NIAGARA FRAMEWORK GUIDE SPECIFICATION
<INSERT PROJECT TITLE, RELEVANT INFORMATION>
<INSERT FACILITY NAME AND ADDRESS>

SECTION 25 00 00 – INTEGRATE

D AUTOMATION SYSTEMS (IAS)

NOTE TO USER:

<THIS SPECIFICATION DEFINES THE BASIC REQUIREMENTS FOR THE IMPLEMENTATION OF AN INTEGRATED AUTOMATION SYSTEM. PROJECT SPECIFIC DETAILS SHOULD BE ADDED AS REQUIRED TO CLARIFY INTENT AND SCOPE. THIS SPECIFICATION CAN BE AFFECTIVELY APPLIED WITHIN FACILITIES UP TO 100,000 SQUARE FEET. THE COMPLEXITY OF FACILITIES OVER 100,000 SQUARE FEET MAY REQUIRE A MORE DETAILED, MULTI-SECTION DIVISION 25 SPECIFICATION. COMPLEX FACILITIES LESS THAN 100,000 SQUARE FEET WITH COMPLICATED MECHANICAL AND ELECTRICAL SYSTEMS (E.G. DATA CENTERS) MAY ALSO BENEFIT FROM A MORE DETAILED SPECIFICATION. THE DETAILS PROVIDED WITHIN THIS SPECIFICATION MUST BE VERIFIED AND MODIFIED AS REQUIRED TO MEET THE UNIQUE REQUIREMENTS OF THE PROJECT. DO NOT USE ANY OF THE INFORMATION WITHIN THIS SPECIFICATION WITHOUT VERIFYING ITS RELEVANCE TO THE PROJECT DESIGN AND THE EQUIPMENT TO BE CONTROLLED.>

<THE INFORMATION INCLUDED WITHIN THIS SPECIFICATION MUST BE TIGHTLY COORDINATED WITH THE DESIGN DRAWINGS.>

PART 1 - GENERAL

1.01   RELATED DOCUMENTS

   A.   Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

   B.   Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

   C.   **<Add references to specific mechanical and electrical specification sections and any other project related documents>**

1.02   SCOPE OF WORK

   A.   This project requires the **<expansion of an existing or installation of a new>** Integrated Automation System constructed using a Niagara Framework **<or equivalent (if hard spec is not allowed)>** with **<LonWorks, BACnet, Modbus, Legacy>** Field Level Devices. The **<existing or new>** IAS shall utilize **<a single or multiple>** < **JACE 8000>** controller(s), **<networked with a Niagara Framework Web Supervisor (when multiple JACEs are necessary to address the point counts and resource limitations)>** and **<identify device type for existing or new systems>** control devices.

   B.   The Contractor will be required to perform the following:

      1.   Furnish, install, configure and commission a new Niagara Framework with **<LonWorks, BACnet, Modbus, Legacy>** fully programmable and application specific DDC controllers for the equipment identified in the IAS drawings **<state range of drawing numbers e.g. IAS-100 through IAS-504>,** including all components, software and applications required to meet the sequence of operation and the design/performance intent of the systems; **<Air Handling Units (AHUs), Exhaust Fans (EXs), Cabinet Unit Heaters (CUHs), Electric sub-meters>** and **<list all equipment to be controlled and/or monitored>.**

2. Provide Application Specific Controllers (ASCs) and Programmable Control Units (PCUs) as specified herein and as indicated on the IAS drawings. **<Coordinate with Design Drawings>** Provide I/O and ancillary devices as specified herein, as indicated on the IAS drawings, and as necessary to perform the sequences of operation. Provide **<LONMARK®, BTL or Niagara Framework-based>** certified products that communicate on **<free topology, MS/TP, bus topology, IP>** channels to meet the functional specifications.

3. Provide BACnet BTL AWS (Advanced Work Station) certification for the Control System Server (CSS). All Network Controllers (NCs) shall be BTL BBC certified.

4. Furnish and install electronic energy meters to monitor energy usage and measure the efficiency of energy use within the facility. **<specify type, accuracy and quantity>**

5. Furnish and install all low voltage step-down transformers with associated low voltage connections, power supplies and power/communication/input/output cabling necessary for the control system.

6. Provide and install a spare DLN communication cable at all **<Master or Peer to Peer>** control network locations. This cable shall be a separate color different than the color used for the primary operational bus. Run this spare cable parallel to the operating cable to and from each communicating device.

   <Installing a spare DLN cable is an insurance policy for design issues and communication problems, and is an asset for future needs. A spare DLN communication cable should be provided for all Master BACnet controllers or LonWorks devices to allow for cost effective expansion and rewiring in the event of an overloaded DLN. The spare cable represents a minimal increase in cost during implementation but could provide significant cost savings in the future. Identify this requirement in the IAS Drawings.>

7. Furnish and install conduit, junction boxes, fittings, panels, enclosures, and hardware as specified in these specifications, on the drawings and as required by Code.

8. Provide Graphical User Interface Development for all of the devices identified above and illustrated within the IAS drawings. **<Graphical User Interface development must match existing graphics, tool sets and features.>**

9. It is the contractor's responsibility to review all of the design documents and specifications and report any discrepancies to the owner.

1.03   GENERAL IAS INSTALLATION SCOPE OF WORK

A. Contractor shall implement a Niagara Framework based open system that will allow products from various suppliers to be integrated into a unified system in order to provide flexibility for expansion, maintenance, and service of the system. The **<Owner>** shall be the named license holder of all software associated with any and all incremental work on the project. Only Niagara Framework based products **<branded Vykon>** are acceptable.

B. The **<Owner>** shall receive ownership of all job specific configuration documentation, data files and application-level software developed for the project. This shall include all custom, job specific software code, databases and documentation for all configuration and programming that is generated for a given project and/or configured for use with the NAC, FMCS Server(s), and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required IDs and passwords for admin and programming level access to any component or software program shall be provided to the **<Owner>**.

C. It is the owner's intent to purchase an open system capable of being serviced and expanded by any acceptable system integrator that has and maintains certification (TCP) to work on Niagara Framework systems. The Niagara Compatibility Statement (NICS) for all Niagara Software shall allow open access and be set as follows: accept.station.in="*" accept.station.out="*" accept.wb.out="*" accept.wb.in="*". In any case, the **<Owner>** shall maintain the right to direct contractor to modify any software license, regardless of supplier, as desired by the **<Owner>**. The Contractor shall not install any "brand specific" software, applications or utilities on Niagara Framework based devices.

D. All hardware and field level devices installed, (i.e.; ASCs, PDUs), for the project shall not be limited in their ability to communicate with a specific brand of Niagara Framework device. They shall also be constructed in a modular fashion to permit the next generation and support components to be installed in replace of or in parallel with existing components.

E. Provide and install all wiring required for a complete system, including communication bus, analog points, digital points, low voltage power, emergency power, and spare communication bus. Splices are not permitted within the IAS FAC LAN or DLN communication cables. Only continuous bus topologies, MS/TP or continuous homeruns are allowed for these networks. Capacity of any bus shall be limited to 80% of the allowable device count to allow for future minor modifications or expansions to the network.

F. Provision of all documentation called out in these specifications including, but not limited to, submittals, O&M manuals, commissioning submittals, CAD based as-built documentation, and training manuals. Provide both hard copies and electronic files on electronic media.

G. Training of facility personnel, and or maintenance contractor, on the operation and maintenance of the system.

H. The repair of all finished surfaces effected as a result of IAS related installation work. This includes but is not limited to carpet, drywall, paint, ceiling tiles, furniture, and the like.

I. System point to point check out, verification and documentation. Assist the Owner/CxA, and/or TAB Firm in verification and functional performance testing and GUI acceptance testing.

J. Graphical User Interface Development. The Contractor shall develop the graphics, tools, features, and network integration as required.

1.04   CONTROL DIAGRAMS AND SCHEDULE

A. **<The control diagrams and schedules are an integral part of the control system design. Together the specifications, design drawings and schedules will provide a complete design. It is important that these documents be completed to a level of detail that will enable the performance expectations for the project to be realized. It is the design engineer's responsibility to insure the requirements of the open system are properly defined, referenced and enforced.>**

B. Refer to IAS and Mechanical, Design and As-Built Drawings for information on the components and intended control functions.

1.05   SEQUENCES OF OPERATION

A. Program each Niagara Framework Network Controller, and third party ASC, PCU, device, etc., to perform the sequences of operation provided on the construction documents **<coordinate with IAS drawings>**. Provide all necessary hardware on each piece of equipment in order for the equipment to perform the specified sequence and to meet the requirements of the point lists.

B. The Contractor shall be responsible for all control wiring connections, auxiliary devices and control wiring diagrams to complete the control system and attain the described sequence of operation.

1.06 CODES

A. Comply with all current codes, ordinances, regulations, and the City of **<????>** requirements.

1.07 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references: **<edit the following list as required>**

1. **<American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)**

2. **American National Standards Institute (ANSI)**

3. **UL 916: Energy Management Systems**

4. **LonMark International**

5. **BACnet Testing Lab>**

1.08 COORDINATION OF WORK WITH EXISTING CONDITIONS

A. Certain **<LONMARK®, BACnet®, MODBUS, and other>** products, systems and interface devices **<e.g. computer room air conditioners, ATS>** may be provided by other trades. Examine the Contract Documents to ascertain the requirements to install, wire, program, commission, and/or interface to these systems. Particular attention must be paid towards the interface boards submitted by the various equipment providers. It is the Contractor's responsibility to verify the submitted interfaces will integrate properly into the IAS. Report any discrepancies to the Owner.

B. Wherever work interconnects with work of other trades, coordinate with other trades and with the Owner's representative to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment.

C. Provide sleeves and conduit for passage of pipes, and wiring through structural masonry, concrete walls and floors, and elsewhere for the proper protection of the IAS work.

1.09 PARTS LIST

A. As part of the submittal, provide an accurate parts list including manufacturer, model number and quantity for all hardware and software.

1.10 DEFINITIONS AND ABBREVIATIONS

A. **<Clarify terms unique to the project, coordinate with IAS drawings>**

1.11 QUALITY ASSURANCE

A. Provide a Niagara Framework as the basis of the new IAS. The Contractor shall be fully certified in the development and customization of the Niagara Framework software.

B. All microprocessor based control products used shall conform to **<LONMARK® Certified Interoperability Standards, BTL Certified Standards, Modbus communication standards and/or Niagara Framework>**.

C. The IAS and components shall be listed by Underwriters Laboratories (UL 916) as an Energy Management System.

D. Functionality and Completeness: Contractor shall furnish and install all hardware, software and programming necessary to provide a complete and functioning system as specified. Contractor shall include all hardware, software and programming not specifically itemized in these Specifications, which is necessary to implement, maintain, operate, and diagnose the system in compliance with these Specifications.

1.12   INSTALLER'S QUALIFICATIONS

A. Installer's Qualifications: The Contractor shall have a successful history in the design and installation of Niagara Framework based Integrated Automation Systems to provide web browser monitoring and control of **<LONWORKS®, BACnet, Modbus>** field level devices. Contractor must demonstrate experience in IAS installations for not less than 5 years and in DDC installation projects with point counts equal to this Project and systems of the same character as this Project.

B. Installer's Experience with Proposed Product Line: Firms shall have specialized in and be experienced with the installation of the proposed product line for not less than one year from date of final completion on at least three (3) projects of similar size and complexity. Submittals shall document this experience with references. Provide evidence of Niagara TCP certification as part of the submittal process.

1.13   BID PACKAGE SUBMITTAL

A. Provide the following submittals as part of the bid package.

    1. Proposed device schedule including all hardware and software.

    2. Qualifications

    3. One-line diagram indicating how the new Niagara Framework network controllers will integrate with the **<existing>** IAS **<LONWORKS®, BACnet, Modbus>** field level devices.

    4. An overall sequence of the construction as it pertains to the installation of the Integrated Automation System.

1.14   SUBMITTALS

A. General: Submit under provisions of Division 01. **<Confirm that Division 1 will be provided or list requirements here>**.

B. Electronic Submittals: While all requirements for hard copy submittal apply, IAS control submittals and operation and maintenance (O&M) information shall also be provided in electronic format as follows:

    1. Drawings and Diagrams: Shop Drawings shall be provided on electronic media as an AutoCAD drawing per Owner's CAD standards.

    2. Other Submittals: All other submittals shall be provided in Adobe Portable Document Format

C. Qualifications: Manufacturer, Installer, and Key personnel qualifications as indicated for the appropriate items.

D. Submit a list of no less than three similar projects, which utilize the Niagara Framework **<or equivalent (if required)>** for Enterprise connectivity to provide an Integrated Automation System that consists of web-browser control and monitoring of the proposed **<LONWORKS®, BACnet, Modbus>** field level devices. These projects must be on-line and functional such that representatives from the Owner can observe the Integrated Automation System and Interface in full operation. Include proper references and contact numbers of these reference projects.

E. Submit validation which indicates the successful completion of the Niagara Framework TCP **<or equivalent (if required)>** certification course.

F. Submit resumes of installing staff indicating passing certificates for training on the **<LONWORKS®, BACnet, Modbus, Tridium TCP certification>** line of controls to be installed as part of this project.

G. GUI development software

1. Provide screen captures of graphical user interfaces developed by the Contractor on previous projects. These screen shots shall represent work performed by the contractor and not of the company from the line of controls which the Contractor represents. Provide client contact information for the Owner to validate.

H. Product Data: Submit manufacturer's technical product data for each Niagara Framework based Network Controller, control device, sensor, actuator, relay, panel, and accessory furnished, indicating dimensions, capacities, performance and electrical characteristics, and material finishes. Also include installation and start-up instructions.

I. Products: Within **<twenty one (21) days>** after date of execution of General Contractor/Sub-Contractor agreement, submit for acceptance a list of all material and equipment manufacturers whose products are proposed, as well as names of all subcontractors whom the Contractor proposes to employ.

J. Submit documentation indicating **<LONMARK®, NICs and/or BTL>** compliance and include Protocol Implementation Conformance (PIC) Statements.

K. Submit Shop Drawings for each control system.

L. Control Logic Documentation:

1. Provide a written description of each control sequence.

2. Include control response, settings, set points, throttling ranges, gains, reset schedules, adjustable parameters and limits as part of as-built documentation.

M. Submit an IAS Start-Up Test Agenda and Schedule for review and approval.

N. Record Documents:

1. Provide record copies of product data and control Shop Drawings updated to reflect the final installed condition.

2. Accurately record actual set points and settings of controls, final sequence of operation, including changes to programs made after submission and approval of Shop Drawings and including changes to programs made during specified testing.

3. Record copies shall include individual floor plans with device (controllers, routers, sensors, etc.) locations with all interconnecting wiring routing including space sensors, LAN wiring, power wiring, low voltage power wiring.

1.15   SYSTEM ARCHITECTURE

A. The system provided shall incorporate hardware and software resources sufficient to meet the functional requirements of these Specifications. The Facility Local Area Network (FAC LAN) and Device Level Network (DLN) shall be based on industry standard open platforms as specified herein and utilize commonly available operation, management and application software. All software packages and databases shall be licensed to the Owner to allow unrestricted maintenance and operation of the IAS. Contractor shall include all items not specifically itemized in these Specifications that are necessary to implement, maintain, and operate the system in compliance with the functional intent of these Specifications.

B. The system architecture shall **<expand on the existing or implement a new>** building IAS which is based on the Niagara Framework and consists of an Ethernet-based, wide area network (WAN), a single Local Area Network (LAN) that supports NCs, PCUs, ASCs, Operator Workstations (OWS), Smart Devices (SD), and Remote Communication Devices (RCDs) as applicable.

1. **<WAN: Internet-based network connecting multiple facilities with a central data warehouse and server, accessible via standard web-browser. This is an existing infrastructure and Contractor is not required to configure any components of this WAN.>**

2. Facility Local Area Network (FAC LAN): The FAC LAN shall be an Ethernet-based, 10/100/1000 Ethernet LAN connecting Local NCs, IAS Server and OWSs. The FAC LAN serves as the backbone for the NCs communications path **<and as the connection point to the WAN>**. Contractor shall provide a FAC LAN as a dedicated LAN for the control system. LAN shall be IEEE 802.3 Ethernet over Fiber or Category 6 cable with switches and routers that support 1000base-T gigabit Ethernet throughput.

3. Device Level Network (DLN): Network used to connect PCUs and ASCs. These shall be **<Peer to Peer or Master/Slave>** devices as defined in the **<LONMARK® Interoperability, Sedona or BTL>** standard. Network speed shall be **<78K bits per second (LonWorks), 19.2K bits per second (MODBUS), Varies (BACnet)>**.

4. ARCnet and/or Token-Ring based FAC LANs and DLNs shall not be acceptable.

C. Remote Data Access: The system shall support the Internet Browser-based remote access to the building data. The IAS contractor shall coordinate with the Owner's IT department to insure all remote browser access (if desired by the owner) is protected with the latest Niagara Software updates and a VPN (Virtual Private Network) <u>must be installed</u> to protect the owner's network from cyber attacks.

D. Browser-based access: A remote/local user using a standard browser will be able access all control system facilities and graphics via the WAN or direct connection, with proper username and password. Only native Internet browser-based user interfaces (HTML5, Java, XML, CCS3 JAVA Script, etc.) that do not require plug-ins (thin clients) are acceptable. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™, Firefox™ or Chrome™.

E. The communication speed between the controllers, LAN interface devices, CSS, and operator interface devices shall be sufficient to ensure fast system response time under any loading condition.

F. Niagara Framework Control Systems Server (CSS): A server that maintains the systems configuration and programming database. It shall allow secure multiple-access to the control information.

G. Systems Configuration Database: The system architecture shall support maintaining the systems configuration database on a server that resides on the FAC LAN. User tools for DLN and FAC LAN management shall be provided and licensed to the Owner and shall allow unrestricted configuring, updating, maintaining, and expanding of all current devices, configurations and settings.

H. Database Schema shall be published and provided to the Owner to facilitate easy access to DLN and FAC LAN data.

1.16   SUBSTITUTIONS

A. Wherever the words "for review" or "for acceptance" are used in regard to manufactured specialties, or wherever it is desired to substitute a different make or type of apparatus for that specified, submit all information pertinent to the adequacy and adaptability of the proposed apparatus to the Owner's Representative and secure their approval before the apparatus is ordered. Refer to general condition requirements for substitutions.

1.17   WARRANTY

A. The entire IAS and all ancillary equipment required for its operation shall be free from defects in workmanship and material under normal use and service. If within 12 months from the date of substantial completion the installed equipment is found to be defective in operation, workmanship or materials, the Contractor shall replace, repair or adjust the defect at no cost to the Owner.

B. The warranty period for work and systems of this project shall commence after written notification of Owner's final acceptance.

C. Corrective software modifications made during warranty service periods shall be updated on all user documentation and on user and manufacturer archived software disks.

D. The Owner reserves the right to make changes to the IAS during the Warranty Period. Such changes do not constitute a waiver of warranty. Contractor shall warrant parts and installation work regardless of any such changes made by Owner, unless the Contractor provides clear and convincing evidence that a specific problem is the result of such changes to the IAS.

E. At no cost to the Owner, during the Warranty Period, Contractor shall provide maintenance services for software including all current software updates, firmware and hardware PRODUCTS. Prior to the closeout of the warranty period, the IAS contractor shall meet with the owner's representative to address any questions or concerns and offer ongoing Software Maintenance Services to the owner.

1.18   GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

1.19   MANUFACTURERS

A. Acceptable Manufacturers – Network Controllers

1. Vykon Niagara 4.3 Framework JACE 8000 or most current revision.

      2. **<Equivalent Niagara Framework based product line approved by the Owner's representatives>**

1.20　MATERIALS AND EQUIPMENT

    A.　Materials shall be new, the best of their respective kinds without imperfections or blemishes, and shall not be damaged in any way. Used equipment shall not be used in any way for the permanent installation except where Drawings or Specifications specifically allow existing materials to remain in place.

    B.　All Niagara hardware and software shall be Vykon.

    C.　The make and model of **<network switches, routers, ups, control system server computers, personal computers (PC), notebook PC's, and monitors>** shall comply with Owner's current standards as of the date of Substantial Completion. Contact Owner for the current hardware standards.

    D.　**<List important field device, input and output requirements including specifications for critical sensors, actuators, valves, relays, etc.>**

1.21　STAND-ALONE FUNCTIONALITY **<KEY FEATURE THAT SHOULD BE INCLUDED FOR RELIABILITY, INTEROPERABILITY AND SUSTAINABILITY>**

    A.　The Contractor shall furnish and install single controllers with the physical and software resource count for standalone operation of each piece of equipment **<(e.g. AHU, MAU, VAV, etc.)>**. The sequence of operation and required points for control shall reside on a single controller. Remote I/O modules (via a field wired communications bus) are not acceptable for points required to achieve the sequence of operation. Expansion I/O modules plugged directly into the controller may be utilized for expansion.

1.22　THIRD PARTY INTERFACES

    A.　Manufacturer third party interfaces shall be limited to equipment which the IAS contractor cannot or has not been contracted to control directly via DDC controllers. This equipment shall include the following. **<CRAC, ATS, Energy Meters, Lighting Systems. Modify list to address project specific equipment that will be provided with third party interfaces>**

1.23　ENERGY MANAGEMENT APPLICATIONS

    A.　The IAS shall have the ability to perform energy management routines via preprogrammed function blocks or template programs.

    B.　**<Define required energy management routines and acceptable software applications>**

1.24　UNIFORMITY

    A.　To the extent practical, all equipment of the same type serving the same function shall be identical and from the same manufacturer

PART 2 - EXECUTION

2.01　PREPARATION

    A.　Examine areas and conditions under which control systems are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

B. These specifications call out certain duties of the Contractor and any subcontractor(s). They are not intended as a material list of all items required by the Contract.

2.02 INSTALLATION

A. Utilize licensed electricians for all new and retrofitted electrical distribution systems and comply with Division 26 electrical specifications.

B. Provide related items and work indicated on the IAS Drawings and items and work called for in this Division of the Specifications. This includes all incidentals, equipment, appliances, services, hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete systems. Perform start up, configuration, programming and commissioning coordination on each control product and system to provide fully operable systems in accordance with the specified functional performance.

C. Installation shall be in accordance with manufacturer's published recommendations and shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

D. The IAS Drawings show the general arrangement of the respective systems. Follow these Drawings as closely as actual building construction and the work of other trades will permit. Provide devices, power, fittings, sensors, controllers, wiring and accessories, which may be required but are not shown on the Drawings or specified herein. The Contractor shall be responsible for achieving the sequence of operations and intent of the system design.

E. All installation shall be in accordance with manufacturer's published recommendations.

F. Limit LAN cable lengths to no longer than 80% of the longest dimension published by the manufacturer of the cable between the most remote network nodes.

G. Comply with all rules, guidelines and procedures defined by the owner's IT authority.

2.03 DIGITAL CONTROL PANELS, CONTROLLER QUANTITY AND LOCATION

A. Individual Digital Control Panels (DCP) are referenced to indicate allocation of points to each DCP and DCP location. Digital control panels shall consist of one or multiple controllers to meet requirements of this Specification.

B. Contractor shall extend power to the DCP from an acceptable power panel (coordinate with Division 26).

2.04 NETWORK MANAGEMENT FUNCTIONAL REQUIREMENTS

A. Contractor shall thoroughly and completely configure IAS system control devices, software, supplemental software, application programming, network communications, CSS, OWS, remote operator workstations, portable operator's terminal, printer, and network communications to permit the functional requirements of the IAS herein specified. The setup shall include as a minimum the following network management procedures:

1. Automatic backup of the DDC System database to appropriate media.

2. Program, load and debug all software installations, including integration of third party applications (e.g. analytics and energy management).

3. Network user auditing routine.

2.05   SURGE PROTECTION

    A. Contractor shall furnish and install any power supply surge protection, filters, etc. as necessary for proper operation and protection of all NCs, operator interfaces, printers, routers and other hardware and interface devices. All equipment shall be capable of handling voltage variations 10 % above or below measured nominal value, with no affect on hardware, software, communications, and data storage.

2.06   CONTROL POWER SOURCE AND SUPPLY

    A. IAS Contractor shall provide all power source wiring required for operation of all equipment and devices provided under Division 25 and the IAS Drawings.

2.07   PRODUCT DELIVERY, STORAGE, HANDLING, PROTECTION AND CLEANING

    A. All products and materials shall be new, clean, and free of defects, damage and corrosion.

    B. Ship and store products and materials in a manner which will protect them from damage, weather, and entry of debris until final acceptance.

2.08   SITE CLEAN UP

    A. At conclusion of each day's work, and at the request of the owner, clean up and remove from the site all rubbish, debris and trash accumulated during the day as a result of work of the Contractor.

    B. Marks on walls or ceiling tiles caused by the Contractor shall be cleaned by the Contractor. Ceiling tiles, drywall, carpet, paint, and all architectural finishes damaged by the Contractor shall be replaced by the Contractor.

2.09   IAS CONTRACTOR'S CHECK OUT (CCO) START-UP TESTING, ADJUSTING, CALIBRATION

    A. Work and/or systems installed under this Division shall be fully functioning prior to Demonstration and Acceptance Phase. Contractor shall conduct the CCO which addresses the start-up, testing, adjustments, and calibrations of all work and/or systems under this Contract.

    B. All CCO testing procedures shall be documented in the CCO report to be provided by the contractor to the Owner/CxA.

2.10   SUMMARY OF IAS ACCEPTANCE PROCEDURE

    A. Submit product data, Shop Drawings, logic documentation, and sample graphics to the Engineer of Record, and receive approval.

    B. Install IAS. Obtain Owner/CxA ((**commissioning authority) if the project has a CxA)** acceptance of each phase of installation when installation consists of a renovation in an occupied space.

    C. Submit as-built record documents.

    D. Provide the Owner/CxA an agenda and schedule of CCO testing activities for approval and coordination.

    E. Provide written notice that the system is ready for Owner acceptance testing. Schedule IAS Demonstrations and Owner/CxA Commissioning.

F.   Demonstrate IAS systems to Owner/Engineer. Perform functional performance testing including sequence of operation, point to point verification to graphical interface, historical data logging, and alarms.

G.   Owner/CxA to provide detailed punch list to contractor.

H.   Contractor to repair issues on Owner/CxA punch list in seven (7) calendar days.

I.   Contractor provides all usernames, passwords, software, GUI, databases, licenses, and application programming tool(s) to the Owner.

J.   Contractor Trains Owner on all aspects of the IAS including architecture, devices, software, final sequences and modes of operation.

K.   Owner issues letter to contractor declaring that system is substantially complete. Date of this letter starts the warrantee period,

L.   Revise and re-submit as-built record Drawings and O&M Manuals.

M.   Final Acceptance. Owner issues letter to contractor accepting system.

<div align="center">END OF SECTION 25 00 00</div>