIRECT WASTE.

CONTROL BUILDING PLAN

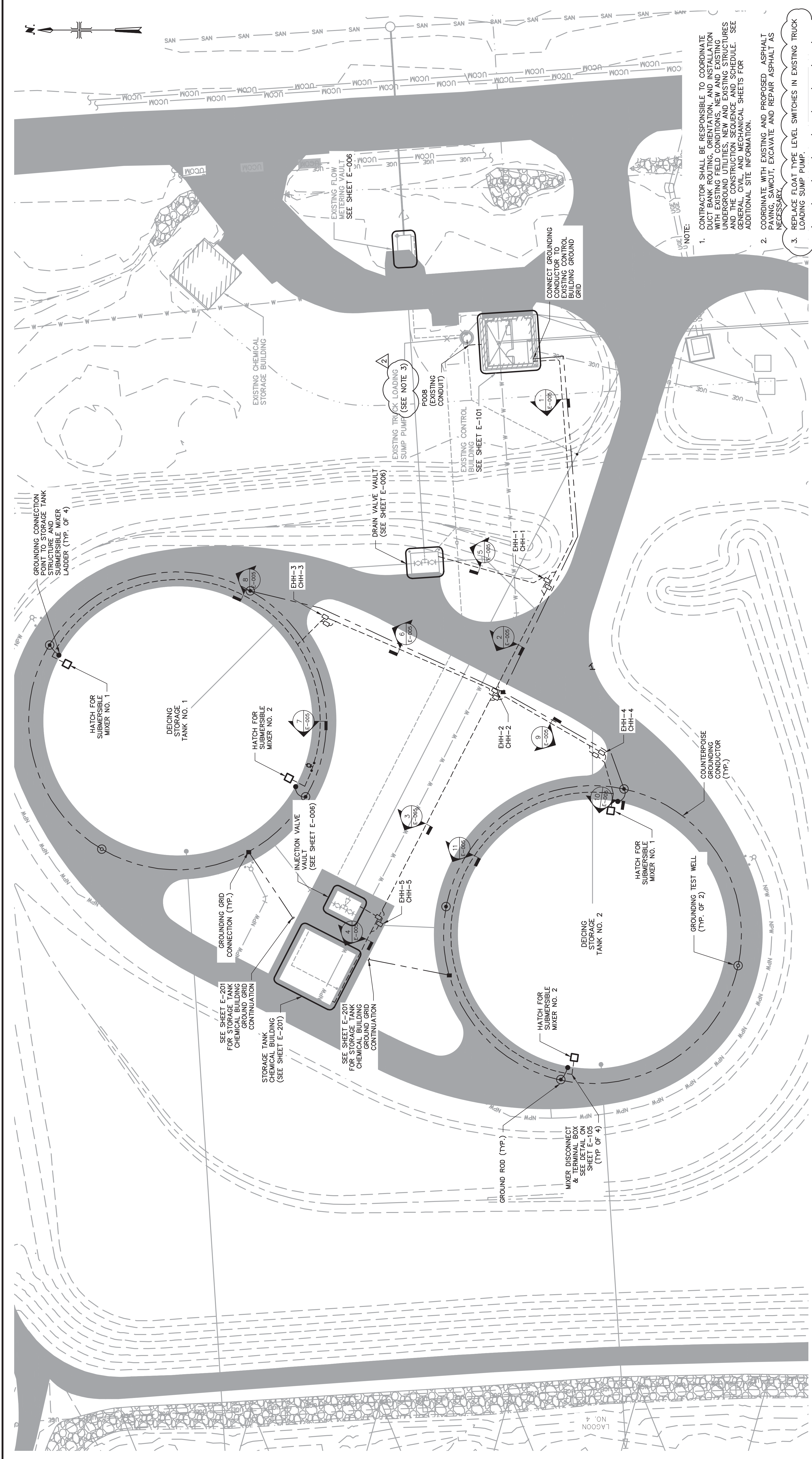


ADDENDUM No. 3 - 5/22/18

PORTION OF CONTRACT DRAWING M-200

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<p>SCALE(S) AS INDICATED</p> <p>THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING.</p> <p>USE TO VERIFY FIGURE REPRODUCTION SCALE</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>No.</th> <th>Date</th> <th>Revisions</th> <th>By</th> <th>Ckd</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p><small>THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.</small></p>	No.	Date	Revisions	By	Ckd						<p>Professional Engineer's Name JOHN C. PERRIELLO</p> <p>Professional Engineer's No. 081662</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>State</td> <td>Date Signed</td> <td>Project Mgr.</td> </tr> <tr> <td>NY</td> <td>04/16/18</td> <td>JCP</td> </tr> <tr> <td>Designed by</td> <td>Drawn by</td> <td>Checked by</td> </tr> <tr> <td>PFC</td> <td>SMH</td> <td>BRT</td> </tr> </table>	State	Date Signed	Project Mgr.	NY	04/16/18	JCP	Designed by	Drawn by	Checked by	PFC	SMH	BRT		<p>SYRACUSE, NEW YORK • SYRACUSE HANCOCK INTERNATIONAL AIRPORT REHABILITATION OF DEICING STORAGE FACILITIES</p> <p>CONTROL BUILDING PLUMBING DETAIL</p> <p>GENERAL</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>ARCADIS Project No. B0001738.0004</td> <td rowspan="2" style="text-align: center; vertical-align: middle;">Fig. 2</td> </tr> <tr> <td>Date APRIL 2018</td> </tr> <tr> <td colspan="2"> <small>ARCADIS OF NEW YORK, INC. ONE LINCOLN CENTER 110 W FAYETTE ST., SUITE 300 SYRACUSE, NY 13202 TEL. 315.446.9120</small> </td> </tr> </table>	ARCADIS Project No. B0001738.0004	Fig. 2	Date APRIL 2018	<small>ARCADIS OF NEW YORK, INC. ONE LINCOLN CENTER 110 W FAYETTE ST., SUITE 300 SYRACUSE, NY 13202 TEL. 315.446.9120</small>	
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ELECTRICAL SITE PLAN

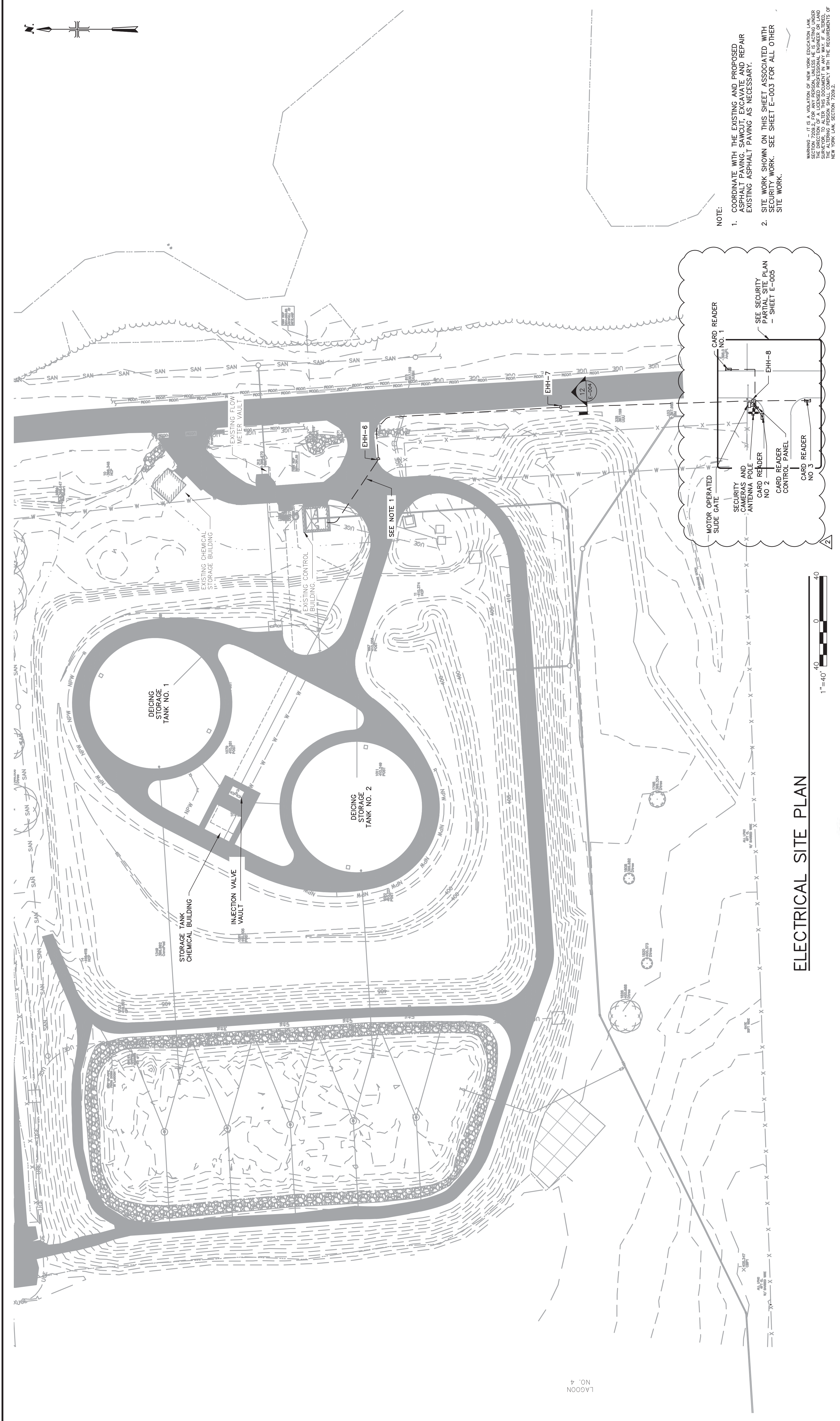


- CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE DUCT BANK ROUTING, ORIENTATION, AND INSTALLATION WITH EXISTING FIELD CONDITIONS, NEW AND EXISTING UNDERGROUND UTILITIES, NEW AND EXISTING STRUCTURES AND THE CONSTRUCTION SEQUENCE AND SCHEDULE. SEE GENERAL, CIVIL, AND MECHANICAL SHEETS FOR ADDITIONAL SITE INFORMATION.
- COORDINATE WITH EXISTING AND PROPOSED ASPHALT PAVING, SAWCUT, EXCAVATE AND REPAIR ASPHALT AS NECESSARY.
- REPLACE FLOAT TYPE LEVEL SWITCHES IN EXISTING TRUCK LOADING SUMP PUMP.

<p>SYRACUSE, NEW YORK • SYRACUSE HANCOCK INTERNATIONAL AIRPORT REHABILITATION OF DEICING STORAGE FACILITIES</p>		<p>ARCADIS Project No. B0001738.0004</p>											
<p>SITE PLAN - SHEET 1 OF 2</p>		<p>Date APRIL 2018</p>											
<p>ELECTRICAL</p>		<p>ARCADIS OF NEW YORK, INC. ONE LINCOLN CENTER 110 W FAYETTE ST. SUITE 300 SYRACUSE, NY 13202 TEL: 315 440 6161</p>											
<p>Professional Engineer's Name DAVID V. CAMARDA</p>		<p>Professional Engineer's No. 090411</p>											
<p>Professional Engineer's State NY</p>		<p>Date Signed 04/16/18</p>											
<p>Project Mgr. JCP</p>		<p>Checked by DC</p>											
<p>Designed by WEH</p>		<p>Drawn by WEH</p>											
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No.	Date	Description	By	CRD									
2	5/17/2018	ADDED NOTE 3 FOR NEW FLOAT TYPE LEVEL SWITCH	WEH	DC									
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E-003

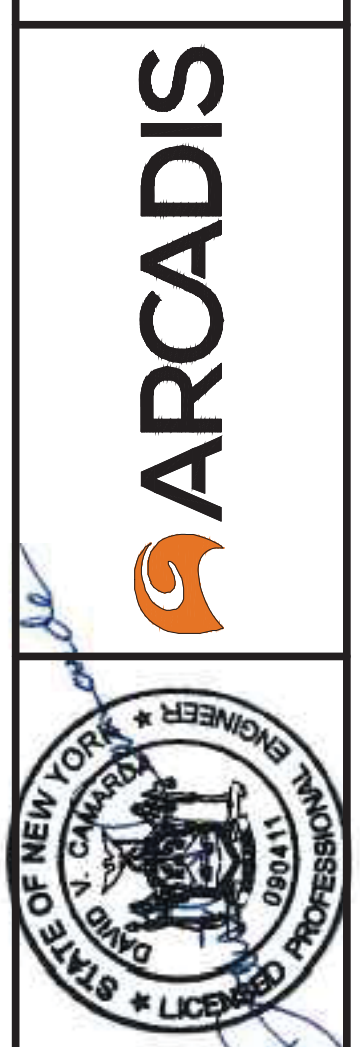


- NOTE:
- COORDINATE WITH THE EXISTING AND PROPOSED ASPHALT PAVING, SAWCUT EXCAVATE, AND REPAIR EXISTING ASPHALT PAVING AS NECESSARY.
 - SITE WORK SHOWN ON THIS SHEET ASSOCIATED WITH SECURITY WORK. SEE SHEET E-003 FOR ALL OTHER SITE WORK.

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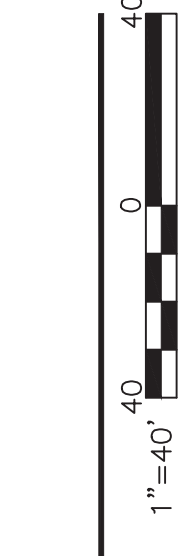
ARCADIS Project No. B001738.0004	
Date APRIL 2018	ARCADIS OF NEW YORK, INC. ONE LINCOLN CENTER 110 W FAYETTE ST. SUITE 300 SYRACUSE, NY 13202 TEL: 315-440-9100

SYRACUSE, NEW YORK • SYRACUSE HANCOCK INTERNATIONAL AIRPORT
 REHABILITATION OF DEICING STORAGE FACILITIES
SITE PLAN - SHEET 2 OF 2
 ELECTRICAL



Professional Engineer's Name DAVID V. CAMARDA	Date Signed 04/16/18	Project Mgr. JCP
Professional Engineer's No. 090411	State NY	Drawn by WEH
REVISIONS	Designed by WEH	Checked by DC
2	5/17/2018	WEH DC
REVISED SECURITY DESIGN		
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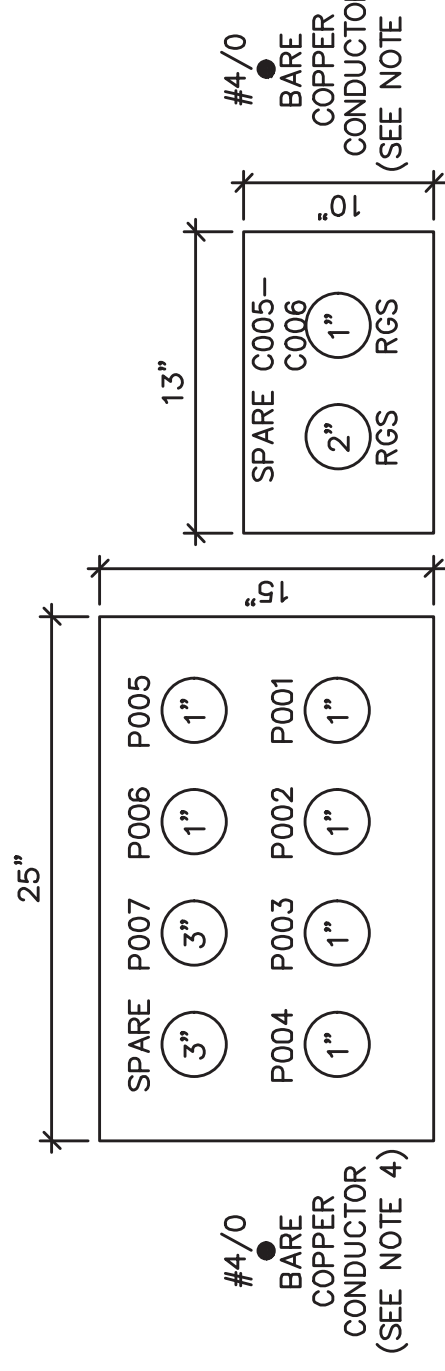


ELECTRICAL SITE PLAN

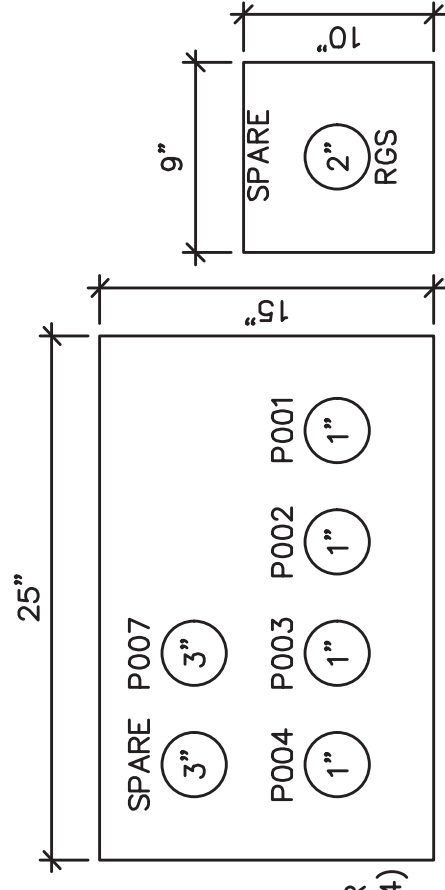
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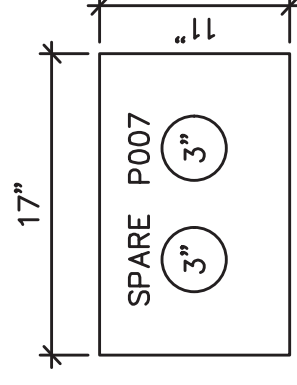
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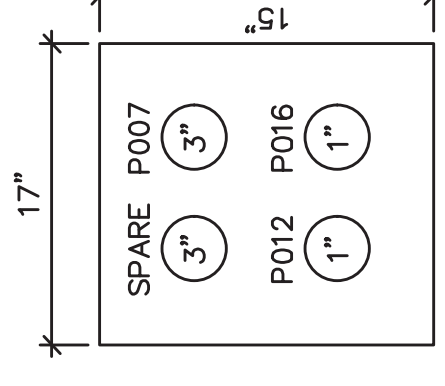
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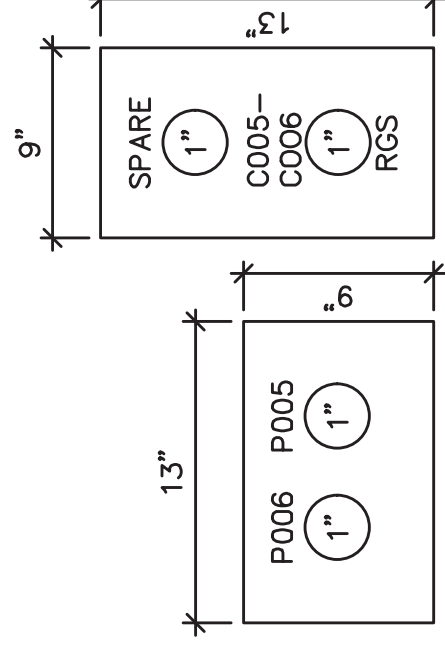
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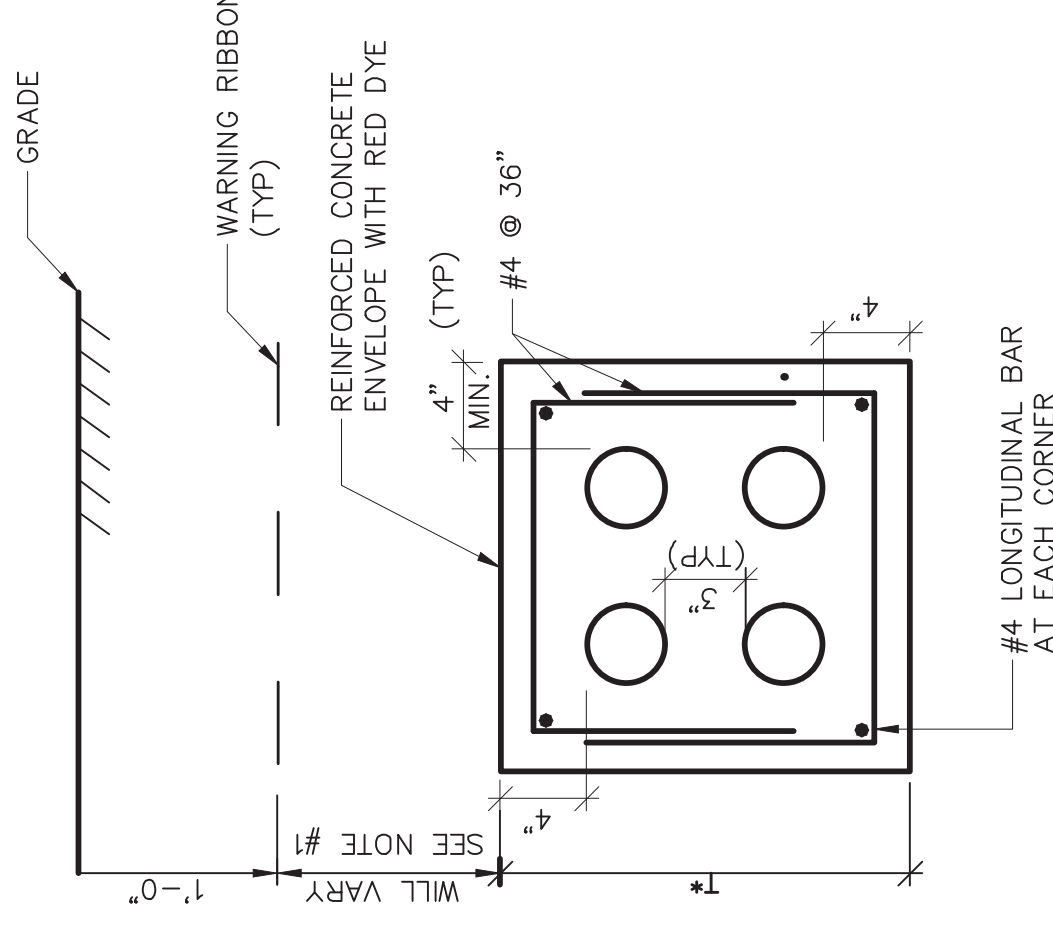
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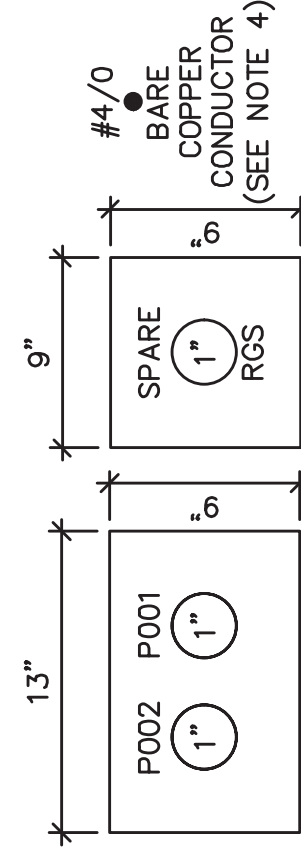
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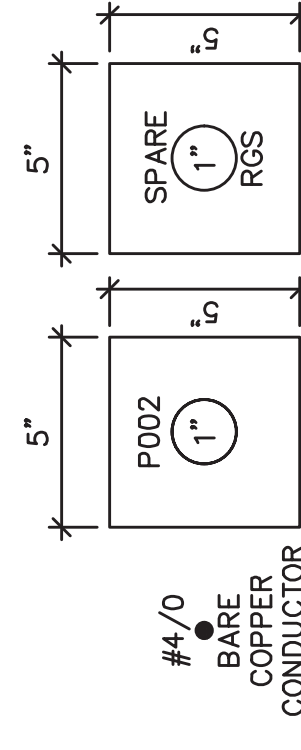
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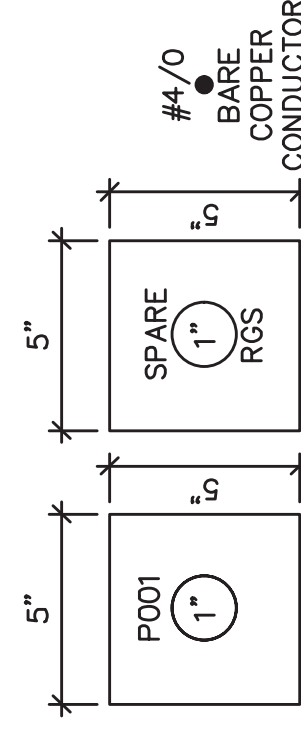
TYPICAL DUCT BANK SECTION
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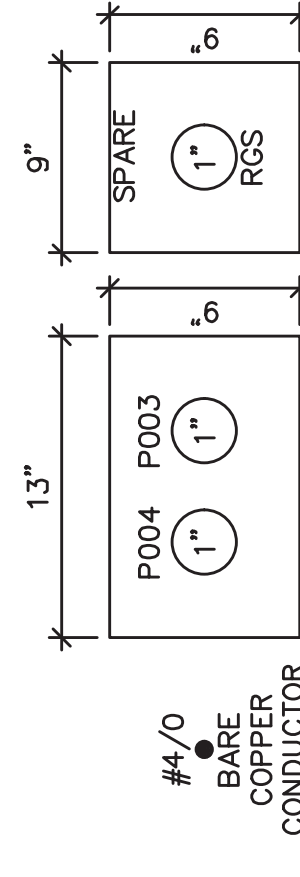
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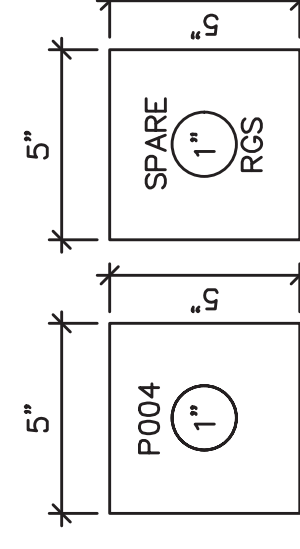
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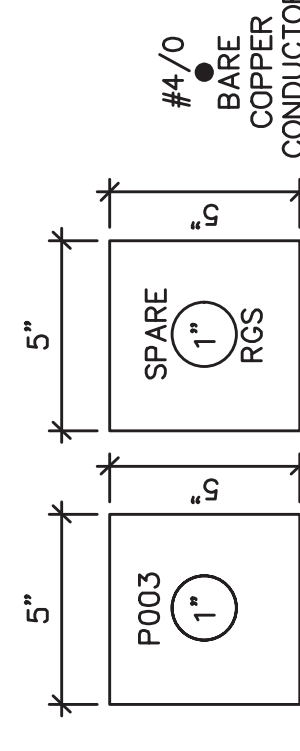
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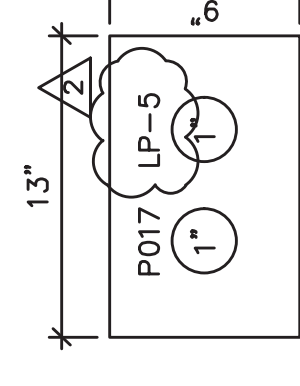
9 SECTION
E-003 NOT TO SCALE



10 SECTION
E-003 NOT TO SCALE



11 SECTION
E-003 NOT TO SCALE



12 SECTION
E-004 NOT TO SCALE

TYPICAL DUCT BANK SECTION NOTES:

- DUCT BANK DIMENSION (1'-0" MINIMUM UNLESS NOTED OR SHOWN OTHERWISE) VARIES TO CLEAR OTHER UNDERGROUND SYSTEMS AND TO MAINTAIN SLOPE AS REQUIRED.

NOTES:

- SEE ONE LINES AND INTERCONNECT DIAGRAMS FOR CONDUIT SIZE AND FILL UNLESS NOTED OTHERWISE.
- CONDUIT ARRANGEMENT SHOWN IS TYPICAL. DUCT BANK LAYOUT MAY REQUIRE ALTERATIONS. PLACE ALL SPARE CONDUITS AT THE TOP OF THE DUCT BANK.
- CONTRACTOR SHALL BE RESPONSIBLE TO SIZE ALL DUCT BANKS.
- INSTALLED BARE COPPER CONDUCTOR SHALL BE CONNECTED TO DEICING STORAGE TANKS AND STORAGE TANK CHEMICAL BUILDING FOR GROUNDING AND LIGHTNING PROTECTION.

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SYRACUSE, NEW YORK • SYRACUSE HANCOCK INTERNATIONAL AIRPORT
REHABILITATION OF DEICING STORAGE FACILITIES

DUCTBANK SECTIONS AND DETAILS
ELECTRICAL



Professional Engineer's Name
DAVID V. CAMARDA
Professional Engineer's No.
090411

Professional Engineer's Name	DAVID V. CAMARDA
Professional Engineer's No.	090411
State	NY
Date Signed	04/16/18
Project Mgr.	JCP
Drawn by	WEH
Checked by	DC

No.	Date	Revisions	By	CRK
2	5/17/2018	DUCTBANK SECTION 12 REVISED	WEH	DC

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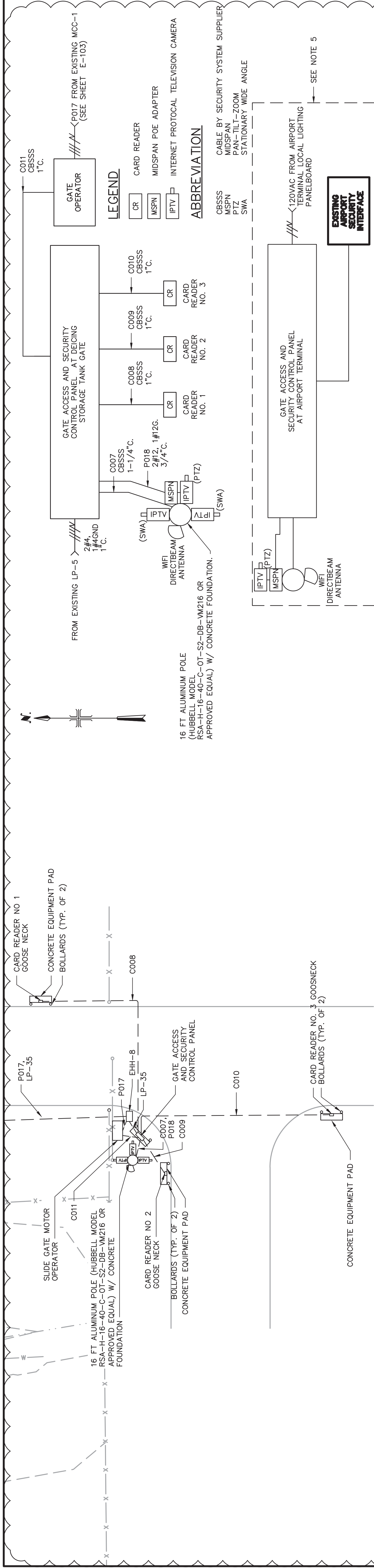
THIS BAR REPRESENTS ONE FIGURE REPRODUCTION SCALE

CITY: SYRACUSE DIV/GROUP: WATER DB: LD: PIC: PM: J. PERRIELLO TM: LVR: ON: OFF: REF: ACADVER: 21.05 (LMS TECH) PAGES: 21.05 (LMS TECH) PLOTTER: NCS FULL MONO.CTB PLOTTED: 5/21/2018 6:06 PM BY: HOWELL, WILLIAM

ARCADIS Project No.
B0001738.0004

Date
APRIL 2018
ARCADIS OF NEW YORK, INC.
ONE LINCOLN CENTER
110 W FAYETTE ST, SUITE 300
SYRACUSE, NY 13202
TEL: 315.440.9161

E-005

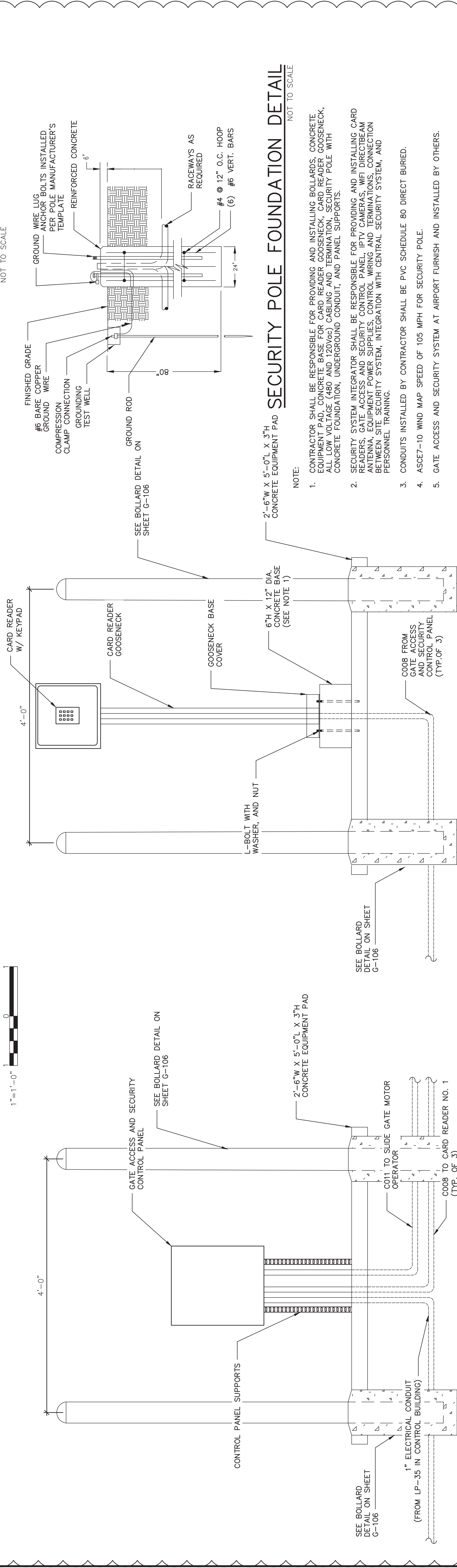


SECURITY PARTIAL SITE PLAN

1"=1'-0"

SECURITY RISER DIAGRAM

NOT TO SCALE



GATE ACCESS AND SECURITY CONTROL PANEL DETAIL

NOT TO SCALE

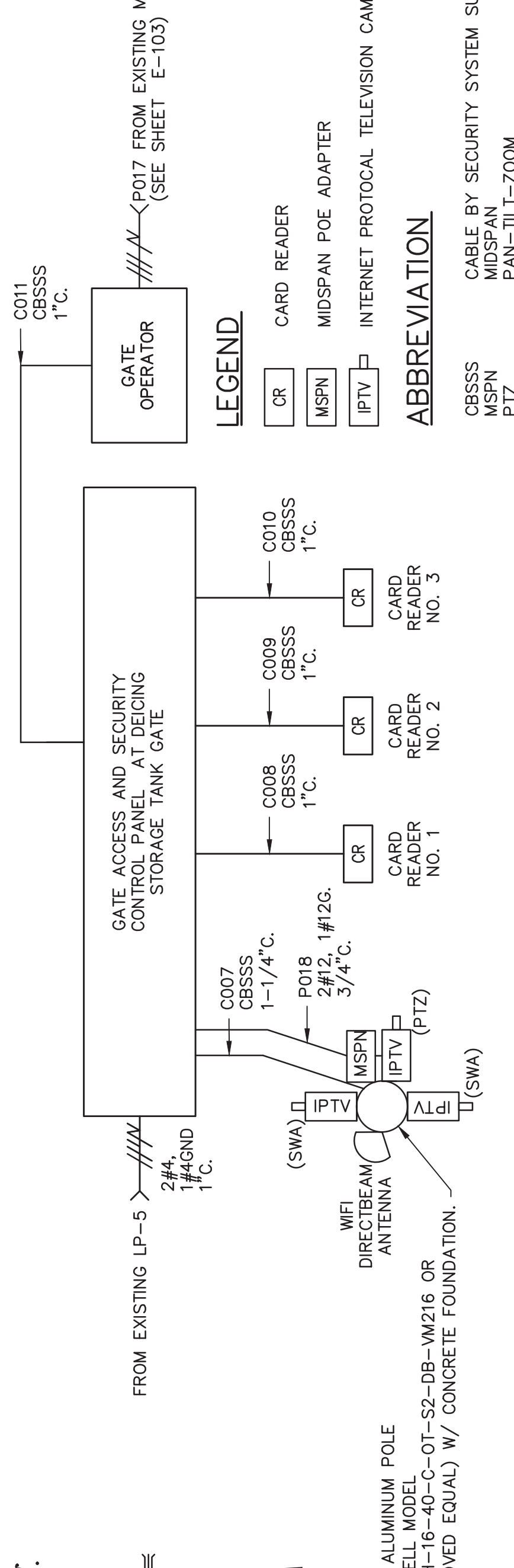
TYPICAL CARD READER DETAIL

NOT TO SCALE

SECURITY POLE FOUNDATION DETAIL

NOT TO SCALE

- NOTE:
- CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING BOLLARDS, CONCRETE EQUIPMENT PAD, CONCRETE BASE FOR CARD READER GOOSENECK, CARD READER GOOSENECK, ALL LOW VOLTAGE (480 AND 120VAC) CABLING AND TERMINATION, SECURITY POLE WITH CONCRETE FOUNDATION, UNDERGROUND CONDUIT, AND PANEL SUPPORTS.
 - SECURITY SYSTEM INTEGRATOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING CARD READERS, GATE ACCESS AND SECURITY CONTROL PANEL, IPTV CAMERAS, IPTV DIRECT BEAM ANTENNA, EQUIPMENT POWER SUPPLIES, CONTROL WIRING AND TERMINATIONS CONNECTION BETWEEN SITE SECURITY SYSTEM, INTEGRATION WITH CENTRAL SECURITY SYSTEM, AND PERSONNEL TRAINING.
 - CONDUITS INSTALLED BY CONTRACTOR SHALL BE PVC SCHEDULE 80 DIRECT BURIED.
 - ASCE7-10 WIND MAP SPEED OF 105 MPH FOR SECURITY POLE.
 - GATE ACCESS AND SECURITY SYSTEM AT AIRPORT FURNISH AND INSTALLED BY OTHERS.



SYRACUSE, NEW YORK • SYRACUSE HANCOCK INTERNATIONAL AIRPORT
REHABILITATION OF DEICING STORAGE FACILITIES

ARCADIS

Professional Engineer's Name: **DAVID V. CAMARDA**
Professional Engineer's No.: 090411
State: NY
Date Signed: 04/16/18
Project Mgr.: JCP
Designed by: WEH
Drawn by: WEH
Checked by: WEH
DC

Professional Engineer's Seal: STATE OF NEW YORK, SEAL OF DAVID V. CAMARDA, LICENSE NO. 090411, PROFESSIONAL ENGINEER

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DC

Professional Engineer's Seal: STATE OF NEW YORK, SEAL OF DAVID V. CAMARDA, LICENSE NO. 090411, PROFESSIONAL ENGINEER

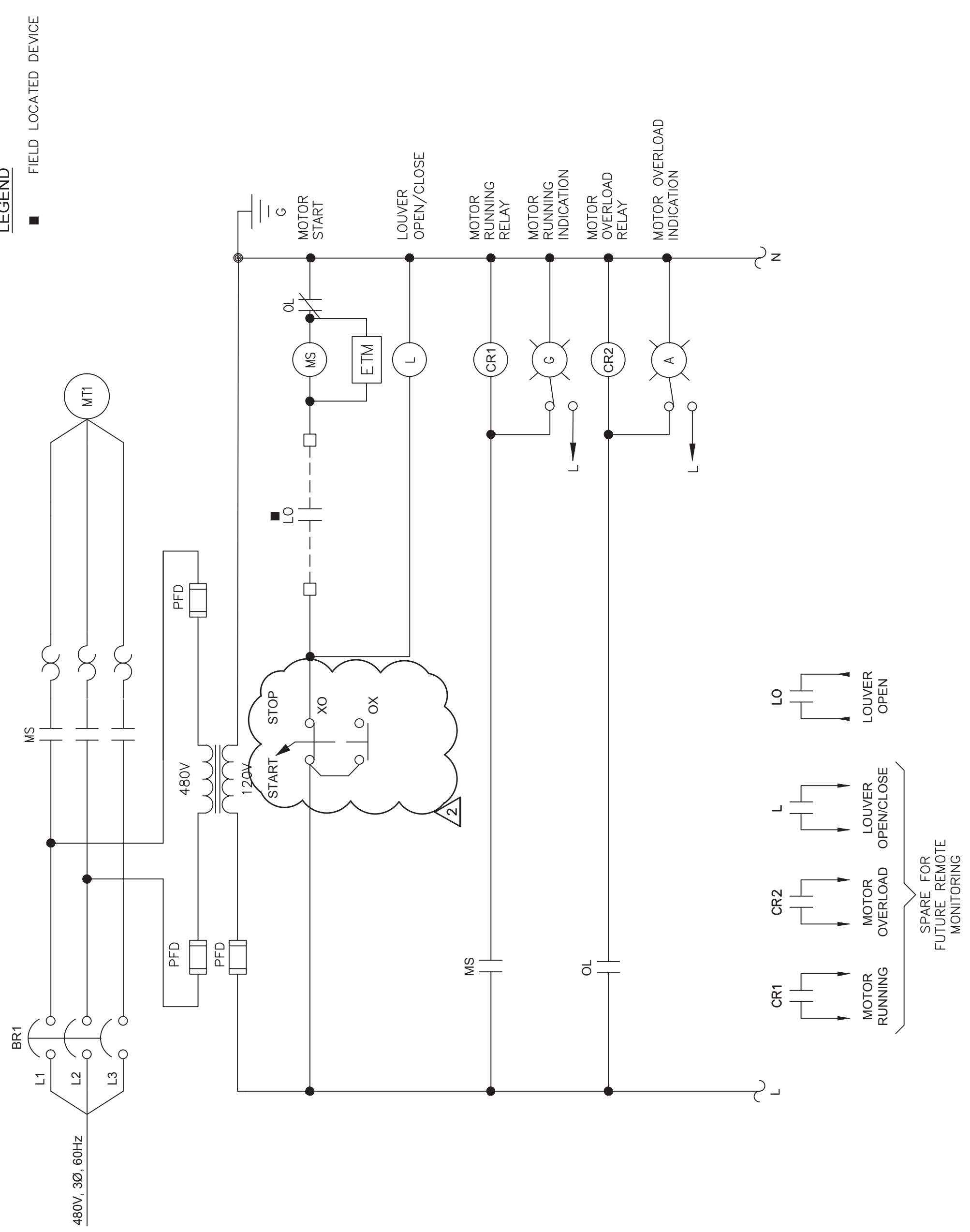
SCALE AS INDICATED

USE TO VERIFY REVISIONS AND FUNCTION ON THE ORIGINAL DRAWING.

THIS BAR REPRESENTS THE SCALE OF THE ORIGINAL DRAWING.

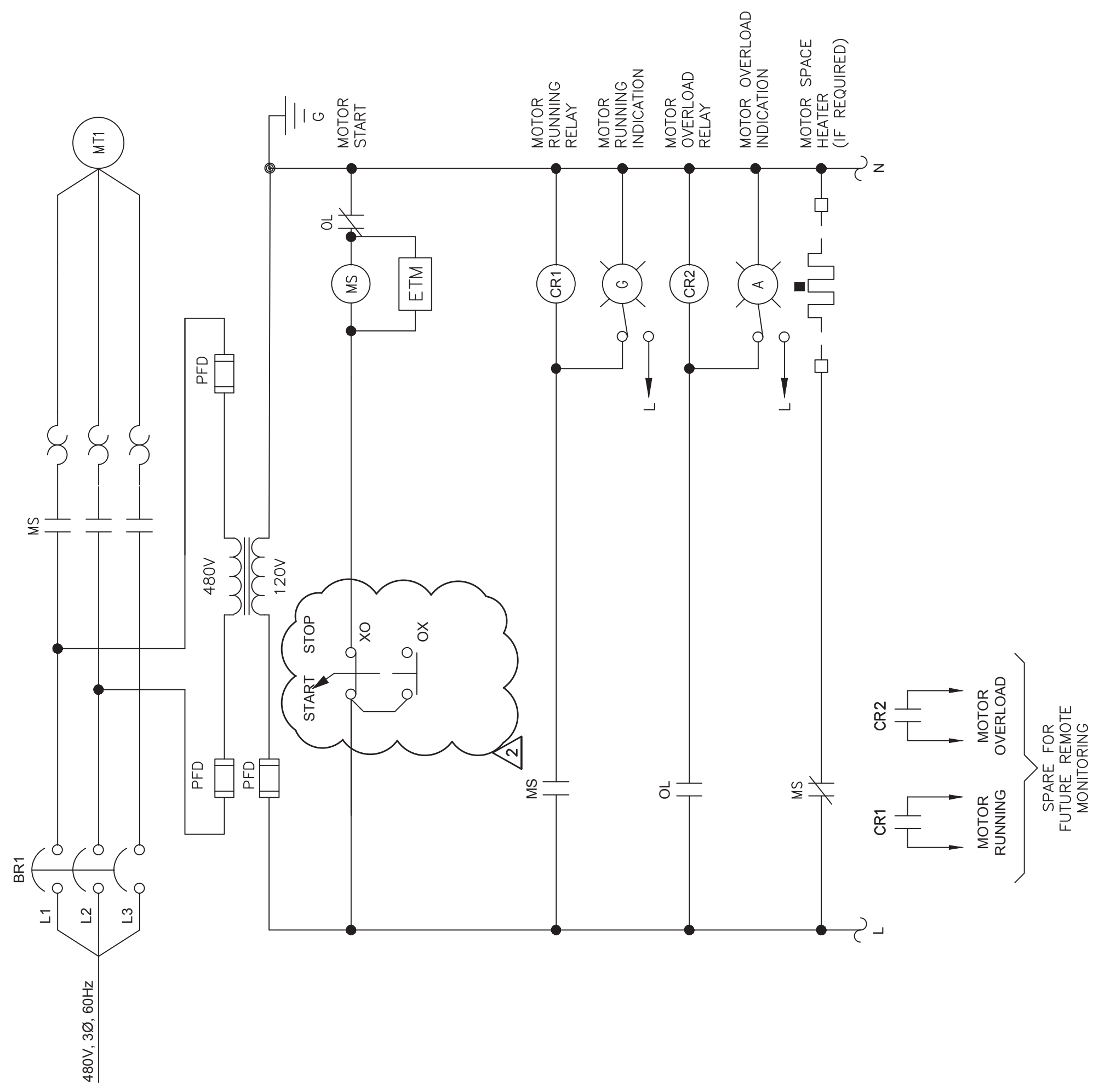
ARCADIS Project No. B0001738.0004
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E-006



TYPICAL PUMP COMBINATION MOTOR STARTER WIRING SCHEMATIC

TYPICAL EXHAUST FAN COMBINATION MOTOR STARTER WIRING SCHEMATIC



NOT TO SCALE

THIS BAR REPRESENTS ONE FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	CRD
2	5/17/2018	COMBINATION MOTOR STARTER SCHEMATIC REVISED	WEH	DC

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SYRACUSE, NEW YORK • SYRACUSE HANCOCK INTERNATIONAL AIRPORT
REHABILITATION OF DEICING STORAGE FACILITIES

CHEMICAL BUILDING CONTROL WIRING SCHEMATICS

ELECTRICAL

ARCADIS Project No. B0001738.0004

Date: APRIL 2018

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E-203

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CKT NO.	TRIP AMPS	DESCRIPTION OF LOAD	KVA PER PHASE			AMPS	LOAD KVA	DESCRIPTION OF LOAD	TRIP AMPS	CKT NO.	
			A	B	C						
1	20	AUTODIALER	0.02	0.2	1	7.5	0.9	ELECTRICAL ROOM RECEPTACLES	20	2	
3	20	SPARE			1			<FAULTY BREAKERS>	20	4	
5	20	SPARE			1			ELECTRICAL ROOM LIGHTS	20	6	
7	20	INSTRUMENTATION PANEL	0.1	0.8	1	1.9	0.23	MECHANICAL ROOM LIGHTS	20	8	
9	20	INSTRUMENTATION PANEL PIC	0.06	0.5	1	6.0	0.72	MECHANICAL ROOM RECEPTACLES	20	10	
11	20	SPARE			1			OUTDOOR LIGHTS	20	12	
13	20	HEAT TRACING & RECEPTACLE	1	8.3	1	1.1	0.13	EXHAUST FAN EF-1 & DM-1	20	14	
15	20	FLOW METER VAULT RECEPTACLE	0.18	1.5	1	1.1	0.13	3 WAY VALVE OPERATOR	20	16	
17	20	TANK & LAGOON FLOW METERS	0.02	0.2	1	1.4	0.5	EXHAUST FAN EF-2 & DM-2 (LAGOON TANK)	20	18	
19	20	LEY CREEK FLOW METER	0.14	1.2	1			3-WAY VALVE (LOAD)/RECIRC	20	24	
21	20	LAGOON #1 HEAT RECEPTACLE SPARE			1						
23	20	LAGOON #2 HEAT RECEPTACLE SPARE			1						
25	20	LAGOON #3 HEAT RECEPTACLE SPARE			1						
27	15	AIR COMPRESSOR			3						
33	20	WIRELESS			1			SOLENOID	20	30	
35	20	<SPACE>			1			MAGFLOW ACTUATOR PANEL	20	32	
37	20	<SPACE>			1			HOT WATER TANK	20	34	
39	20	<SPACE>			1			PIT (SUMP PUMPS, ELECTRIC ACTUATED)	20	36	
41	20	<SPACE>			1			MOTORIZED VALVE/VENT FAN AND LIGHT	20	38	
TOTAL KVA			2.9	1.4	0.9	SERVICE CHARACTERISTICS				A MILO	
GRAND CONNECTED TOTAL KVA			5.2			VOLTS: 208Y/120				150 A MCB	
GRAND CONNECTED TOTAL KVA			5.2			PHASE: 3				A MCB	
GRAND CONNECTED TOTAL KVA			5.2			WIRE: 4				A MCB	
GRAND CONNECTED TOTAL KVA			5.2			10k MIN A/C SYMM, FULLY RATED ASSEMBLY				A MCB	

Existing LP (Demo)

PANEL
LOCATION: Control Building
BUILDING

NOTES

CKT NO.	TRIP AMPS	DESCRIPTION OF LOAD	KVA PER PHASE			AMPS	LOAD KVA	DESCRIPTION OF LOAD	TRIP AMPS	CKT NO.	
			A	B	C						
1	20	AUTODIALER	0.02	0.2	1	7.5	0.9	ELECTRICAL ROOM RECEPTACLES	20	2	
3	20	DEICING STORAGE TANK LV1 PNL	0.25	2.1	1			<FAULTY BREAKERS>	20	4	
5	20	GATE ACCESS AND SECURITY CP	1	8.3	1	1.9	0.23	ELECTRICAL ROOM LIGHTS	20	6	
7	20	INSTRUMENTATION PANEL	0.1	0.8	1	1.9	0.23	MECHANICAL ROOM LIGHTS	20	8	
9	20	INSTRUMENTATION PANEL PIC	0.06	0.5	1	6.0	0.72	MECHANICAL ROOM RECEPTACLES	20	10	
11	20	SPARE			1			OUTDOOR LIGHTS	20	12	
13	20	HEAT TRACING & RECEPTACLE	1	8.3	1	1.1	0.13	EXHAUST FAN EF-1 & DM-1	20	14	
15	20	FLOW METER VAULT RECEPTACLE	0.18	1.5	1	1.1	0.13	EXHAUST FAN EF-2 & DM-2	20	16	
17	20	TANK & LAGOON FLOW METERS	0.02	0.2	1	1.4	0.5	3 WAY VALVE OPERATOR	20	18	
19	20	LEY CREEK FLOW METER	0.14	1.2	1			3-WAY VALVE (LOAD)/RECIRC	20	24	
21	20	SPARE			1						
23	20	SPARE			1			SOLENOID	20	30	
25	20	SPARE			1			MAGFLOW ACTUATOR PANEL	20	32	
27	15	AIR COMPRESSOR			3			HOT WATER TANK	20	34	
33	20	WIRELESS			1			<SPACE>	20	36	
35	20	<SPACE>			1			PIT (SUMP PUMPS, ELECTRIC ACTUATED)	20	38	
37	20	<SPACE>			1			MOTORIZED VALVE/VENT FAN AND LIGHT	20	38	
39	20	<SPACE>			1						
41	20	<SPACE>			1						
TOTAL KVA			2.9	1.7	1.9	SERVICE CHARACTERISTICS				A MILO	
GRAND CONNECTED TOTAL KVA			6.5			VOLTS: 208Y/120				150 A MCB	
GRAND CONNECTED TOTAL KVA			6.5			PHASE: 3				A MCB	
GRAND CONNECTED TOTAL KVA			6.5			WIRE: 4				A MCB	
GRAND CONNECTED TOTAL KVA			6.5			10k MIN A/C SYMM, FULLY RATED ASSEMBLY				A MCB	

Existing LP (Proposed)

PANEL
LOCATION: Control Building
BUILDING

NOTES

CKT NO.	TRIP AMPS	DESCRIPTION OF LOAD	LOAD KVA	AMPS	POLES	KVA PER PHASE			AMPS	LOAD KVA	DESCRIPTION OF LOAD	TRIP AMPS	CKT NO.
						A	B	C					
1	15	EYEWASH SHOWER	0.2	1.7	1	0.2	1	0.2	1	0.2	SPARE	20	2
3	20	SPARE			1				1	0.0	SPARE	20	4
5	20	GFO RECEPTACLES (5 TOTAL)	0.9	7.5	1	1.2	1	2.3	1	2.3	INTERIOR LIGHTING (4 LEADS)	20	6
7	20	EXTERIOR LIGHTING (1 LED)	0.07	0.6	1	2.40	1	2.88	1	2.40	HEAT TRACE (SEE NOTE 1)	30	8
9	20	SPARE			1				1	0.0	SPARE	20	10
11	20	SPARE			1				1	0.0	SPARE	20	12
13	20	SPARE			1				1	0.0	SPARE	20	14
TOTAL KVA			1.4			SERVICE CHARACTERISTICS				A MILO			
GRAND CONNECTED TOTAL KVA			4.3			VOLTS: 240/120				100 A MCB			
GRAND CONNECTED TOTAL KVA			4.3			PHASE: 1				A MCB			
GRAND CONNECTED TOTAL KVA			4.3			WIRE: 3				A MCB			
GRAND CONNECTED TOTAL KVA			4.3			22k MIN A/C SYMM, FULLY RATED ASSEMBLY				A MCB			

CHM-LP

LOCATION: STORAGE TANK CHEMICAL BUILDING
BUILDING

NOTES

NOT TO SCALE

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING.

USE TO VERIFY FIGURE REPRODUCTION SCALE

Professional Engineer's Name
DAVID V. CAMARDA

Professional Engineer's No.
090411

Date Signed
04/16/18

Project Mgr.
JCP

State
NY

Designed by
WEH

Drawn by
WEH

Checked by
DC

Professional Engineer's Seal



SYRACUSE, NEW YORK • SYRACUSE HANCOCK INTERNATIONAL AIRPORT
REHABILITATION OF DEICING STORAGE FACILITIES

PANEL SCHEDULES

ELECTRICAL

E-402

ARCADIS Project No.
B0007738.0004

Date
APRIL 2018

ARCADIS OF NEW YORK, INC.
100 W. WASHINGTON STREET
SYRACUSE, NY 13202
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NOTE:

1. PROVIDE 30mA GROUND FAULT EQUIPMENT CIRCUIT BREAKER FOR HEAT TRACE CIRCUIT.

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