



DESIGN AND CONSTRUCTION GROUP
THE GOVERNOR NELSON A. ROCKEFELLER
EMPIRE STATE PLAZA
ALBANY, NY 12242

ADDENDUM NO. 2 TO PROJECT NO. 44219-C

**PROJECT LABOR AGREEMENT PROJECT
CONSTRUCTION WORK
PROVIDE CONVERSION OF 8TH FLOOR TO ANIMAL LAB
BUILDING NO. 4
NEW YORK PSYCHIATRIC INSTITUTE
1051 RIVERSIDE DRIVE
NEW YORK, NY 10032**

November 3, 2016

NOTE: This Addendum forms a part of the Contract Documents. Insert it in the Project Manual. Acknowledge receipt of this Addendum in the space provided on the Bid Form.
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SPECIFICATION GROUP

1. DOCUMENT 013200 CONSTRUCTION PROGRESS DOCUMENTATION: Discard the Section bound in the Project Manual.
2. DOCUMENT 013113 PROJECT SCHEDULE: Add the accompanying section (pages 013113 – 1 thru 013113 – 10) to the Project Manual.
3. SECTION 011100 SAFETY: Add the accompanying document (pages 011100 – 1 thru 011100 – 3) to the Project Manual.
4. SECTION 087100 FINISH HARDWARE: Discard the Section bound in the Project Manual and substitute the accompanying Sections (pages 087100 – 1 thru 087100 – 23) noted “ADDENDUM #2_10-24-16”.
5. Page 088100-6, Subparagraph 3.05 A. 3.: Delete “Where required replace operating hardware.”
6. Page 211318-3, Change paragraph 2.02 H. a. to Read:
 - a. Fenwall PSD-7156 or equal Notifier, Siemens photoelectric smoke detector.
7. Page 230900-3, Change Paragraph 1.6 10. To Read:
 - 10) Provide pricing for heat pump connection to BMS.
8. Page 230993-5, Article 1.7 F: Delete this Article in its entirety.
9. Page 230993-5, Change paragraph 1.7 G. 1. to read:
 1. Provide all available software points from VFD drive via BACnet MS/TP communication interface
10. Page 230993-11, Article 1.12 B. 3: Delete this Article in its entirety.

11. Page 233600-5, Change paragraph 3.5 A. to read:
 - A. Engage a factory-authorized service representative to train facility maintenance personnel to adjust, operate, and maintain air terminal units.
12. Page 260509-3, Change paragraph 3.02 C. to read:
 - C. Provide all empty conduits, pull boxes, junction boxes, cables and/or wiring, conduit sleeves, core drills, cable trays, grounding bars, grounding wiring and conduit, grounding of IT/security equipment racks, cable trays and empty conduits, fire retardant plywood, any additional 120V power outlets, data and communications outlets, etc. not shown on electrical drawings and associated with telephone/data, audio visual and security systems required for this project. During the bidding process, refer to telephone/data drawings (IT series), audio/visual drawings (AV series), security systems drawings (SEC series) and architectural drawings for their locations, quantities, installation details and the full extent of electrical work and responsibilities associated with each separate system. All the above listed devices, materials, etc. and associated labor required for their complete installation shall be included in the electrical bid price. During the bidding process and during construction coordinate electrical scope of work and responsibilities with the respective system trade contractor.
13. Page 260943-20, Change paragraph 2.12 A. 2. d. 1) to read:
 - 1) Ceiling-Mounted Dual Technology Sensor, 500 square feet (46 sq m): Coverage of 500 square feet (46 sq m) with ceiling height of 8 to 12 feet (2.4 to 3.7 m); 180 degree field of view; self-adaptive.
14. Page 260943-20, Change paragraph 2.12 A. 2. d. 2) to read:
 - 2) Ceiling-Mounted Dual Technology Sensor, 1000 square feet (93 sq m): Coverage of 1000 square feet (93 sq m) with ceiling height of 8 to 12 feet (2.4 to 3.7 m); 180 degree field of view; self-adaptive.
15. Page 260943-20, Change paragraph 2.12 A. 2. d. 3) to read:
 - 3) Ceiling-Mounted Dual Technology Sensor, 2000 square feet (186 sq m): Coverage of 2000 square feet (186 sq m) with ceiling height of 8 to 12 feet (2.4 to 3.7 m); 360 degree field of view; self-adaptive.
16. 265100 INTERIOR LIGHTING: Discard the Section bound in the Project Manual and substitute the accompanying Sections (pages 265100 – 1 thru 265100 – 19) noted “ADDENDUM #2_10-24-16”.
17. 270500 COMMON WORK RESULTS FOR COMMUNICATIONS: Discard the Section bound in the Project Manual and substitute the accompanying Sections (pages 270500 – 1 thru 270500 – 22) noted “ADDENDUM #2_10-24-16”.
18. 270800 COMMISSIONING OF COMMUNICATIONS: Discard the Section bound in the Project Manual and substitute the accompanying Sections (pages 270800 – 1 thru 270800 – 13) noted “ADDENDUM #2_10-24-16”.
19. 271100 COMMUNICATIONS EQUIPMENT ROOM FITTINGS: Discard the Section bound in the Project Manual and substitute the accompanying Sections (pages 271100 – 1 thru 271100 – 8) noted “ADDENDUM #2_10-24-16”.

20. 271500 COMMUNICATIONS HORIZONTAL CABLING: Discard the Section bound in the Project Manual and substitute the accompanying Sections (pages 271500 – 1 thru 271500 – 17) noted “ADDENDUM #2_10-24-16”.
21. Page 271600-2, Subparagraph 2.1 A. 4. A.: Change “Owner” to “Director’s Representative”.
22. Page 271600-3, Paragraphs 3.1 A. and 3.1 C. Change “Owner” to “State”.
23. Page 271600-4, Paragraphs 3.1 J., 3.2 B. and 3.2 C: Change “Owner” to “Director’s Representative”.
24. 280500 COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY: Discard the Section bound in the Project Manual and substitute the accompanying Sections (pages 280500 – 1 thru 280500 – 32) noted “ADDENDUM #2_10-24-16”.
25. Page 281300-1, Article 1.2. Delete this Article in its entirety.
26. Page 281300-8, Paragraph 2.1 E.: Change “Owner” to “Director’s Representative”.
27. Page 281300-9, Paragraphs 2.1 I. and 2.1 J.: Change “Owner” to “Director’s Representative”.
28. Page 281300-23, Change Paragraph 2.8 B. to Read:

“B. Provide 50 active cards and 50 non-active cards for temporary badge production.”
29. Page 281300-23, Change Paragraph 2.8 C. to Read:

“C. Provide 75 OMH SB-34H silk-screened lanyards. “
30. Page 281300-23, Change Paragraph 2.8 D. to Read:

“D. Provide 75 508-ZSJ with anti-print transfer material vertical card pouches. “
31. Page 281300-24, Change Paragraph 2.10 C. to Read:

“C. Magnetic Locks: Dorma EML 310DP. Refer to section 087100.”
32. Page 282000-1, Article 1.2. Delete this Article in its entirety.

- 33. Page 282000-6, Paragraph 2.1 D.: Change “Owner” to “Director’s Representative”.
- 34. Page 282000-9, Paragraph 2.1 R.: Change “Owner” to “Director’s Representative”.
- 35. 283105 MODIFICATIONS TO FIRE ALARM SYSTEM: Discard the Section bound in the Project Manual and substitute the accompanying Sections (pages 283105 – 1 thru 283105 – 20) noted “ADDENDUM #2_10-24-16”.

DRAWINGS

- 36. Drawing No. AR-100:
8TH FLOOR REMOVALS LEGEND, REMOVALS KEY, Revise note:
 - L. CAREFULLY DISASSEMBLE EXISTING RF SHIELDED ACOUSTIC TEST BOOTHS COMPOSED OF HEAVY STEEL PANELS AND PLATFORMS. SALVAGE PANELS AND PLATFORMS PER INSTRUCTION OF DIRECTOR’S REPRESENTATIVE. FILL FLOOR DEPRESSION TO ALIGN W/ EXISTING FLOOR LEVEL. SEE CONSTRUCTION DRAWINGS.
- 37. Addendum Drawing:
 - a. Drawing SK-A-01 accompanies this Addendum and forms part of the Contract Documents
- 38. Drawing No. I-100: Change Ceiling Finish in Room 8-45 to “HBGC-1-CL”.
- 39. Drawing No. MR-101:
 - a. Delete coded note #5.
- 40. Drawing No. M-101
 - a. CONSTRUCTION NOTES, delete note #2.
 - b. CONSTRUCTION NOTES, revise note #5.
 - 1. CONTRACTOR TO SEAL EXISTING SUPPLY, RETURN, AND EXHAUST DUCTWORK.
- 41. Drawing No. M-104:
CONSTRUCTION NOTE #2: Delete “Provide allowance for replacement if dampers are found deficient.”
- 42. Drawing No. M-600:
 - a. Water Source Heat Pump Schedule: Change Note 5 to read: “Provide pricing for heat pump connection to BMS.”
- 43. Revised Drawings:
 - a. Drawing Nos. E-003, E-501, E-502, E-503, E-504, E-505, E-506, E-507, E-508, E-509, FA-001, FA-003 and FA-101, noted “ADDENDUM #2 10/24/2016” accompany this Addendum and supersede the same numbered originally issued drawings.
- 44. Drawing No. E-101:
 - a. GENERAL NOTES, revise note:

5. FOR LIGHTING CONTROL WIRING DIAGRAMS, SCHEMATICS, AND ADDITIONAL INFORMATION REFER TO DRAWINGS E-503 THROUGH E-509.

b. KEY NOTES, revise note#5:

AS REQUESTED BY THE DIRECTOR'S REPRESENTATIVE, IN ROOMS WHERE THIS KEY NOTE IS INDICATED, NO AUTOMATIC LIGHTING CONTROLS VIA LOCAL OCCUPANCY/VACANCY SENSORS (AUTOMATIC LIGHTS 'OFF') SHALL BE PROVIDED IN THESE ROOMS. IN THESE ROOMS, LIGHTING FIXTURES AUTOMATIC SHUT OFF SHALL BE ACCOMPLISHED VIA THE CENTRAL LIGHTING SYSTEM AND SPECIAL PROGRAMMING AT THE LIGHTING CONTROL PANEL, AT THE TIMES INDICATED BY THE DIRECTOR'S REPRESENTATIVE (AFTER NORMAL WORKING HOURS); COORDINATE WORK WITH DIRECTOR'S REPRESENTATIVE.

45. Drawing No. FA-002:

a. FIRE ALARM RISER DIAGRAM NOTES, revise note:

19. ALL NEW FIRE ALARM WORK SHOWN SHALL COMPLY WITH 2010 NYS BUILDING CODE. ELECTRICAL WORK SHALL COMPLY WITH 2008 NEC. ALL FIRE ALARM CIRCUITS SHALL BE SUPERVISED.
ALL REQUIRED MODIFICATIONS, ADDITIONS (BOOSTER POWER SUPPLIES, STROBE PANELS, ETC.), EXPANSIONS, PROGRAMMING OF THE EXISTING FIRE ALARM SYSTEM (EXISTING FACP) AND/OR EXISTING ASSOCIATED DATA GATHERING PANELS (DGP'S), AND ADDITIONAL CONNECTIONS (FIRE ALARM CABLES AND CONDUITS) IN ORDER TO ACCOMMODATE ALL FIRE ALARM DEVICES SHOWN AND TO COMPLY WITH 2014 CODE REQUIREMENTS SHALL BE PROVIDED UNDER THIS CONTRACT. ELECTRICAL CONTRACTOR SHALL COORDINATE ALL FIRE ALARM RELATED WORK WITH THE FIRE ALARM VENDOR AND SHALL INCLUDE IN HIS BID PRICE ALL REQUIRED ELECTRICAL AND FIRE ALARM COSTS TO COMPLY WITH 2014 BUILDING CODE.

46. Drawing No. P-300:

a. AUTOMATED WATERING SYSTEM, revised note:

THE FOLLOWING REQUIREMENTS MUST BE PROVIDED BY PLUMBING CONTRACTOR FOR INSTALLATION TO BE COMPLETED.

b. DUAL PURPOSE FLUSH STATION (MODEL 6400) R.H. & CHLORINE INJECTION STATION (MODEL 302), revised note:

CONDUIT AND FITTINGS (NEMA 4 OR 12) TO CONNECT TO GROUND FAULT PROTECTED CIRCUIT (ONE CIRCUIT 120 VAC, 60HZ, 120 WATTS WITH TWO SEPARATE LINES TO CONTROLLER)

END OF ADDENDUM

Margaret F. Larkin
Executive Director

SECTION 011100

SAFETY

PART 1 GENERAL

1.01 SUMMARY

- A. This section requires compliance with applicable Safety codes, standards and regulations, including but not limited to OSHA, Building Code of New York State, Fire Code of New York State, and Facility Regulations.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Summary of the Work: Section 011000.
- B. Regulatory Requirements: Section 014100.

1.03 DEFINITIONS AND ABBREVIATIONS

- A. OSHA: Occupational Safety and Health Administration.
- B. BCNYS: Building Code of New York State.
- C. EBCNYS: Existing Building Code of New York State.
- D. FCNYS: Fire Code of New York State.
- E. NFPA: National Fire Protection Association.
- F. NFPA 70E: National Fire Protection Association Standard for Electrical Safety in the Workplace.

1.04 SUBMITTALS

- A. Provide a SITE SPECIFIC SAFETY PLAN no later than 15 days after approval of the Contract by the Comptroller. The plan must include at a minimum:
 - 1. A program providing 100% hard hats and safety glasses, as well as other personal protective equipment (PPE), i.e. dust protection, noise protection, safety vests, etc.
 - 2. A program for assuring employees have proper work attire, i.e. substantial sole safety toed footwear, long pants, shirts with minimum 4" sleeves, etc.
 - 3. A 100% 6-foot conventional fall protection program which provides full body harnesses, lanyards, and guardrails when applicable.
 - 4. A program for training employees.
 - 5. A program for Confined Space, including procedures for entry, when applicable.
 - 6. A program for High Hazard Assessment including procedures for all high hazard work activities, i.e. critical lifts involving cranes or material

- handling equipment, scaffolding, demolition, excavations, hot work activities, steel erection, and roofing. A pre-task meeting is required to verify all hazards will be addressed.
7. A list of the names of all competent and/or qualified persons, including their qualifications, for each activity requiring a competent person, i.e. excavations, scaffolding, rigging, fall protection, etc.
 8. The name and contact information of the Company Safety Representative.
 9. A program for project safety inspections, with a minimum of one documented safety inspection per week during the course of construction. Submit copies of all resultant inspection reports to the Director's Representative on a weekly basis.
 10. A program for providing proper care for injured employees, including the name of the employee with First Aid/CPR certification who will be on site at all times during the course of construction.
 11. A program for providing potable water and sanitary toilet services for all employees.
 12. A program for addressing heat stress during high heat periods and/or cold stress during extreme cold periods, for employees exposed to these elements during the course of construction.
 13. A program for record keeping per OSHA 1904.
- B. Provide safety orientation training for each employee prior to their starting work on site. This orientation shall include but not be limited to; Fitness for Duty (drug and alcohol policies), training on general safety hazards, site specific safety policies and procedures, personal protective equipment, injury reporting and protocols, emergency evacuation and preferred medical providers, and, HAZCOM (GHS Harmonization). Provide documentation of all safety orientation training for each new employee on the site, including all subcontractors, to the Director's Representative.
- C. Provide copies of all employee training and certifications related to the safe performance of activities, i.e. OSHA 10 hour certifications, forklift training, powder actuated tool training, aerial lift training, etc., to the Director's Representative.
- D. Provide an Emergency Action and Evacuation Plan, including Fire Protection and Emergency Response, when applicable.
- E. Accident Reporting: the Director's Representative shall be immediately notified of any and all accidents. A copy of a written accident report shall be furnished to the Director's Representative within 24 hours of incidents.
- F. Where Work or related staging, storage, or temporary use of areas outside the boundaries of state property are required, comply with the rules, regulations and all applicable safety codes of the applicable municipality.

1.05 STOP WORK ACTIVITY AUTHORITY

- A. All NYS D&C OGS employees and/or their direct representatives have the authority to stop a work activity that exposes any Contractor employees,

consultants, or other visitors to potentially serious injury and/or illness. The responsible Contractor shall immediately cease work, perform an assessment of the activity that is exposing employees to any Immediately Dangerous to Life or Health (IDLH) conditions, and take action necessary to satisfactorily address the unsafe condition(s) at no cost to the State. The activity may only resume when the NYS D&C OGS representative or the Director's Representative and respective Contractor's Safety Representative verify corrective measures have been satisfactorily completed. Any related impact to time of completion shall be considered within the Contractor's control.

- B. **No Work, other than mobilization, shall commence until the Site Specific Safety Plan is approved.**

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 013113

PROJECT SCHEDULE

PART 1 GENERAL

1.01 RELATED REQUIREMENTS AND INFORMATION SPECIFIED ELSEWHERE

- A. Summary of Work: Section 011000.
- B. Administrative Requirements: Section 013000.
- C. Project Meetings: Section 013119.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements to plan, schedule, and document the progress of the Project, and predict and prevent delays to established activities and milestones during performance of the Work.

1.03 SUBMITTALS

- A. Waiver of Submittals: The “Waiver of Certain Submittal Requirements” in Section 013300 does not apply to this Section.
- B. Schedule Submittals:
 - 1. Initial Spreadsheet
 - 2. CMU 01 Agreement Form

1.04 DEFINITIONS

- A. Project: Work to be performed as part of one or more Contracts.
- B. Project Team: Persons acting on behalf of the State or Contractors in an effort to successfully plan, schedule, and coordinate the Work of the Project.
- C. Schedule: A comprehensive leveling of necessary procedural tasks, the sequencing of those tasks, and the incorporated resource allocation required to successfully complete the Work by the Project completion date.
- D. Activity: A task or grouping of tasks containing an anticipated start-date and corresponding duration, comprising a generalized portion of the Work, that can be identified and measured for planning, coordinating, monitoring, and controlling the project.
- E. Milestone: A significant start or finish to Work on the Project defined by both the Director’s Representative and the Contractors.

- F. Bid Milestones: Milestones or phases identified and included in the Contract Documents to be utilized by the Contractors and Project team in developing the Baseline Project Schedule.
- G. Spreadsheet: The electronic Excel© file provided to the Contractors for establishing activities, anticipated start, duration, predecessors, successors, and budgeted cost for Work of the Project.
- H. Baseline Project Schedule: The Activities and their prescribed durations recognizing the completion of the Work of the Project in accordance with the Contract duration and approved by the Director's Representative and Contractors.
 - 1. Updates to the Baseline Project Schedule, including but not limited to starts, finishes, and activity percent complete, as agreed upon at the Project Schedule meeting by the Contractors and the Director's Representative, shall be defined as the Project Schedule.
 - 2. The Baseline Project Schedule will remain unaltered as a tool to measure progress outlined and anticipated during the initial Project Schedule meeting.
- I. Float: The measure of latitude in starting and/or completing an activity without impeding on the successful realization of Project milestones.
 - 1. Float time is not for the exclusive use or benefit of either the State or the Contractors, but is a jointly owned expiring Project resource; float is available as needed to meet scheduled milestones and Project completion.
 - 2. Recognizing float within an activity, or chain of activities, does not permit the Contractors to disrupt progress or delay completion of an activity.
- J. Resource: Any labor, material, or equipment, shared or exclusive, required for the completion of an Activity or the Work, which recognizes an associated cost.
- K. OGS Scheduling: A member of the OGS Scheduling Department responsible for importing, updating, analyzing, reviewing, and interpreting schedule related information for the Project team to ensure compliance with this or related sections.

1.05 DEVELOPMENT OF THE PROJECT SCHEDULE

- A. An electronic file is available to the Contractors and is to be utilized to assist in completing the Baseline Project Schedule. This file is an Excel© spreadsheet exported from the Scheduling Software and requires the completion of six specified columns including activity name, original duration, anticipated start, predecessor, successor, and budgeted cost.
 - 1. Failure to acquire the file by request upon Project Award will not excuse the required submission times as noted within the section.
 - 2. Contractors may submit initial planning schedule in format compatible with the State's Scheduling Software to be utilized in developing the Baseline Project Schedule in lieu of the Spreadsheet.

- B. The Contractors will complete the Spreadsheet with information relating to activity naming, duration, anticipated start date, predecessor, successor, and budgeted cost and submit to the Director's Representative for review prior to the initial Project Schedule meeting.
- C. The Director's Representative will schedule the initial Project Schedule meeting within 15 calendar-days of Project Award. The meeting will include members of the Project team and will be conducted by OGS Scheduling for the purpose of reviewing the Contractors' initial planning schedule, defining the intent of the specification, and realizing a schedule management strategy for all required iterations and reporting. The mutual agreements reached at this and subsequent meetings form the basis for the Baseline Project Schedule, and will be used for coordinating, scheduling, and monitoring the Work of all related contracts.
 - 1. OGS Scheduling will work with other members of the Project team to incorporate activities, task summaries, contractual or Project milestones, intermediate and critical milestones, and testing, inspection, or commissioning periods to assist in planning or coordination.
- D. The Contractors will sign the CMU 01 Agreement form (blank included in Document 013113) within five (5) calendar-days of final Baseline Project Schedule review and approval by the Director's Representative. Failure to complete and submit the Spreadsheets, develop the Baseline Project Schedule, and sign the CMU 01 Agreement form will not absolve the Contractors of the scheduling requirements. The Contractors will be required to provide the necessary resources, at no additional charge to the State, to complete the Project in the manner defined by the Director's Representative.
 - 1. The Baseline Project Schedule and CMU 01 agreement are to be completed within 45 days of Project Award. Failure by the Contractors to provide the required or requested information will result in the withholding of progress payments.
- E. A Baseline Project Schedule recognizing early completion will be reviewed by members of the Project team prior to acceptance.
- F. Bid Milestones are to be incorporated into the project schedule.

1.06 UPDATING THE PROJECT SCHEDULE

- A. Monthly Project Schedule meetings will be held to review updates to the actual starts, actual finishes, and the percent complete of in-progress activities, and consider logic changes, sequencing alterations, duration amendments, time impact events, and scope changes, for the purpose of determining the status of construction progress for the updated Project Schedule.
 - 1. During the progress of Work on the Project, the Contractors are required to document actual start, actual finish, and activity percent complete on a daily basis, and provide the information to OGS Scheduling in the manner defined during the Initial Project Schedule meeting.

2. The Contractors and Director's Representative will review the documented progress at the Project Schedule meeting prior to incorporating the information on the Project Schedule.
 3. Any Contractor failing to progress their Work as outlined in the updated Project Schedule will be informed of their deficiencies and, if required, be requested to provide a recovery option.
- B. The Contractors will furnish all schedule information requested by the Director's Representative. Any Contractor who fails to furnish accurate information during the Project Schedule meeting will be required to provide all resources necessary to execute the updated Project Schedule based on progress information documented and recorded by the Director's Representative.
- C. Project Schedule updates recognizing early completion will be reviewed by members of the Project team prior to acceptance of the Project Schedule update.

1.07 MAINTAINING SCHEDULE

- A. Perform the Work in accordance with the Project Schedule and provide resources necessary to maintain the progress of activities as scheduled so that no delays are caused to other Contractors engaged in the Work.
1. Should any Contractor fail to maintain progress according to the Project Schedule, or cause delay to another Contractor, that Contractor shall provide such additional manpower, equipment, additional shifts, or other measures, at their own cost, to bring their operations back on schedule.
 2. Performing activities as part of the Work out of sequence with the Project Schedule is not permitted unless written approval is obtained from the Director's Representative prior to commencement.

1.08 RECOVERY SCHEDULE

- A. Recovery Schedule: When periodic updates indicate the Work is 15 or more calendar-days behind the approved Baseline Project Schedule's Substantial or Physical Completion dates, the Contractors will present recovery options to the Director's Representative to be incorporated into an updated Project Schedule; these include, but are not limited to, allocating additional resources for activity duration reduction or modifying activity sequencing,
- B. Any Contractor failing to furnish recovery options to the Director's Representative for a Recovery Schedule within 10 calendar-days subsequent to the monthly Project Schedule update will be required to provide all resources necessary to execute an updated Project Schedule defined by the Director's Representative .
- C. Alterations to the Project Schedule by a Recovery Schedule will require the approval of the Contractors and the Director's Representative.
- D. Approved alterations to the Project Schedule by a Recovery Schedule, will constitute the updated Project Schedule.

1. The updated Project Schedule following the implemented Recovery Schedule will be recognized as the primary baseline schedule for reporting. The Baseline Project Schedule will be retained as a secondary baseline schedule and will be utilized to measure progress against the alterations.
- E. A Recovery Schedule recognizing early completion will be reviewed by the Director's Representative prior to acceptance of the Project Schedule update.

1.09 RESOURCE ASSIGNMENTS

- A. Resources recognizing the budgeted cost associated with all efforts necessary for the completion of a unique activity within the schedule, and the total cumulative cost of the Work of the Project, are to be assigned by the Contractors. All Contractors are responsible for providing the information necessary for assigning resources for the Baseline Project Schedule; all Contractors are responsible for reviewing the information.
- B. Resources recognizing the total Labor/Manpower and specialized equipment associated with all efforts necessary for the completion of a unique activity within the schedule network, and the cumulative curve associated with the Work of the Project, are to be assigned concordant with the intended means and methods proposed by the Contractors. All Contractors are responsible for providing the information necessary for assigning resources for the Baseline Project Schedule; all Contractors are responsible for reviewing the information prior to approval.

PART 2 PRODUCTS

2.01 SCHEDULING SOFTWARE

- A. Scheduling Software: Schedule is to be prepared utilizing the Spreadsheet, developed specifically to interface with the State's schedule program portfolio.
 1. The State's program portfolio utilizes Oracle's Primavera P6®.

2.02 SCHEDULE UPDATE REPORTS

- A. OGS Scheduling will submit the updated Project Schedule within five (5) calendar-days of the Project Schedule meeting utilizing the Scheduling Software.

PART 3 EXECUTION

3.01 PROJECT SCHEDULE

- A. The Contractors' will complete the Spreadsheet including all columns and rows within the form and submit to either the web collaborative site or Director's Representative, two (2) days prior to the initial meeting, in a manner appropriate to the development of the Baseline Project Schedule.

1. If compatible software is utilized, the Contractors will be required to provide all information applicable to the Spreadsheet, and in accordance with all submission requirements noted in this section or related sections.
- B. The Contractors will determine and define activities applicable to the Work of their Contract and the scope of the Project. Activities are to be appropriately placed within the Spreadsheet.
- C. Within 15 calendar-days of Project Award, the Contractor's will submit the completed Spreadsheet to be incorporated for the Baseline Project Schedule, encompassing the Work of the Project from Project Award through Physical Completion. The Project team will review the initial project schedule submissions at the Initial Project Schedule meeting and complete the Baseline Project Schedule.
 1. The Project team will recommend tasks or summaries appropriate to planning, scheduling and coordinating, including but not limited to: establishing a focused work breakdown structure (WBS), phasing requirements, identifying logical connections critical to Substantial and Physical completion, accounting for critical submittals or submission, fabrication, and delivery of long-lead materials, products, specialized equipment, or services, and recognizing critical testing, inspection, or commissioning durations for coordination and tracking.
- D. The Baseline Project Schedule is to be approved and the CMU 01 Agreement Form signed within 45 calendar-days of Project Award. Failure to complete the Spreadsheet, review the incorporated Spreadsheets and Baseline Project Schedule, and sign the CMU 01 Agreement Form will result in non-payment for Work progressing beyond 30 calendar-days subsequent to Project Award.
- E. Updates to the Project Schedule will be performed concurrent with Project Schedule meetings.

3.02 ACTIVITIES

- A. The Contractors are to provide activities which adequately represent the coordinating needs of the Project and scope of the Work.
 1. Each activity will identify the Contractors' anticipated start-date of the task or grouping of tasks, anticipated duration for the activity defined in work-days, and the budgeted cost of the activity.
 2. Activities are not required to realize an interlocking and dependent progression of the Work.
- B. The Contractors will identify each activity with a unique Activity Name. No Activity Name will be altered after the Baseline Project Schedule has been approved without written approval by the Director's Representative.
- C. The Project team will identify milestones, activities, or summary activities for incorporation into the Baseline or Project Schedule to assist in planning, scheduling, and coordinating the Project.

- D. The calendar utilized by the Baseline and Project Schedule for each activity will accurately reflect anticipated state and federal holidays as well as work being performed off-hours as defined in the Contract Documents and by the Director's Representative.

3.03 BASELINES

- A. OGS Scheduling will maintain a copy of the Baseline Project Schedule as the assigned project baseline schedule.

3.04 TIME IMPACT AND TIME IMPACT ANALYSIS

- A. OGS Scheduling will represent Time Impact to the Project Schedule milestones utilizing, at a minimum, a milestone event, an activity for resolution, and related work associated with the impact to the as-updated Work of the Project.
 - 1. OGS Scheduling and the Project team will use the most current Project Schedule update to prepare the Time Impact representation.
 - 2. If Project Schedules have not been updated in accordance with this specification, an update must be generated which includes an accurate realization of the Work performed and progressed up to the Time Impact event. Failure to maintain Project Schedule updates in accordance with this or related specifications will not absolve the Schedule Preparer or Contractors of the responsibility to identify Time Impact as defined at a minimum by this article.
 - 3. A Request for Time Extension will require Time Impact recognition within the CPM schedule.
 - 4. Time Impact events will be reviewed for accuracy and are to be updated in accordance with relevant new information regarding time for resolution and impact to remaining work on the Project.

3.05 REQUESTS FOR TIME EXTENSIONS

- A. The Contractors are to submit in writing to the Director's Representative a Request for Time Extension within ten (10) days of recognizing the need to amend the contractual Substantial or Physical Completion date.
 - 1. OGS Scheduling will provide Project Schedule reports, generated from the current Project Schedule update, recognizing the inability to complete the contractual, Project, or Bid Milestones by the established completion dates and a copy of the P6 file used to generate the reports.
 - 2. Submitting a Request for Time Extension does not permit the Contractors to delay Work on the current Project Schedule update.
- B. The Project team is to develop and submit CPM schedule options, in accordance with applicable requirements of this section, showing a milestone event, the time for resolution, the related work associated with the resolution or alternate options, and the newly projected Project and Bid Milestone dates.

- C. Requests for Time Extensions will be responded to within 15 calendar-days of receipt and the Contractors will be notified in writing of the refusal or acceptance of the request.
- D. Reasons for which extensions will be rejected upon receipt include, but are not limited to, the Contractors' failure to provide appropriate resources to complete the Work, misinterpretations of contract requirements, improper planning, failure to coordinate with other Contractors or the Director's Representative, misappropriated distribution of approved costs, payments, or budget for Project Work, failure to comprehend project schedule requirements, failure to provide Project Schedule updates consistent with the requirements of this or related sections, material procurement or delivery delays not associated with Special Events (*force majeure*), or subcontractor and worker related issues such as contractual disputes or work-stoppage strikes.
- E. Approved Request for Time Extensions will require the creation of a revised Project Schedule prepared by OGS Scheduling which will serve as the primary baseline

3.06 CONTRACTORS' OPTION

- A. The Contractors may elect, in writing, to utilize computerized software compatible with the Scheduling Software in place of the Spreadsheet and the OGS Scheduling provided service. Compatible software options include but are not limited to Microsoft Project Professional®, Asta PowerProject®, or P3®. If the Contractors resolve to utilize compatible software, one file is to be submitted encompassing the Work of all Contracts, and the selected compatible software file is to be submitted in the proper format for interfacing with the Scheduling Software. The Contractors will notify the Director's Representative, in writing, prior to proceeding with the Contractors' Option.
 - 1. The State will not be responsible for the Contractors' failure to properly review the compatibility properties or the requirements of this and related sections, and will not accommodate files submitted in an improper format.
 - 2. The Contractors will be responsible for complying with all requirements of this and related sections when coordinating the development or update of a Baseline or Project Schedule utilizing compatible software under the Contractors' Option.
 - 3. If the Contractors' elect to utilize compatible software, the Contractors will be responsible for all updating of the Project Schedule, obtaining approval of the updated activities actual start, actual finish, and activity percent complete by the Director's Representative, and submitting the properly formatted file for each update through Physical Completion; under this option, failure to create the Baseline Project Schedule, update the Project Schedule, obtain approval, or failure to submit the properly formatted file may result in withholding of payments.
 - 4. The State will not compensate any Contractor for the selection of this optional article during the compliance of this or related sections.
 - 5. Proceeding with this option will require the Contractors to assume at the role of OGS Scheduling as recognized within this section.

- B. If all Contractors elect to utilize compatible software, the Baseline Project Schedule is to be submitted within the parameters of this section and is to encompass the Work of all Contracts.
 - 1. If any Contractor fails or refuses to provide information for developing the Baseline Project Schedule, or if in the judgment of the Director's Representative the information provided does not adequately reflect the of Work of the Project, all Contractors will be deemed not to have provided the information necessary for development of the Baseline Project Schedule and payments may be withheld.
- C. The Contractors are not prohibited from developing a complete Project Schedule encompassing all Contracts utilizing the Critical Path Method.
 - 1. The Critical Path Method is a scheduling process used to plan and coordinate the Project, arranging activities based on logical relationships in order to create a network diagram of interconnected procedures.

END OF SECTION

PROJECT NO. _____

PROJECT NAME: _____

REPORT DATE: _____

REPORT NAME(S): _____

It is agreed that the Baseline Project Schedule defined by the above listed computer reports has been reviewed and is accepted for use in coordinating, scheduling, and monitoring the work of all related contracts.

EDIT THE CONTRACTOR SIGNATURE LINES BELOW TO REFLECT THE ACTUAL RELATED CONTRACTS FOR THE PROJECT.

FOR CONSTRUCTION WORK CONTRACTOR: _____ DATE: _____

FOR HVAC WORK CONTRACTOR: _____ DATE: _____

FOR PLUMBING WORK CONTRACTOR: _____ DATE: _____

FOR ELECTRICALWORK CONTRACTOR: _____ DATE: _____

FOR DIRECTOR'S REPRESENTATIVE: _____ DATE: _____

SAVE DATE: 10/21/2016 6:26 PM

PLOT DATE: 10/21/2016 7:43 PM

LOGIN: Minzicu, Michael

P:\Projects\Y130000\Y130501-000\Drawings\Elec\Y130501-000_E-001-E-003.dwg

ELECTRICAL GENERAL NOTES

- GENERAL NOTES, SYMBOL LIST AND DETAILS ARE APPLICABLE TO ALL ELECTRICAL DRAWINGS.
- ALL WORK IS NEW UNLESS OTHERWISE NOTED.
- DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS AND WORK. FOLLOW DRAWINGS IN LAYING OUT WORK AND CHECK DRAWINGS OF OTHER TRADES TO VERIFY SPACE CONDITIONS. MAINTAIN HEADROOM AND SPACE CONDITIONS.
- SECURE ALL SUPPORTS TO BUILDING STRUCTURE UTILIZING TOGGLE BOLTS (HOLLOW MASONRY), EXPANSION SHIELDS OR INSERTS (CONCRETE AND BRICK), MACHINE SCREWS (METAL), BEAM CLAMPS (FRAMEWORK), WOOD SCREWS (WOOD) OR PAN THRU STRAPS (METAL DECK). NAILS, RAWL PLUGS AND WOOD PLUGS ARE NOT PERMITTED, WHERE REQUIRED BY STRUCTURE, PROVIDE THRU BOLTS AND FISH PLATES. SUPPORT HORIZONTAL RUNS OF METALLIC RACEWAYS NOT MORE THAN 10 FT APART. SUPPORT RACEWAY RISERS AT EACH FLOOR LEVEL. RUN EXPOSED RACEWAYS PARALLEL WITH OR AT RIGHT ANGLES TO WALLS.
- PASS RACEWAYS OVER WATER, STEAM OR OTHER PIPING WHEN PULL BOXES ARE NOT REQUIRED. NO RACEWAY WITHIN 3 INCHES OF STEAM OR HOT WATER PIPES OR APPLIANCES (EXCEPT PIPE CROSSINGS WHERE RACEWAY SHALL BE AT LEAST 1 INCH FROM PIPE COVERS).
- CUT CONDUIT ENDS SQUARE. REAM SMOOTH. PAINT MALE THREAD OF FIELD THREADED RACEWAYS WITH GRAPHITE BASE PIPE COMPOUND. DRAW UP TIGHT WITH RACEWAY COUPLING.
- HORIZONTAL OR CROSS RUNS IN PARTITIONS AND WALLS ARE NOT PERMITTED. DO NOT RUN CONDUIT IN PRECAST ROOF SLABS, IN 2 INCH SLABS OR IN TERRAZZO FLOOR FINISH.
- LEAVE WIRES WITH SUFFICIENT SLACK TO PERMIT MAKING FINAL CONNECTIONS. RACEWAYS OVER 10 FT LONG IN WHICH WIRING IS NOT INSTALLED: FURNISH FISH WIRE.
- SET BOXES SQUARE AND TRUE WITH BUILDING FINISH. ERECT WALL AND SWITCH OUTLETS IN ADVANCE OF FURRING AND FIREPROOFING. SECURE TO BUILDING STRUCTURE BY ADJUSTABLE STRAP IRONS.
- VERIFY LOCATIONS OF OUTLETS AND SWITCHES IN FINISHED ROOMS WITH ARCHITECTURAL DRAWINGS OF INTERIOR DETAILS AND FINISH. IN CENTERING OUTLETS AND LOCATING BOXES AND OUTLETS, ALLOW FOR OVERHEAD PIPES, DUCTS AND MECHANICAL EQUIPMENT, VARIATIONS IN FIREPROOFING AND PLASTERING, WINDOW AND DOOR TRIM, PANELING, HUNG CEILINGS AND THE LIKE. CORRECT ANY INACCURACY RESULTING FROM FAILURE TO DO SO WITHOUT EXPENSE TO THE ~~DIRECTOR'S REPRESENTATIVE~~.
- LOCATIONS INDICATED FOR LOCAL WALL SWITCHES ARE SUBJECT TO MODIFICATIONS AT OR NEAR DOORS. COORDINATE WITH ~~DIRECTOR'S REPRESENTATIVE~~ AND INSTALL SWITCH ON SIDE OPPOSITE HINGE. VERIFY FINAL HINGE LOCATIONS IN FIELD PRIOR TO SWITCH OUTLET INSTALLATION.
- COVERS OF JUNCTION AND PULLBOXES SHALL BE READILY ACCESSIBLE.
- PROVIDE PULLBOXES WHERE INDICATED, WHERE REQUIRED BY CODE AND WHEREVER NECESSARY TO FACILITATE PULLING OF WIRE. COORDINATE PULLBOX LOCATIONS WITH OTHER TRADES.
- EMPTY RACEWAY RUNS: PROVIDE PULLBOXES EVERY 100 FT AND AS INDICATED. COORDINATE LOCATIONS WITH OTHER TRADES.
- JUNCTION AND PULLBOXES: LOCATE GENERALLY NOT EXPOSED IN FINISHED SPACES. WHERE NECESSARY, REROUTE RACEWAYS OR MAKE OTHER ARRANGEMENTS FOR CONCEALMENT.
- SUPPORT PANEL, JUNCTION AND PULLBOXES INDEPENDENTLY TO BUILDING STRUCTURE WITH NO WEIGHT BEARING ON RACEWAYS.
- ALL ACCESS DOOR LOCATIONS SHALL BE REVIEWED BY ~~DIRECTOR'S REPRESENTATIVE~~ PRIOR TO INSTALLATION.
- CONNECT CONDUIT TO MOTOR CONDUIT TERMINAL BOXES WITH FLEXIBLE CONDUIT (MINIMUM 18 IN. LENGTH AND 50% SLACK). DO NOT TERMINATE IN OR FASTEN RACEWAYS TO MOTOR FOUNDATION.
- PROVIDE 2#14 INDICATING PILOT LIGHT WIRES FROM PILOT LIGHT IN CONTROLLER TO LOAD SIDE OF DISCONNECT SWITCH. RUN WIRES IN BRANCH CIRCUIT CONDUIT AND INCREASE CONDUIT SIZE AS REQUIRED.
- PULL NO THERMOPLASTIC WIRES AT TEMPERATURES LOWER THAN 32°F (0°C). PROVIDE CABLE SUPPORTS FOR WIRE IN RISER CONDUITS AS REQUIRED BY CODE.
- PROVIDE SEPARATE RACEWAYS FOR CONDUCTORS OF NORMAL AND EMERGENCY CIRCUITS. COMMON BOXES: PROVIDE BARRIERS BETWEEN EMERGENCY AND NORMAL WIRING.
- HEIGHTS OF OUTLETS FROM FINISHED FLOOR TO CENTERLINE OF OUTLET:

RECEPTACLES AND TELEPHONES:	
GENERALLY	1'-6"
OVER WORK BENCHES	3'-6"
WALL SWITCHES	4'-0"
WALL FIXTURES	7'-0"
MOTOR CONTROLLERS	5'-0"
GONGS AND HORNS	7'-6"
FIRE ALARM STATIONS	4'-0"
CLOCKS	7'-6"
STROBE LIGHTS	6'-8" TO BOTTOM

EXCEPTIONS: AT JUNCTION OF DIFFERENT WALL FINISH MATERIALS, ON MOLDING OR BREAK IN WALL SURFACE, IN VIOLATION OF CODE REQUIREMENTS, AS NOTED OR DIRECTED.

~~CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING AND CONFIRMING ALL MOUNTING HEIGHTS WITH ~~DIRECTOR'S REPRESENTATIVE~~ AND ARCHITECTURAL DRAWINGS.~~

- WIRE COLOR CODING: AS PER CODE. WHERE COLOR-CODED CABLE IS NOT AVAILABLE, CERTIFY IN WRITING AND REQUEST PERMISSION FOR OVERLAP COLOR TAPING OF CONDUCTORS (MINIMUM LENGTH 6") IN ACCESSIBLE LOCATIONS. COLOR CODING, ONCE SELECTED, MUST BE USED CONSISTENTLY FOR THE ENTIRE PROJECT.
- INSTALL NEW WORK AND CONNECT TO EXISTING WORK WITH MINIMUM INTERFERENCE TO EXISTING FACILITIES. TEMPORARY SHUTDOWNS: ONLY WITH WRITTEN CONSENT OF ~~DIRECTOR'S REPRESENTATIVE~~. MAINTAIN CONTINUOUS OPERATION OF EXISTING FACILITIES. ALARM AND EMERGENCY SYSTEMS ARE NOT TO BE INTERRUPTED.
- FIRESTOPPING SHALL BE INSTALLED WHENEVER WIRING OR RACEWAYS CROSS FIRE RATED CONSTRUCTION.
- FOR ELECTRICAL SPECIFICATIONS REFER TO THE ELECTRICAL SPECIFICATIONS SECTION OF THE PROJECT MANUAL.
- TYPICAL FOR EACH ELECTRIC EYE FAUCET FURNISHED AND INSTALLED BY THE PLUMBING CONTRACTOR: PROVIDE 120V DUPLEX RECEPTACLE, INSTALL AND WIRE COMPLETE FAUCET ASSOCIATED STEP-DOWN TRANSFORMER (120/24V, 40VA) AND CONTROL MODULE, BOTH FURNISHED BY THE PLUMBING CONTRACTOR. INSTALL STEP-DOWN TRANSFORMER AND CONTROL MODULE AT LOCATIONS SELECTED BY THE PLUMBING CONTRACTOR. WIRE TRANSFORMER AND CONTROL MODULE PER FAUCET MANUFACTURER'S APPROVED SHOP DRAWINGS AND WIRING DIAGRAMS. COORDINATE ENTIRE WORK WITH PLUMBING CONTRACTOR.

ELECTRICAL IDENTIFICATION NOTES

- AT EACH EXISTING TO REMAIN RECEPTACLE, NEW RECEPTACLE, LIGHTING CONTROL TOGGLE SWITCH, POWER AND CONTROL JUNCTION BOX ASSOCIATED WITH THE FINAL CONNECTIONS TO THE HVAC OR PLUMBING EQUIPMENT (FIRE/SMOKE DAMPERS, VAV BOXES, ETC.), AND HVAC OR PLUMBING EQUIPMENT, FURNISH AND INSTALL A SELF ADHESIVE LABEL TO IDENTIFY RECEPTACLE, LIGHTING FIXTURES CONTROLLED OR EQUIPMENT ASSOCIATED POWER SOURCE (PANEL AND CIRCUIT NUMBER). AT EACH LOCAL DISCONNECT SWITCH (LIFE SAFETY TYPE OR TOGGLE TYPE), CONTROL PANEL AND MOTOR STARTER LOCATION, FURNISH AND INSTALL A SELF ADHESIVE IDENTIFICATION NAMEPLATE TO IDENTIFY EQUIPMENT SERVED (HVAC UNIT #) AND ASSOCIATED POWER SOURCE (PANEL AND CIRCUIT NUMBER). AT EACH ELECTRICAL PANEL PROVIDE A SELF ADHESIVE, ENGRAVED IDENTIFICATION NAMEPLATE TO INDICATE THE FOLLOWING: PANEL DESIGNATION, VOLTAGE, SIZE IN AMPS, POWER SOURCE (FED FROM: PANEL AND CIRCUIT NUMBER) AND FEEDER SIZE (NO. OF WIRES, WIRE SIZE, NO. OF CONDUITS AND CONDUIT SIZE).
- BY EACH EXIT LIGHT AND EMERGENCY/NIGHT LIGHT FIXTURE PROVIDE AS SELF ADHESIVE IDENTIFICATION LABEL TO INDICATE ASSOCIATED EMERGENCY POWER SOURCE (EMERGENCY PANEL AND CIRCUIT NUMBER). ATTACH LABEL TO FIXTURE LIGHTING ASSOCIATED ENCLOSURE ENCLOSURE: LABEL SHALL BE READILY VISIBLE AND ACCESSIBLE.
- PULL/SPLICE BOXES IDENTIFICATION, TYPICAL FOR EACH PULL/SPLICE BOX: PROVIDE AN ENGRAVED IDENTIFICATION NAMEPLATE ON OUTSIDE (PULL/SPLICE BOX COVER) TO INDICATE THE FOLLOWING: PULL/SPLICE BOX #; VOLTAGE (EXAMPLE: 120/208V, 3 PHASE, 4W+G); ASSOCIATED FEEDER SIZE (NUMBER OF WIRE, WIRE SIZE, NUMBER OF CONDUITS AND CONDUITS SIZE); FEEDER ORIGINATING POINT (FLOOR NUMBER, PANEL/SWITCHBOARD NAME AND CIRCUIT NUMBER); FEEDER TERMINATING POINT (FLOOR NUMBER, PANEL NAME AND CIRCUIT NUMBER, TENANT'S NAME).
- REFER TO SPECIFICATIONS AND ELECTRICAL DETAILS DRAWINGS FOR ADDITIONAL IDENTIFICATION NAMEPLATES REQUIRED FOR PANELBOARDS, PULL BOXES, SPLICE BOXES, CONDUITS AND OTHER ELECTRICAL EQUIPMENT.

ELECTRICAL REMOVAL NOTES

- ~~NOT USED~~
- THE CONTRACTOR SHALL REMOVE AND/OR RELOCATE ALL EXISTING ELECTRICAL WORK WHICH INTERFERES WITH THE NEW ARCHITECTURAL AND ELECTRICAL LAYOUTS IN FULL COORDINATION WITH THE ~~DIRECTOR'S REPRESENTATIVE'S~~ REMOVAL PLANS. ALL SYSTEMS WHICH ARE NO LONGER REQUIRED TO FUNCTION SHALL BE DE-ENERGIZED AND DISCONNECTED AT THE SOURCE OF POWER SUPPLY.
- THE CONTRACTOR SHALL PERFORM ~~REMOVAL~~ WORK WITH MINIMUM INTERFERENCE WITH FUNCTIONING ELECTRICAL SYSTEMS. ALL AFFECTED SYSTEMS SHALL BE RECONNECTED AND RESTORED.
- ~~REMOVAL~~ WORK SHALL BE PERFORMED IN A NEAT AND WORKMANLIKE MANNER. THE CONTRACTOR SHALL PATCH, REPAIR OR OTHERWISE RESTORE ANY DAMAGED INTERIOR OR EXTERIOR BUILDING SURFACE TO ITS ORIGINAL CONDITION.
- THE CONTRACTOR SHALL REMOVE ALL ELECTRICAL OUTLETS, SWITCHES AND OTHER DEVICES, COMPLETE WITH ASSOCIATED WIRING, CONDUITS, ETC., FROM PARTITIONS THAT ARE TO BE REMOVED. WHERE THE REMOVAL OF THESE ITEMS DISRUPTS EXISTING WIRING THAT IS TO REMAIN, THE CONTRACTOR SHALL INSTALL JUNCTION BOXES AND OTHER DEVICES AND PROVIDE BYPASS CONNECTIONS NECESSARY TO MAKE CIRCUITS AFFECTED CONTINUOUS AND READY FOR OPERATION. OTHERWISE, WIRING SHALL BE REMOVED BACK TO THE NEAREST ELECTRICAL JUNCTION BOX THAT IS TO REMAIN OR TO PANELBOARD.
- ALL RACEWAYS WHICH BECOME EXPOSED DURING THE ALTERATION WORK SHALL BE REMOVED AND REROUTED CONCEALED BEHIND FINISHED SURFACES.
- ALL UNUSED OUTLET BOXES OR CAPPED FLOOR OUTLETS SHALL BE PROVIDED WITH MATCHING BLANK COVERS.
- EXISTING PANEL DIRECTORIES AFFECTED BY THE ALTERATION WORK SHALL BE MODIFIED TO REFLECT THE BRANCH CIRCUIT WIRING CHANGES.
- PORTIONS OF FEEDER RUNS TO BE REMOVED OR ABANDONED AS A RESULT OF REMOVAL WORK, BUT WHICH ARE REQUIRED TO REMAIN ENERGIZED, SHALL BE CUT AT CONVENIENT LOCATIONS, REROUTED AND RECONNECTED. NEW FEEDER EXTENSIONS SHALL MATCH EXISTING ONES IN ALL RESPECTS, CABLE TYPE, CONDUCTOR AMPACITY, CONDUIT SIZES, ETC.
- THE CONTRACTOR SHALL NOTIFY THE ~~DIRECTOR'S REPRESENTATIVE~~ AT THE APPROPRIATE TIME OF THE PROJECTED REMOVAL AND PHASING SCHEDULE SO THAT REMOVAL OR RELOCATION OF AFFECTED UTILITIES MAY BE CARRIED OUT IN COORDINATION WITH THE ~~PROJECT REQUIREMENTS~~. THE CONTRACTOR SHALL FOLLOW CLOSELY THE ~~DIRECTOR'S REPRESENTATIVE'S~~ ~~REMOVAL~~ AND PHASING SCHEDULE AND PROCEED IN THE SPECIFIED SEQUENCE.
- ALL EXISTING MATERIAL AND EQUIPMENT IN USABLE CONDITION, WHICH IS TO BE REMOVED UNDER THIS CONTRACT, SHALL REMAIN THE PROPERTY OF THE ~~DIRECTOR'S REPRESENTATIVE~~ OR SHALL BE DISPOSED OF BY THE ELECTRICAL CONTRACTOR, AS DIRECTED BY THE ~~DIRECTOR'S REPRESENTATIVE~~.
- ARRANGE TO WORK CONTINUOUSLY, INCLUDING OVER TIME, IF REQUIRED, TO ASSURE THAT SYSTEMS WILL BE SHUT DOWN ONLY DURING THE TIME ACTUALLY REQUIRED TO MAKE THE NECESSARY CONNECTIONS TO THE EXISTING SYSTEMS.
- THE SHUTDOWN OF EXISTING BUILDING ELECTRICAL SERVICES SHALL BE COORDINATED WITH THE ~~DIRECTOR'S REPRESENTATIVE~~ MAKE ARRANGEMENTS AT LEAST 5 BUSINESS DAYS PRIOR TO A SHUTDOWN.
- DISCONNECT AND COMPLETELY REMOVE ALL ELECTRICAL WORK ASSOCIATED WITH THE MECHANICAL EQUIPMENT BEING REMOVED BY OTHER TRADES: DISCONNECT AND REMOVE MECHANICAL EQUIPMENT ASSOCIATED LOCAL DISCONNECT SWITCHES, LOCAL CONTROL PANELS, REMOTE CONTROL SWITCHES (AS APPLICABLE), VAV BOXES, ETC. WITH ALL ASSOCIATED WIRING AND CONDUIT BACK TO SOURCE (EXACT POWER SOURCE TO BE DETERMINED IN THE FIELD BY THIS ELECTRICAL CONTRACTOR. COORDINATE THE ENTIRE ~~REMOVAL~~ WORK ASSOCIATED WITH MECHANICAL EQUIPMENT WITH THE RESPECTIVE TRADE. DURING THE BIDDING PROCESS, REFER TO THE OTHER TRADES CONTRACT DRAWINGS FOR THE FULL EXTENT OF THEIR ~~REMOVAL~~ WORK AND RELATED ELECTRICAL ~~REMOVAL~~ WORK: INCLUDE ALL ASSOCIATED ELECTRICAL ~~REMOVAL~~ COSTS IN THE BID PRICE.
- TYPICAL FOR EACH EXISTING PANEL LOCATED WITHIN THE SCOPE OF ~~REMOVAL~~ WORK AREAS SHOWN AS BEING REMOVED: REMOVE EXISTING PANEL. REMOVE EXISTING ASSOCIATED INCOMING FEEDER (WIRING AND CONDUIT) PER PARTIAL ONE LINE DIAGRAMS SHOWN ON DRAWING E-604; REMOVE ALL EXISTING ASSOCIATED BRANCH CIRCUITS (WIRING AND CONDUIT) UP TO THE NEAREST CEILING LOCATED WITHIN THE NOT IN SCOPE OF ~~REMOVAL~~ WORK AREAS (CUT AND CAP CONDUIT INSIDE THE NOT IN SCOPE OF ~~REMOVAL~~ WORK AREAS IF THE BRANCH CIRCUIT DOES NOT TERMINATE WITHIN THE SCOPE OF ~~REMOVAL~~ WORK AREAS). THE INTENT IS TO COMPLETELY REMOVE ALL EXISTING INCOMING FEEDERS (WIRING AND CONDUITS) AND ALL EXISTING BRANCH CIRCUITS (WIRING AND CONDUITS) LOCATED WITHIN THE SCOPE OF ~~REMOVAL~~ WORK AREAS. TYPICAL FOR EACH EXISTING PANEL LOCATED WITHIN NOT IN SCOPE OF ~~REMOVAL~~ WORK AREAS (PANEL DE-ENERGIZED PER THIS ~~REMOVAL~~ WORK): IF EXISTING ASSOCIATED BRANCH CIRCUITS (WIRING AND CONDUIT) SERVE LOADS LOCATED WITHIN THE SCOPE OF ~~REMOVAL~~ WORK AREAS, ONLY REMOVE THOSE BRANCH CIRCUIT SECTIONS LOCATED WITHIN THE SCOPE OF ~~REMOVAL~~ WORK AREAS (CUT AND CAP CONDUITS INSIDE THE NOT IN SCOPE OF ~~REMOVAL~~ WORK AREAS).



Office of
General Services

DESIGN & CONSTRUCTION

CONSULTANT

ARCHITECT
PERKINS EASTMAN
115 FIFTH AVENUE
NEW YORK, NEW YORK 10003

LAB CONSULTANT
JACOBS CONSULTANCY
303 SOUTH BROADWAY, SUITE G20
TARRYTOWN, NEW YORK 10591

MEP & LIGHTING

AKF GROUP
ONE LIBERTY PLAZA
165 BROADWAY, 22ND FLOOR
NEW YORK, NEW YORK 10006

ACOUSTICS/ IT /SECURITY

CERAMI ASSOCIATES
404 FIFTH AVENUE
NEW YORK, NEW YORK 10018

COMMISSIONING

ARMARUM
52 JAMES STREET
ALBANY, NEW YORK 12207

HAZARDOUS MATERIALS

AIRTEK ENVIRONMENTAL CORP.
39-37 29TH STREET
LONG ISLAND CITY, NEW YORK 11101

COST ESTIMATING

VJ ASSOCIATES
100 DUFFY AVENUE
HICKSVILLE, NEW YORK 11801

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CONTRACT:

CONSTRUCTION

TITLE:

PROVIDE CONVERSION OF 8TH FLOOR TO ANIMAL LAB BUILDING NO. 4

LOCATION:

NEW YORK PSYCHIATRIC INSTITUTE
1051 RIVERSIDE DRIVE
NEW YORK, NY 10032

CLIENT:

NEW YORK STATE
OFFICE OF METAL HEALTH

01	10/24/2016	ADDENDUM #2
	07/13/2016	FINAL SUBMISSION
	06/29/2015	100% CD SUBMISSION

MARK	DATE	DESCRIPTION
PROJECT NUMBER:	44219-C	
DESIGNED BY:		
DRAWN BY:	MM	
FIELD CHECK:	ZH	
APPROVED:		

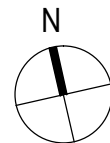
SHEET TITLE:

ELECTRICAL NOTES

DRAWING NUMBER:

E-003

SHEET 46 of 91



Low Voltage Cable Testing Specifications

Cables, Low-Voltage, 600-Volt Maximum

1- Visual and Mechanical Inspection:

- Compare cable data with drawings and specifications.
- Inspect compression-applied connectors for correct cable match and indentation.
- Inspect for correct identification and arrangements.
- Inspect cable jacket insulation and condition
- Inspect exposed sections of cable for physical damage and correct connection in accordance with the single-line diagram.
- Inspect bolted electrical connections for high resistance using one or more of the following.

2-Pre-Testing Methods:

- Use of a low-resistance ohmmeter for bolted connections.
- Verify tightness of accessible bolted electrical connections by calibrated torque-wrench

3- Electrical Tests:

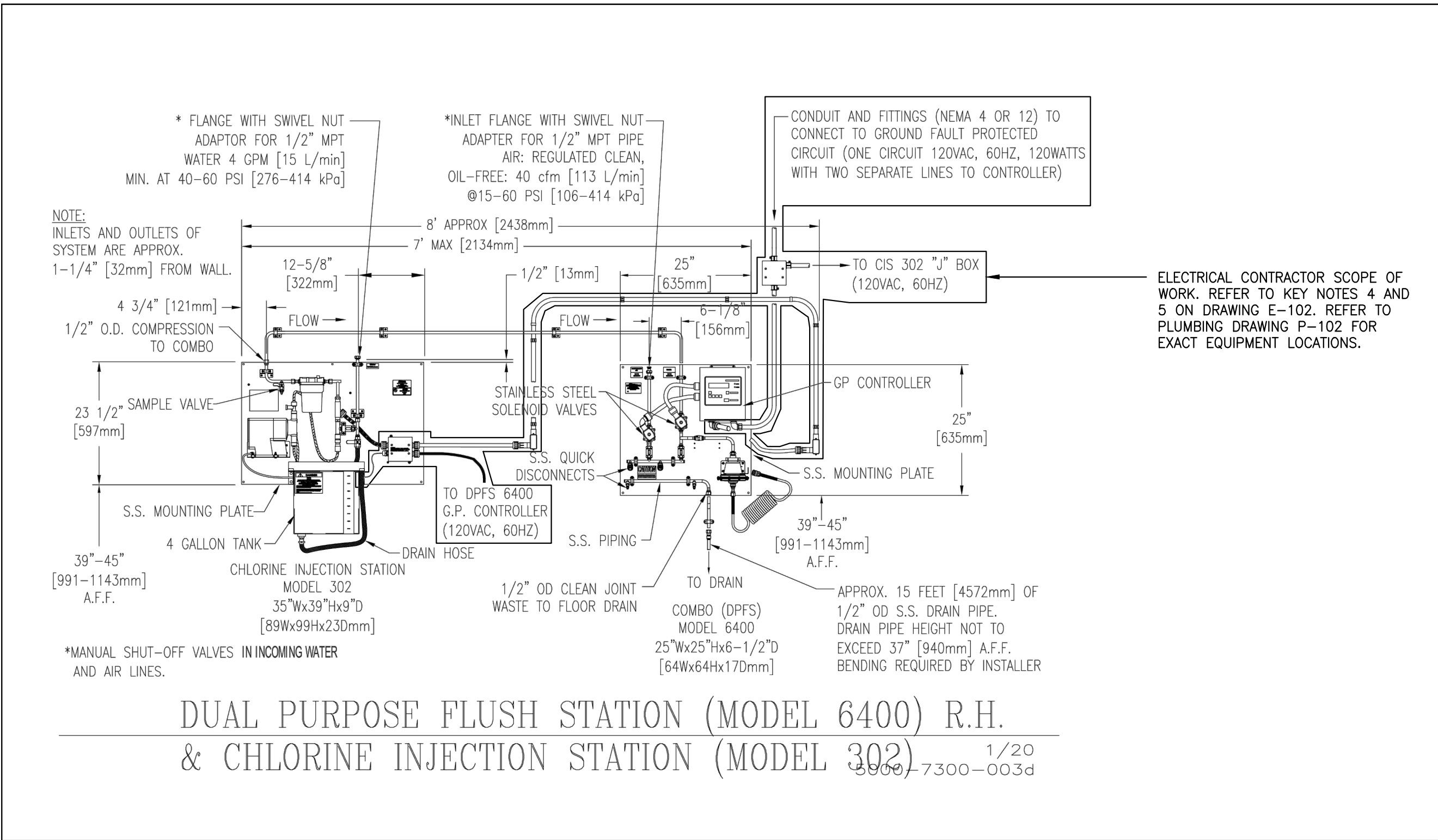
- Perform continuity tests to insure correct cable connection. Verify uniform resistance of parallel conductors.
- Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 500 volts dc for 300-volt rated cable and 1000 volts dc for 600-volt rated cable. Test duration shall be one minute per phase.
- Perform thermographic survey with equipment under normal load conditions

4- Test Values – Visual and Mechanical

- Compare bolted connection resistance values to values of similar connections.
- Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
- Bolt-torque levels shall be in accordance with manufacturer's published data.
- Results of the thermographic survey shall be confirmed to be acceptable.

GENERAL NOTES:

1. PERFORM MEGGER TESTS AND SUBMIT TEST RESULTS FOR EACH NEW FEEDER (NEW WIRING) ASSOCIATED WITH NEW LIGHTING AND RECEPTACLE PANELS, ETC. AS APPLICABLE AND AS SPECIFIED ON THIS DRAWING. SUBMIT ALL TEST RESULTS AFTER COMPLETION.



1 ANIMAL WATERING SYSTEM COMPONENT DETAIL
SCALE: NTS

LV Cables Tested Individually
Functional Form

Client: [] Date: [] Test Form: [] Unit Tag: []
Project: [] Address: []
Cable From: [] Cable To: []
Room Temperature: [] Room Humidity: [] Column Lines: []

Cable Data

Conductor Data	
Manufacturer	Operating Voltage [] V
Cable Size	Cable Temperature [] °F
Insulation Type	Cable Originates []
Cable Length [] Ft	Cable Terminated? [] Yes/No

Cable Protection Data	
Upstream Circuit Breaker	Load CB Manufacturer []
Upstream CB Manufacturer	Load CB Type []
Upstream CB Type	Load CB Rating []
Upstream CB Rating	Load Panelboard MLO [] Yes/No
Load Circuit Breaker	

Submission

Equipment matches design specifications DATE: []

FUNCTIONAL TESTING REQUIRED ITEMS

Mechanical & Visual Verification	DATE	COMMENTS
Switchgear has been properly cleaned to facilitate conductor testing	[]	[]
Cable(s) properly isolated before testing	[]	[]
Verify tightness of all bolted cable connections	[]	[]
Proper compression connector was used if applicable	[]	[]
Cable bend radius does not exceed applicable codes	[]	[]

FUNCTIONAL TESTING REQUIRED ITEMS (CONTINUED)

Mechanical & Visual Verification	DATE	COMMENTS
Cable(s) properly supported	[]	[]
Cable size matches approved shop drawings.	[]	[]

Functional Testing Required Items

Contractors To Be On Hand	DATE	COMMENTS
Testing Company	[]	[]
Construction Manager	[]	[]
Electrical Contractor	[]	[]
Building Operations	[]	[]

Functional Testing

Insulation Resistance Testing (Perform Insulation Resistance Test at 1000VDC
Test Unit - "Megger" model 1060 (5kv) or equivalent required

Manufacturer	Model	Calib. Date
[]	[]	[]

Testing individual feeders
All installed cables shall be tested for acceptable insulation resistance by following the testing procedures below.
Testing to be performed at 1000VDC for 1 minute. Test results to be greater than 100 megohms.
If readings have not stabilized in 60 seconds, record stabilization time and results in appropriate table below
If readings are less than 100 megohms or if there is a discrepancy of greater than 25% between individual feeders, Testing company to inform Contractor and owner.

Phase A with B & C Grounded	Phase B with A & C Grounded	Phase C with A & B Grounded
Test Voltage [] VDC	Test Voltage [] VDC	Test Voltage [] VDC
60 secs []	60 secs []	60 secs []
Notes []	Notes []	Notes []

Neutral with phases Grounded	Stabilized readings over 60 seconds	Time for readings to stabilize if over 60 seconds
Test Voltage [] VDC	A []	[] Seconds
60 secs []	B []	[] seconds
Notes []	C []	[] Seconds
	Neutral []	[] Seconds

Sign Off

Submittal. The above items on this form have been successfully completed.

Items that do not apply shall be noted with the reasons on this form. (N/A = not applicable, BO = by others).
Exceptions. This filled-out checklist has been reviewed. It's completion is approved with the exceptions noted below.

FUNCTIONAL FORM APPROVED

Testing Company	Print Name
Signature	Date
Electrical Contractor	Print Name
Signature	Date
Construction Manager	Print Name
Signature	Date
Commissioning Authority	Print Name
Signature	Date
Building Operations Rep.	Print Name
Signature	Date

DESIGN & CONSTRUCTION

CONSULTANT	
ARCHITECT PERKINS EASTMAN 115 FIFTH AVENUE NEW YORK, NEW YORK 10003	LAB CONSULTANT JACOBS CONSULTANCY 303 SOUTH BROADWAY, SUITE G20 TARRYTOWN, NEW YORK 10591
MEP & LIGHTING AKF GROUP ONE LIBERTY PLAZA 165 BROADWAY, 22ND FLOOR NEW YORK, NEW YORK 10006	ACOUSTICS/IT/SECURITY CERAMI ASSOCIATES 404 FIFTH AVENUE NEW YORK, NEW YORK 10018
COMMISSIONING ARAMARK 52 JAMES STREET ALBANY, NEW YORK 12207	HAZARDOUS MATERIALS AIRTEK ENVIRONMENTAL CORP. 39-37 29TH STREET LONG ISLAND CITY, NEW YORK 11103
COST ESTIMATING VJ ASSOCIATES 100 DUFFY AVENUE HICKSVILLE, NEW YORK 11801	

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CONSTRUCTION

TITLE: PROVIDE CONVERSION OF 8TH FLOOR TO ANIMAL LAB BUILDING NO. 4
LOCATION: NEW YORK PSYCHIATRIC INSTITUTE
1051 RIVERSIDE DRIVE
NEW YORK, NY 10032
CLIENT: NEW YORK STATE
OFFICE OF METAL HEALTH

01	10/24/2016	ADDENDUM #2
	07/13/2016	FINAL SUBMISSION
	06/29/2015	100% CD SUBMISSION
MARK	DATE	DESCRIPTION
PROJECT NUMBER:	44219-C	
DESIGNED BY:		
DRAWN BY:	MM	
FIELD CHECK:	ZH	
APPROVED:		
SHEET TITLE:		

ELECTRICAL DETAILS

DRAWING NUMBER:
E-501

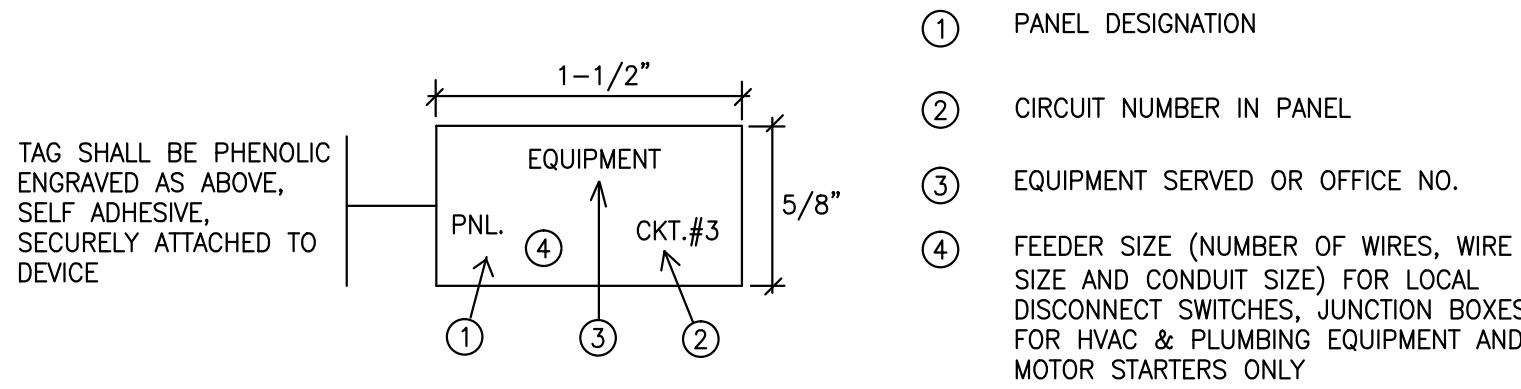
AC UNIT DESIGNATION →

AC-5-1

208V, 3ø, 3W; 200 AMPS
FED FROM: PANEL 5LDP1, SW. #1
FEEDER SIZE: 3#3/0+1#4G IN 2" C

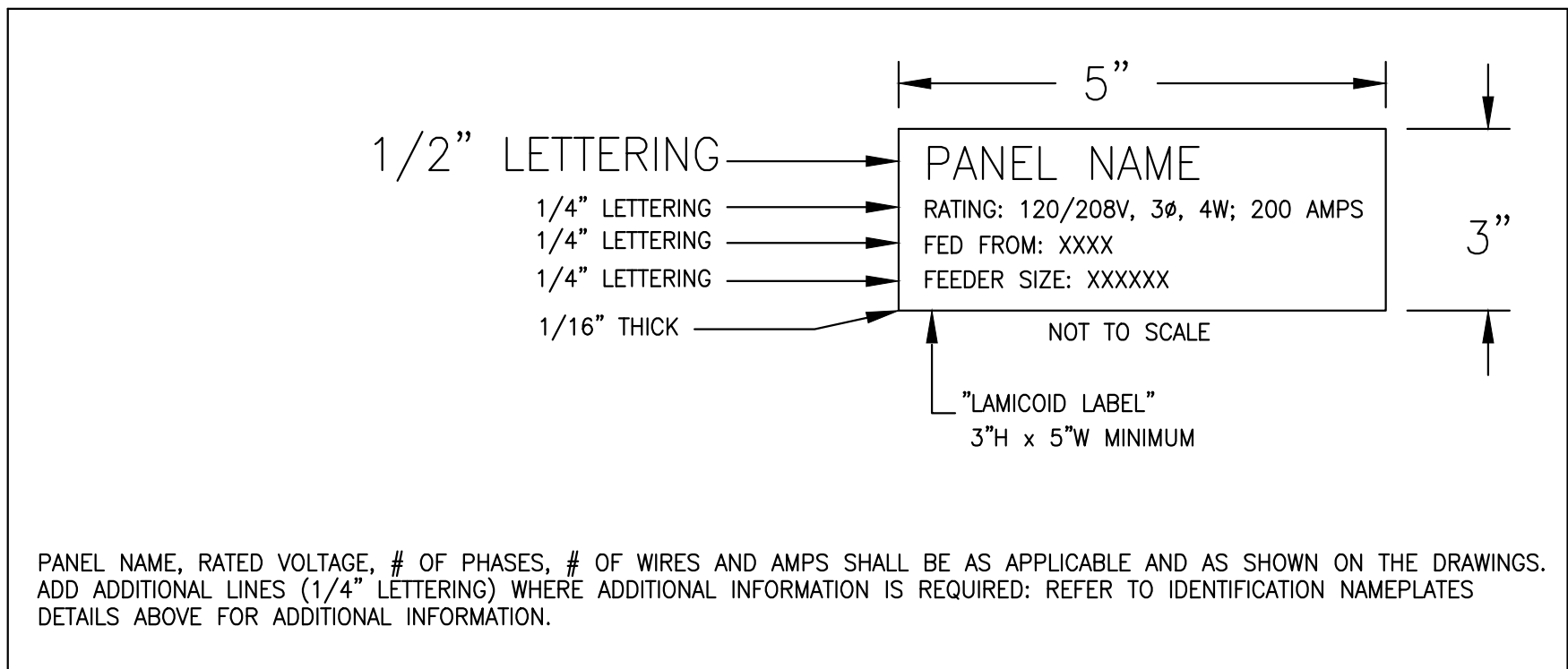
MECHANICAL EQUIPMENT LOCAL STARTER/CONTROL PANEL
AND LOCAL DISCONNECT SWITCH NAMEPLATE SAMPLE

ACTUAL INFORMATION SHALL BE PER DRAWINGS.

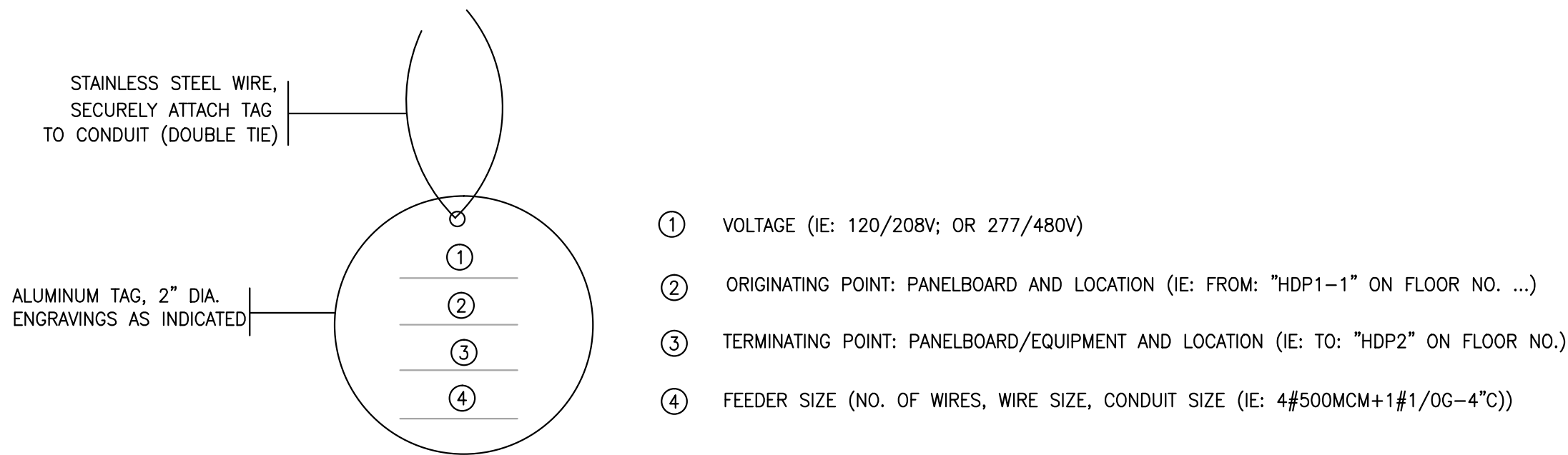


POWER JUNCTION BOXES, LOCAL DISCONNECT SWITCHES, MOTOR STARTERS,
RECEPTACLES, LIGHTING CONTROL SWITCHES TYPICAL DETAIL-DEVICE TAGS

(NOTE: FOR RECEPTACLES AND LIGHTING CONTROL SWITCHES INDICATE POWER SOURCE ONLY: PANEL AND CIRCUIT NUMBER)



ENGRAVED NAMEPLATES SPECIFICATIONS



TYPICAL DETAIL - DEVICE TAGS

TO BE PROVIDED FOR EACH ELECTRICAL FEEDER AND DATA/TELEPHONE CONDUIT

(NOTE: ONE TAG REQUIRED EVERY 50 FEET, FOR THE ENTIRE CONDUIT LENGTH. TAGS SHALL BE READILY ACCESSIBLE AND VISIBLE.
1ST TAG SHALL BE WITHIN 3 FEET FROM POWER SOURCE PANEL, LAST TAG SHALL BE WITHIN 3 FEET FROM PANEL SERVED.
PROVIDE ADDITIONAL TAGS EVERY 50 FEET BETWEEN THE 1ST AND LAST TAG ON CONDUIT AS REQUIRED)

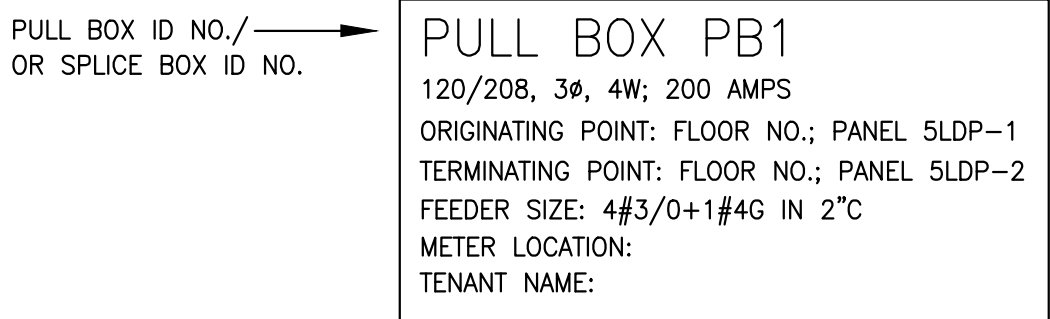
PANEL DESIGNATION →

LH-5A1

120/208, 3ø, 4W; 600 AMPS
FED FROM: FLOOR NO.; PANEL DPH-5A1
FEEDER SIZE: 4#3/0+1#4G IN 2" C

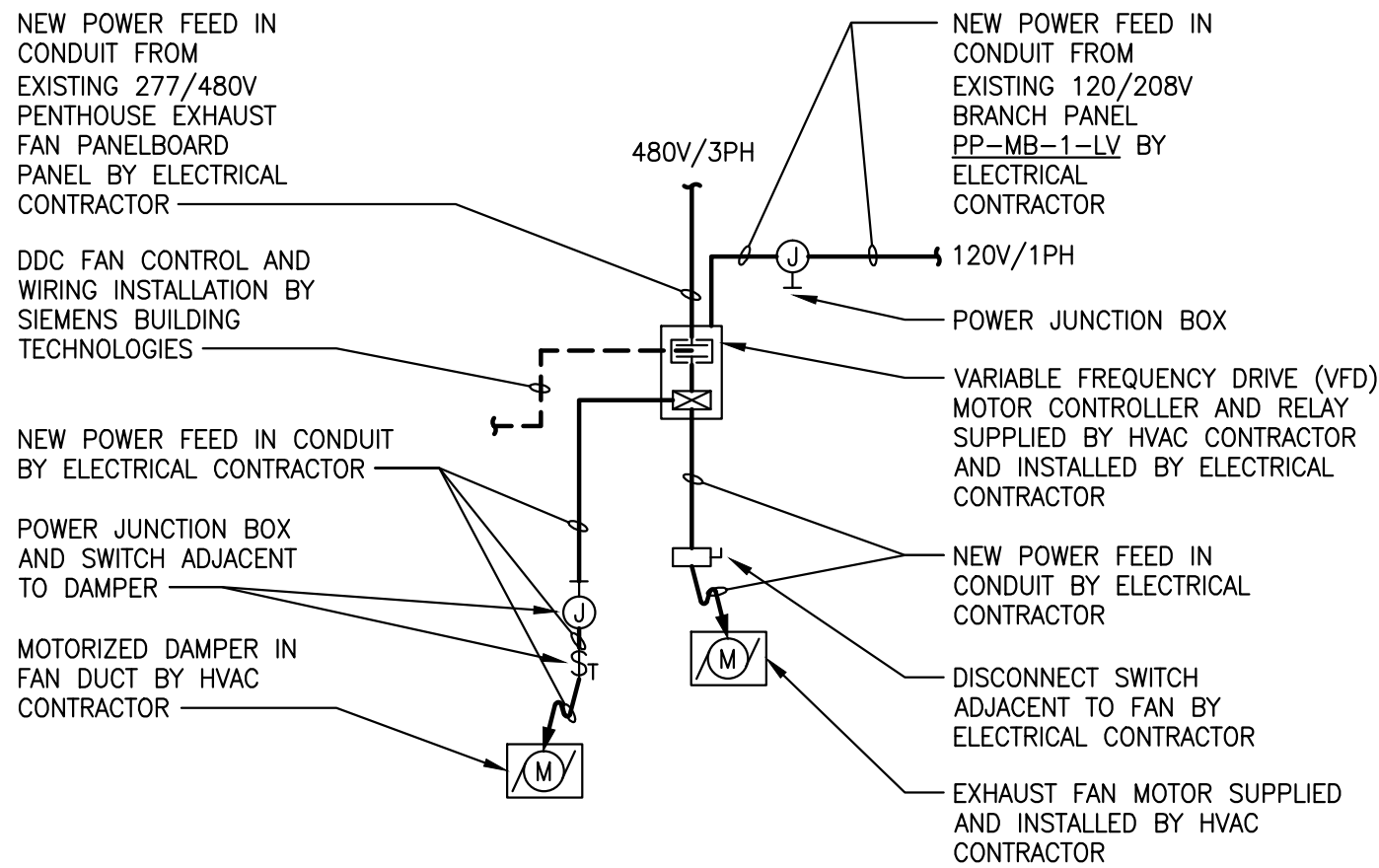
LIGHTING/RECEPTACLE PANELS NAMEPLATE SAMPLE

ACTUAL INFORMATION SHALL BE PER DRAWINGS.



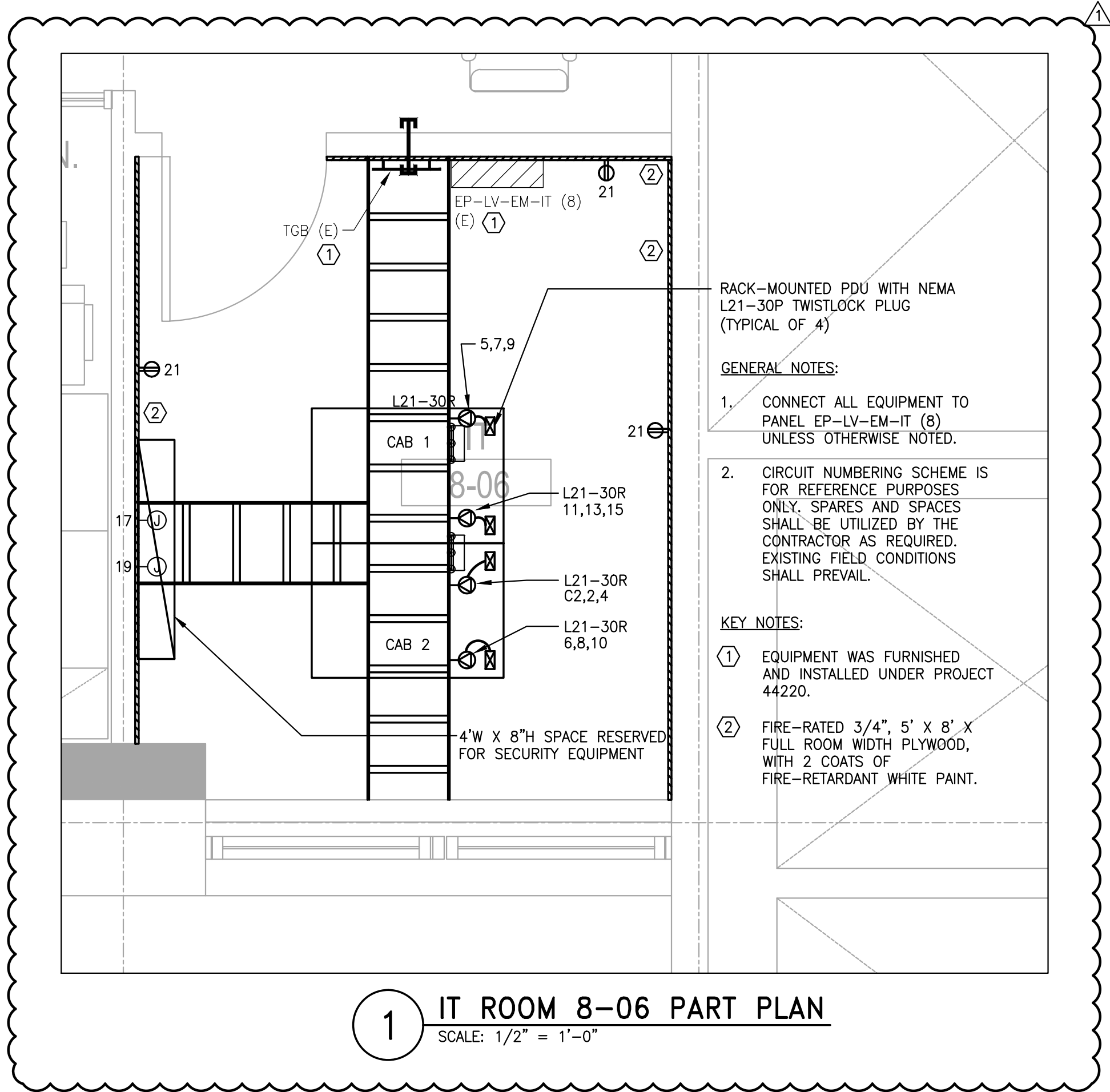
INTERMEDIATE PULL BOX/SPLICE BOX NAMEPLATE SAMPLE

ACTUAL INFORMATION SHALL BE PER DRAWINGS.



TYPICAL PENTHOUSE GENERAL EXHAUST FAN
ELECTRICAL POWER AND CONTROL WIRING DIAGRAM

ACTUAL INFORMATION SHALL BE PER DRAWINGS.



DESIGN & CONSTRUCTION

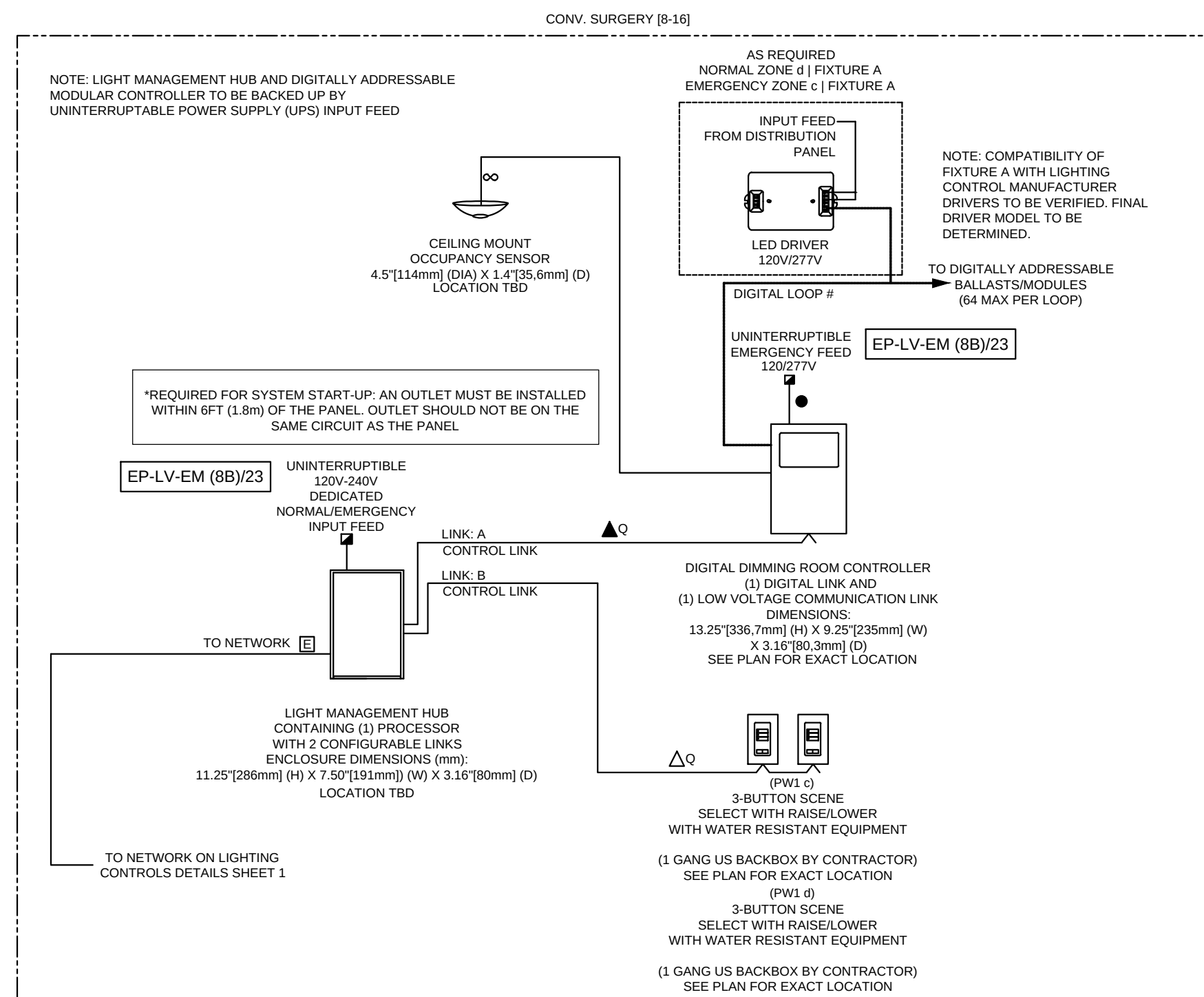
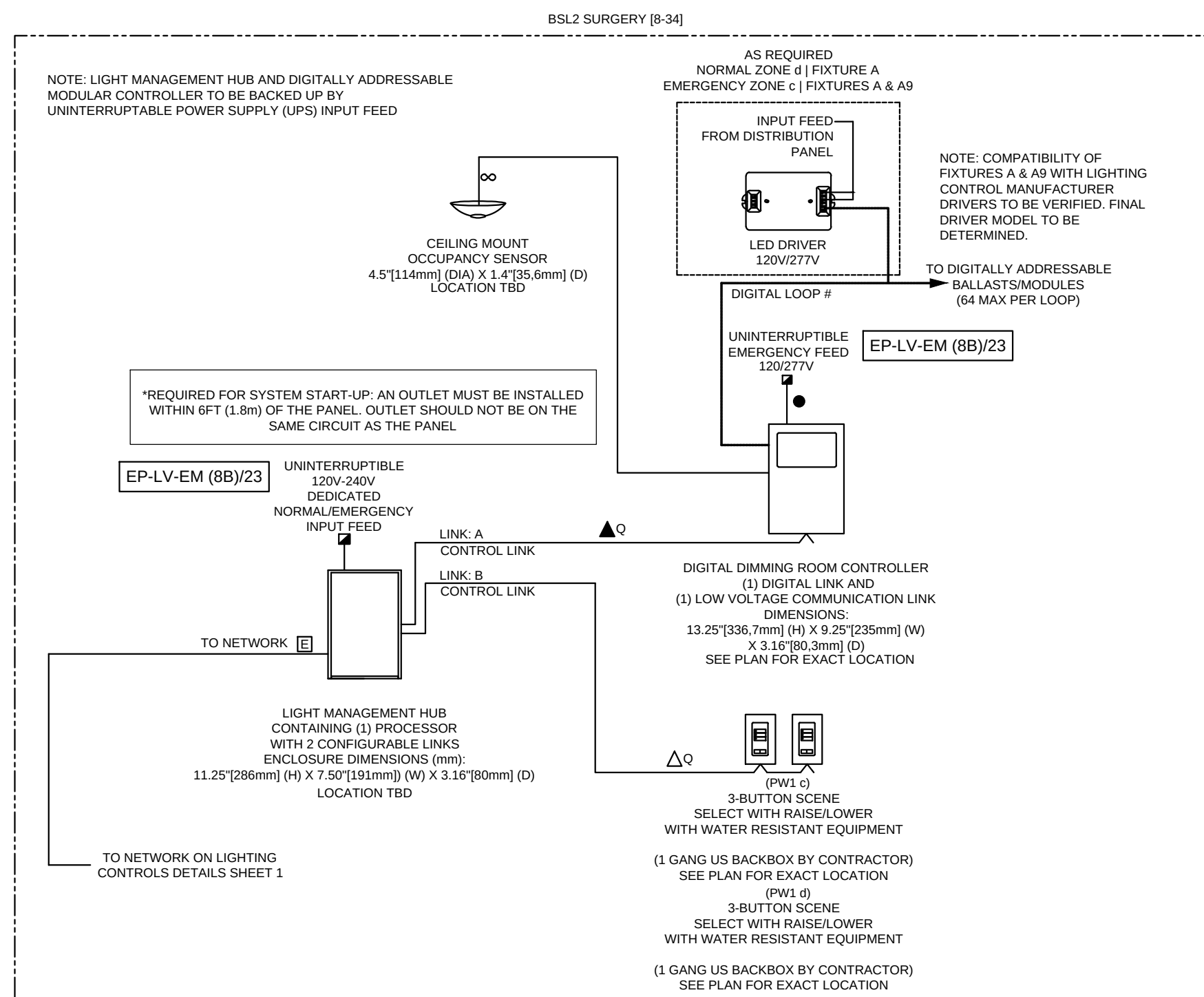
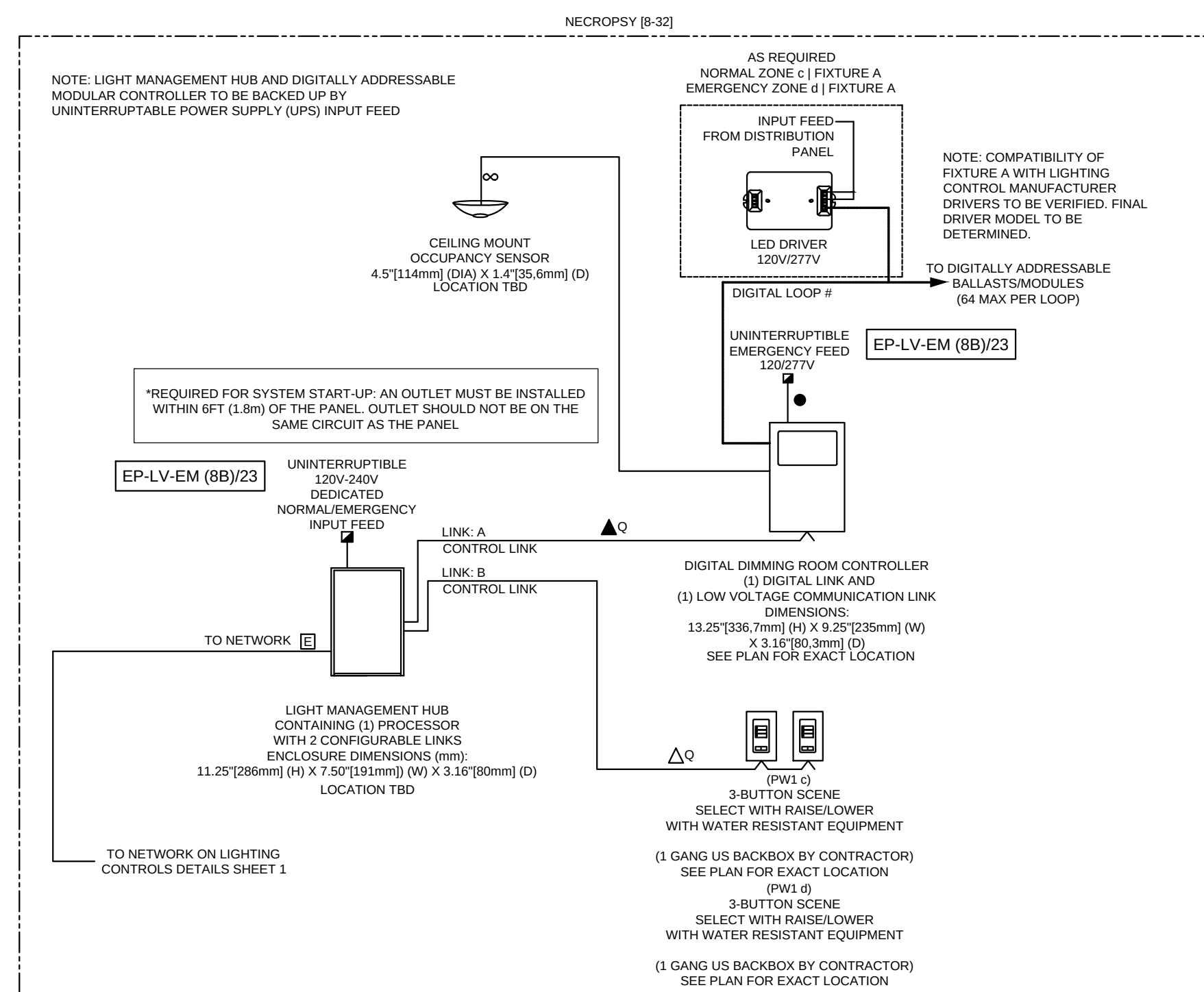
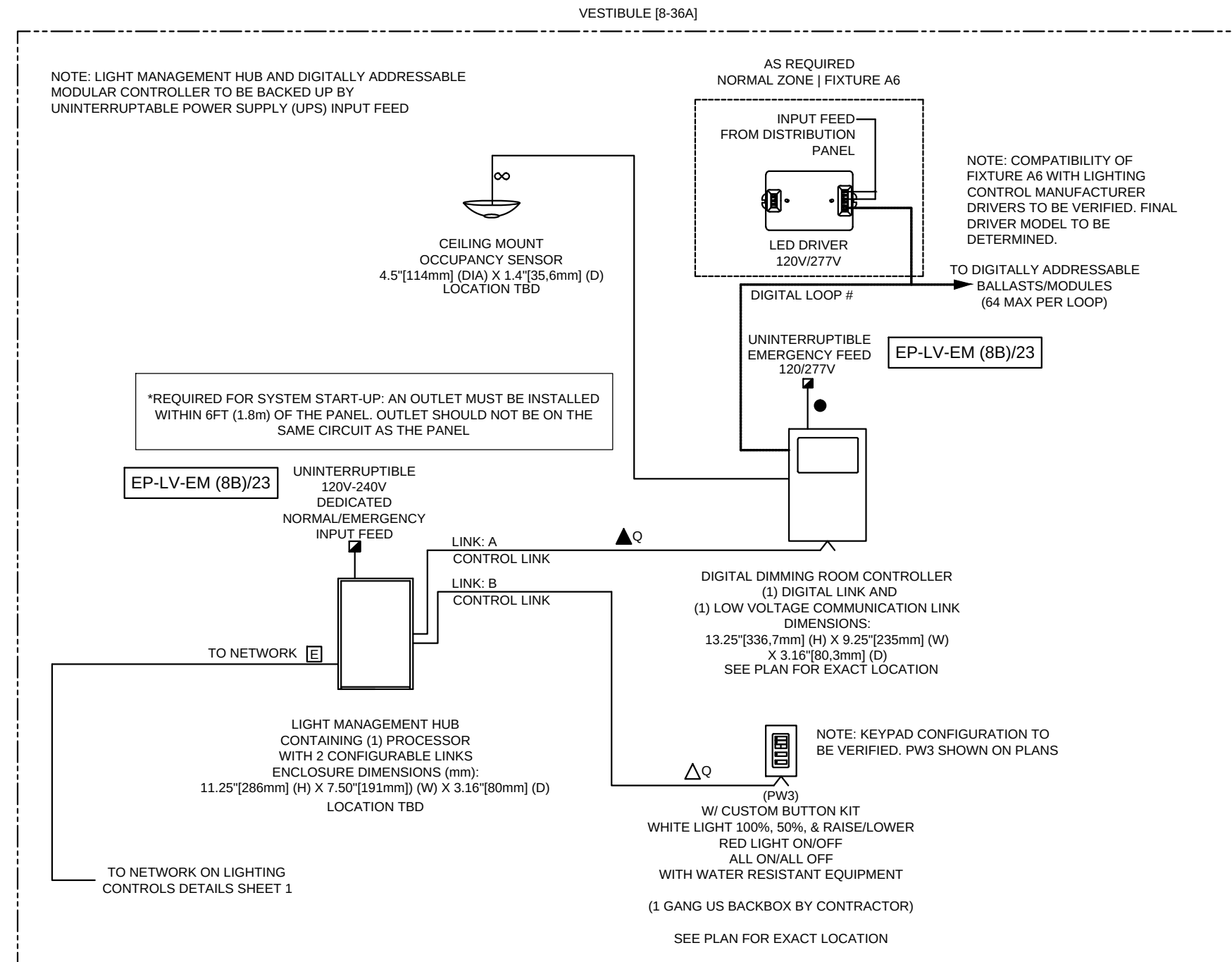
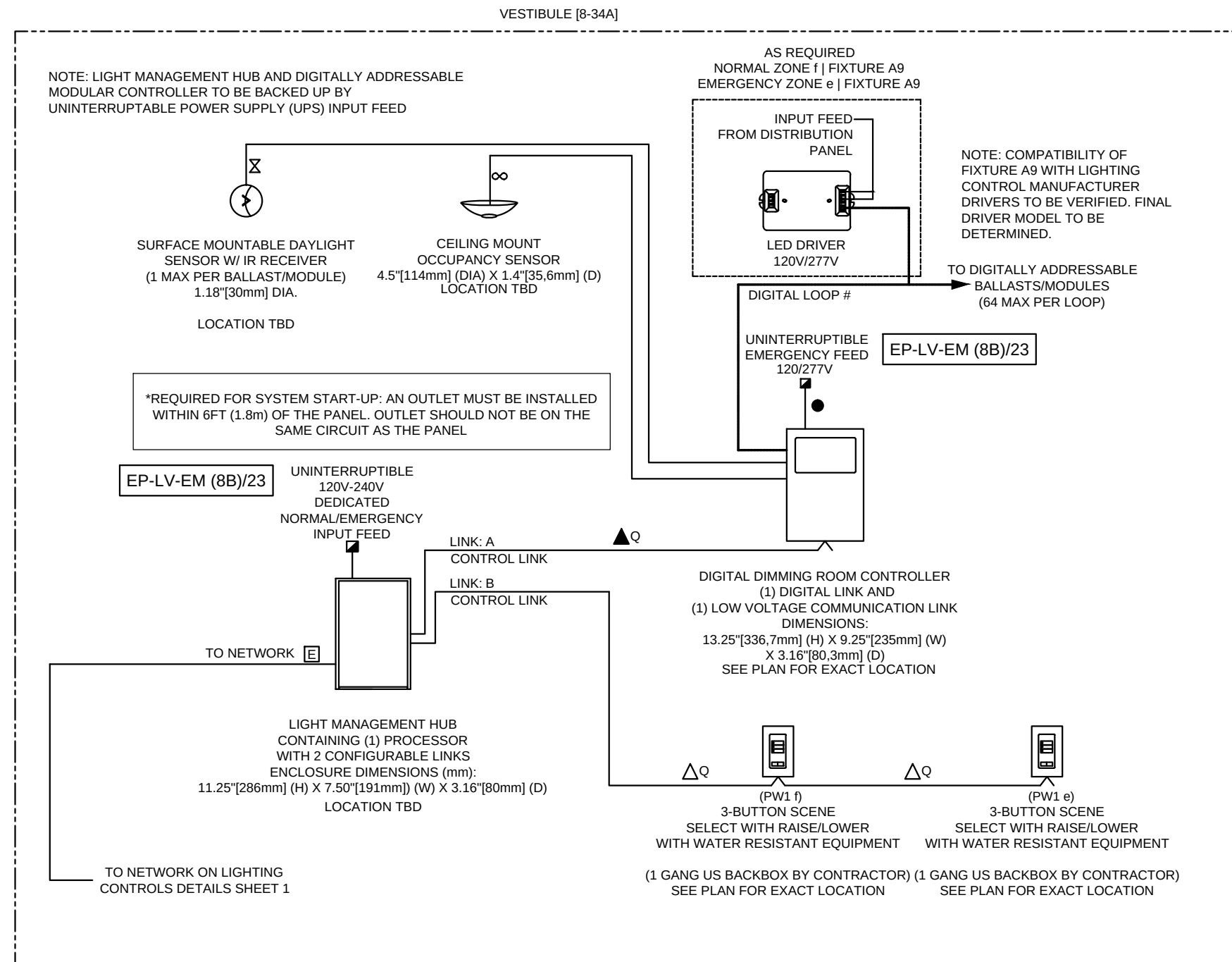
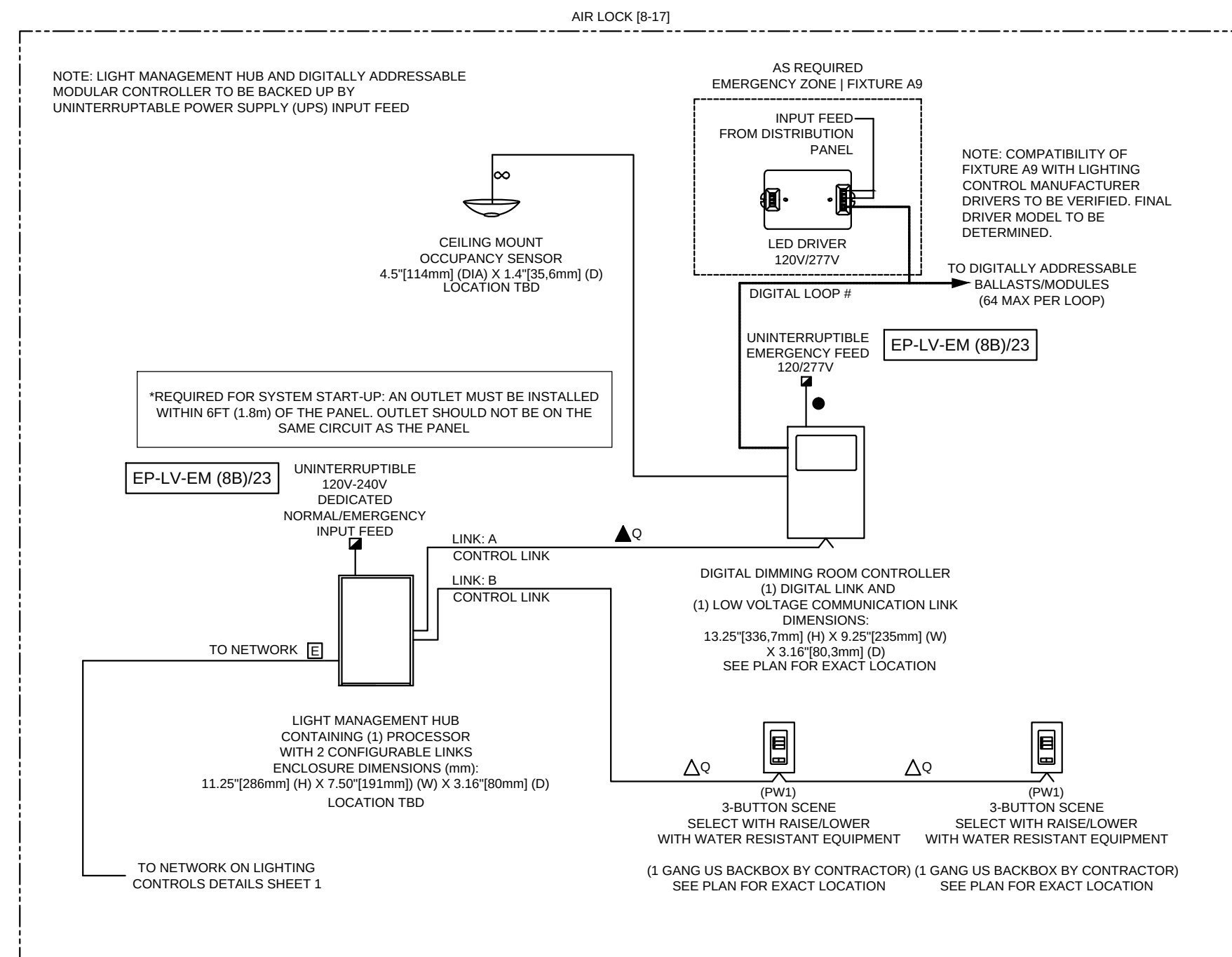
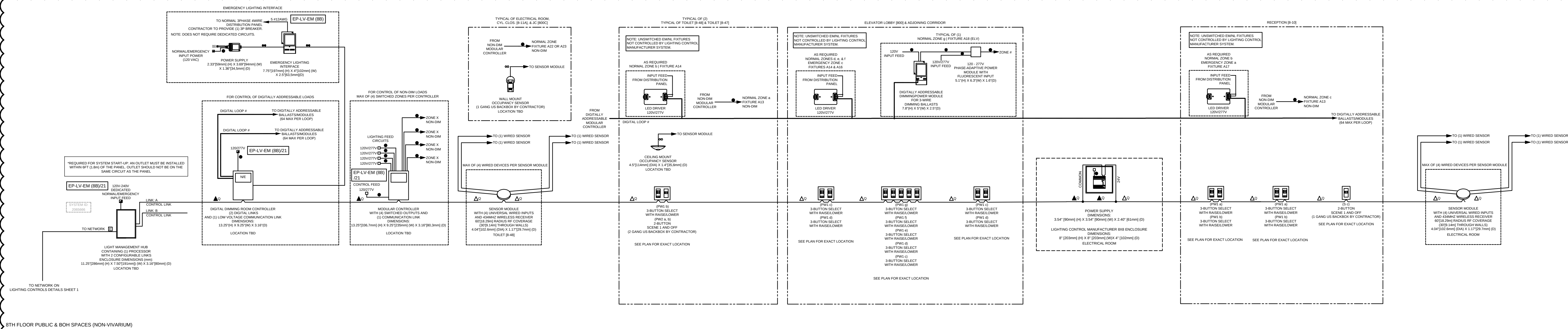
CONSULTANT	
ARCHITECT PERKINS EASTMAN 115 FIFTH AVENUE NEW YORK, NEW YORK 10003	LAB CONSULTANT JACOBS CONSULTANCY 303 SOUTH BROADWAY, SUITE G20 TARRYTOWN, NEW YORK 10591
MEP & LIGHTING AKF GROUP ONE LIBERTY PLAZA 165 BROADWAY, 22ND FLOOR NEW YORK, NEW YORK 10006	ACOUSTICS/ IT /SECURITY CERAMI ASSOCIATES 404 FIFTH AVENUE NEW YORK, NEW YORK 10018
COMMISSIONING ARAMARK 52 JAMES STREET ALBANY, NEW YORK 12207	HAZARDOUS MATERIALS AIRTEK ENVIRONMENTAL CORP. 39-37 29TH STREET LONG ISLAND CITY, NEW YORK 11103
COST ESTIMATING VJ ASSOCIATES 100 DUFFY AVENUE HICKSVILLE, NEW YORK 11801	

WARNING:
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FOR A LANDSCAPE ARCHITECT, IS A VIOLATION OF THE
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AND IS A CLASS "A" MISDEMEANOR.



CONTRACT:	
CONSTRUCTION	
TITLE: PROVIDE CONVERSION OF 8TH FLOOR TO ANIMAL LAB BUILDING NO. 4	
LOCATION: NEW YORK PSYCHIATRIC INSTITUTE 1051 RIVERSIDE DRIVE NEW YORK, NY 10032	
CLIENT: NEW YORK STATE OFFICE OF METAL HEALTH	

MARK	DATE	DESCRIPTION
01	10/24/2016	ADDENDUM #2
	07/13/2016	FINAL SUBMISSION
	06/29/2015	100% CD SUBMISSION
PROJECT NUMBER: 44219-C		
DESIGNED BY:		
DRAWN BY: MM		
FIELD CHECK: ZH		
APPROVED:		
SHEET TITLE: ELECTRICAL DETAILS		
DRAWING NUMBER: E-502		
SHEET 52 OF 91		



LIGHTING CONTROLS DETAILS SHEET 2

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CONTRACT

CONSTRUCTION

TITLE: PROVIDE CONVERSION OF 8TH FLOOR TO ANIMAL LAB BUILDING NO. 4

LOCATION:
NEW YORK PSYCHIATRIC INSTITUTE
1051 RIVERSIDE DRIVE
NEW YORK, NY 10032

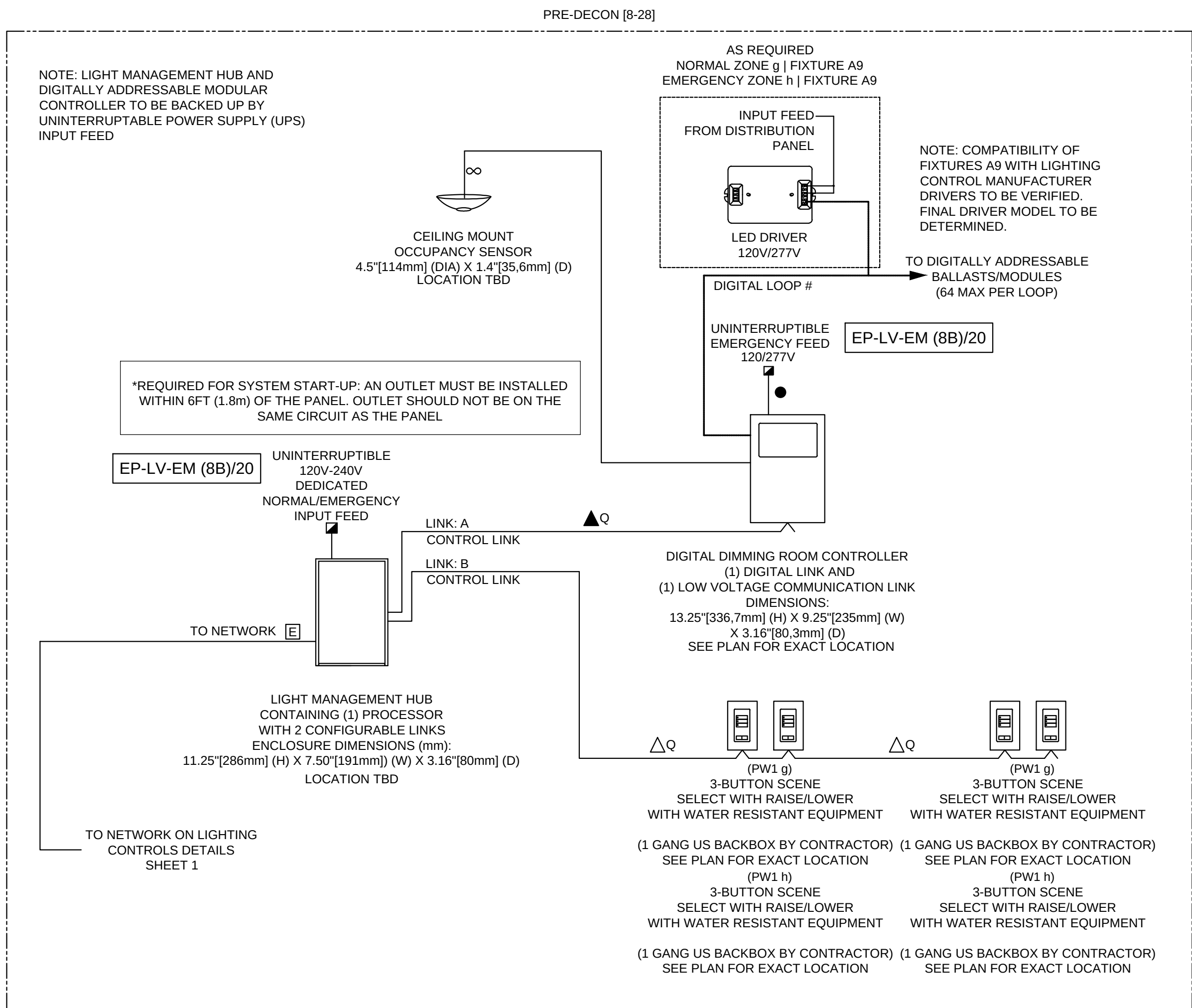
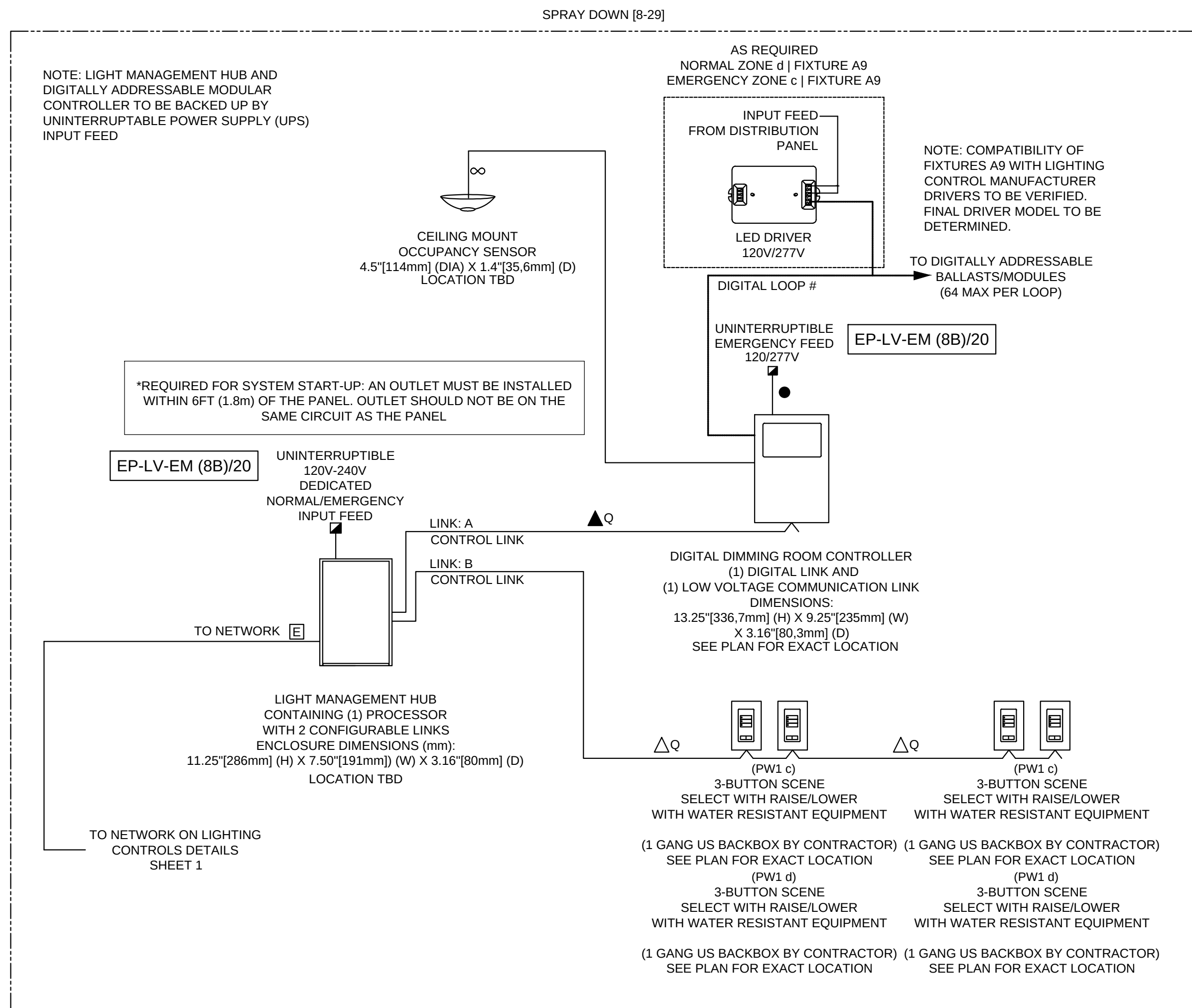
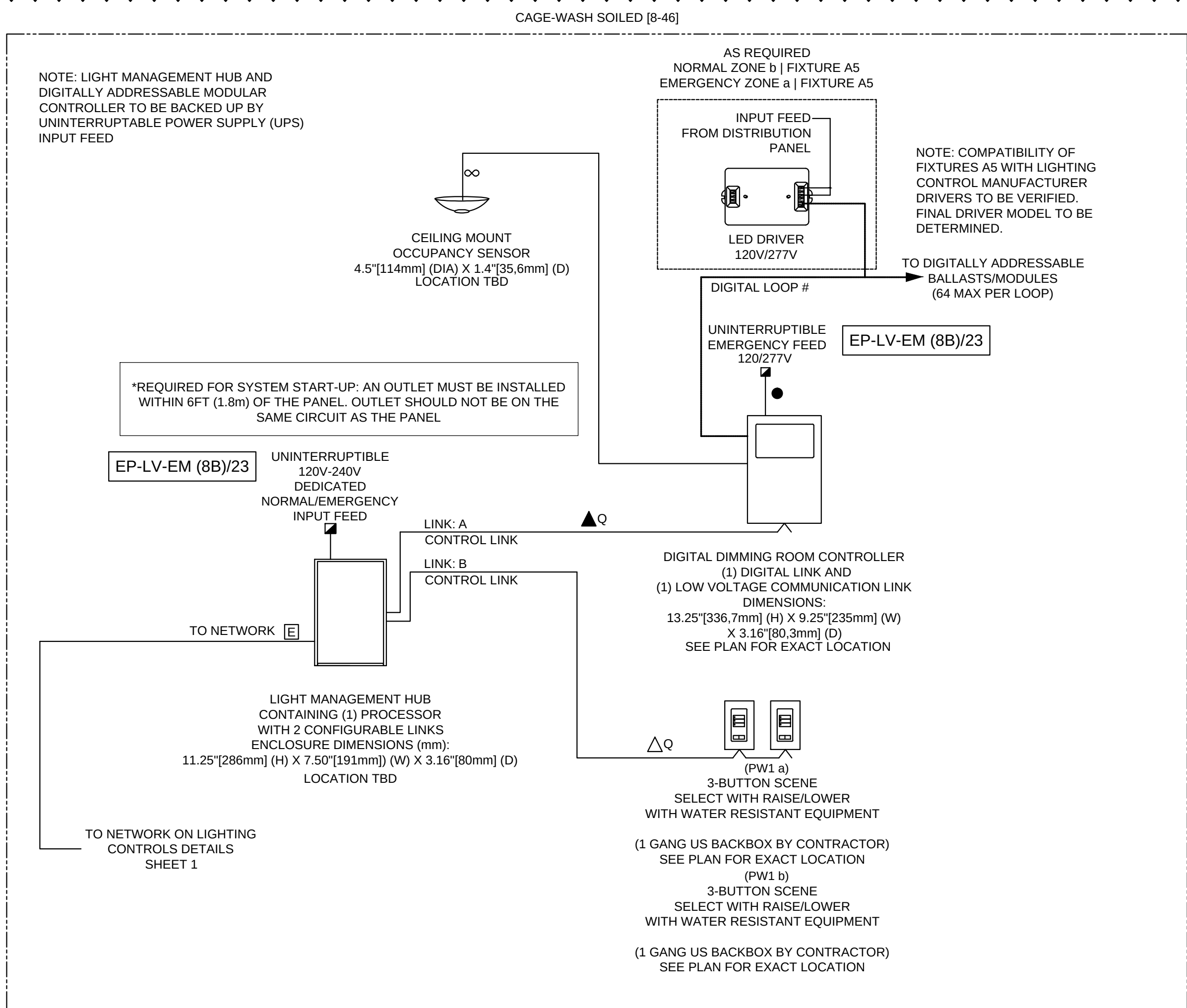
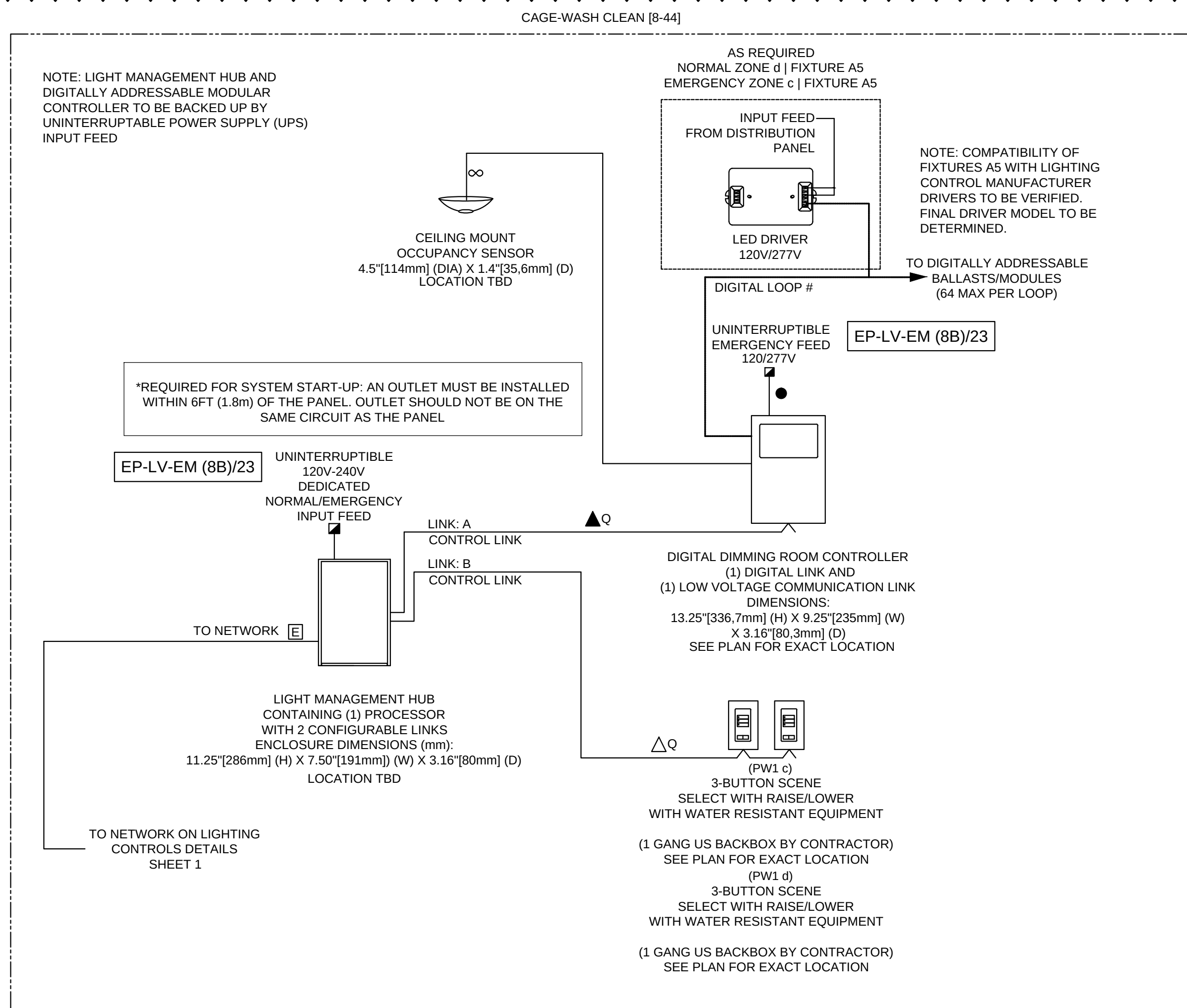
CLIENT: NEW YORK STATE
OFFICE OF METAL HEALTH

01	10/24/2016	ADDENDUM #2	1
	07/13/2016	FINAL SUBMISSION	
	06/29/2015	100% CD SUBMISSION	
MARK	DATE	DESCRIPTION	
PROJECT NUMBER:	44219-C		
DESIGNED BY:			
DRAWN BY:	MM		
FIELD CHECK:	ZH		
APPROVED:			
SHEET TITLE:			

ELECTRICAL DETAILS

DRAWING NUMBER

E-504



8TH FLOOR SENSITIVE AREAS (VIVARIUM)

LIGHTING CONTROLS DETAILS SHEET 3

DESIGN & CONSTRUCTION

CONSULTANT

ARCHITECT

PERKINS EASTMAN
115 FIFTH AVENUE
NEW YORK, NEW YORK 10003

LAB CONSULTANT

JACOBS CONSULTANCY
303 SOUTH BROADWAY, SUITE G20
TARRYTOWN, NEW YORK 10591

MEP & LIGHTING

AKF GROUP
ONE LIBERTY PLAZA
165 BROADWAY, 22ND FLOOR
NEW YORK, NEW YORK 10006

ACOUSTICS/ IT /SECURITY

CERAMI ASSOCIATES
404 FIFTH AVENUE
NEW YORK, NEW YORK 10018

COMMISSIONING

ARAMARK
52 JAMES STREET
ALBANY, NEW YORK 12207

HAZARDOUS MATERIALS

AIRTEK ENVIRONMENTAL CORP.
39-37 29TH STREET
LONG ISLAND CITY, NEW YORK 11103

COST ESTIMATING

VJ ASSOCIATES
100 DUFFY AVENUE
HICKSVILLE, NEW YORK 11801

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CONTRACT:

CONSTRUCTION

TITLE:

PROVIDE CONVERSION OF 8TH
FLOOR TO ANIMAL LAB
BUILDING NO. 4

LOCATION:

NEW YORK PSYCHIATRIC INSTITUTE
1051 RIVERSIDE DRIVE
NEW YORK, NY 10032

CLIENT:

NEW YORK STATE
OFFICE OF METAL HEALTH

MARK	DATE	DESCRIPTION
01	10/24/2016	ADDENDUM #2
	07/13/2016	FINAL SUBMISSION
	06/29/2015	100% CD SUBMISSION
PROJECT NUMBER:	44219-C	
DESIGNED BY:		
DRAWN BY:	MM	
FIELD CHECK:	ZH	
APPROVED:		
SHEET TITLE:	ELECTRICAL DETAILS	

DRAWING NUMBER:

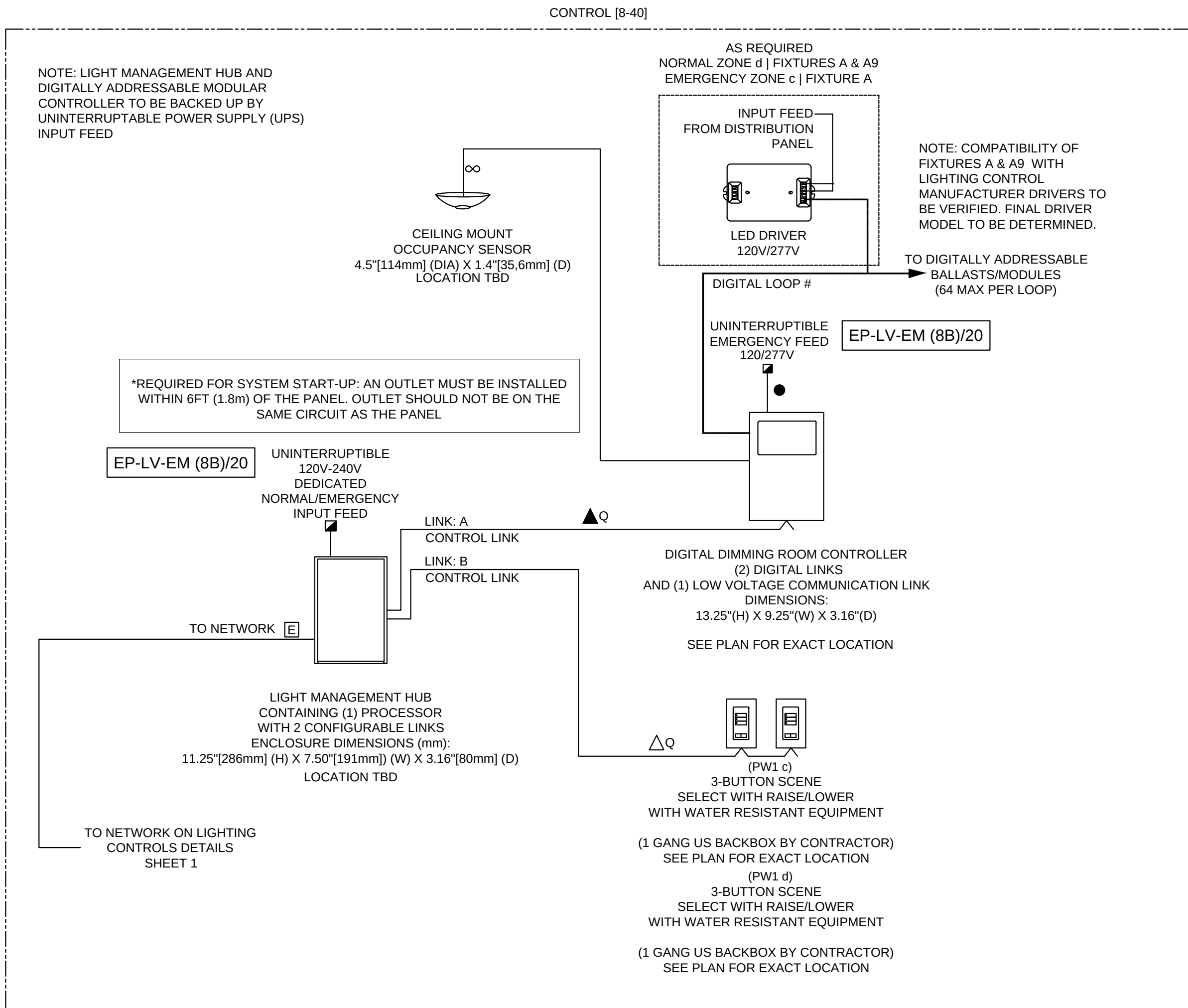
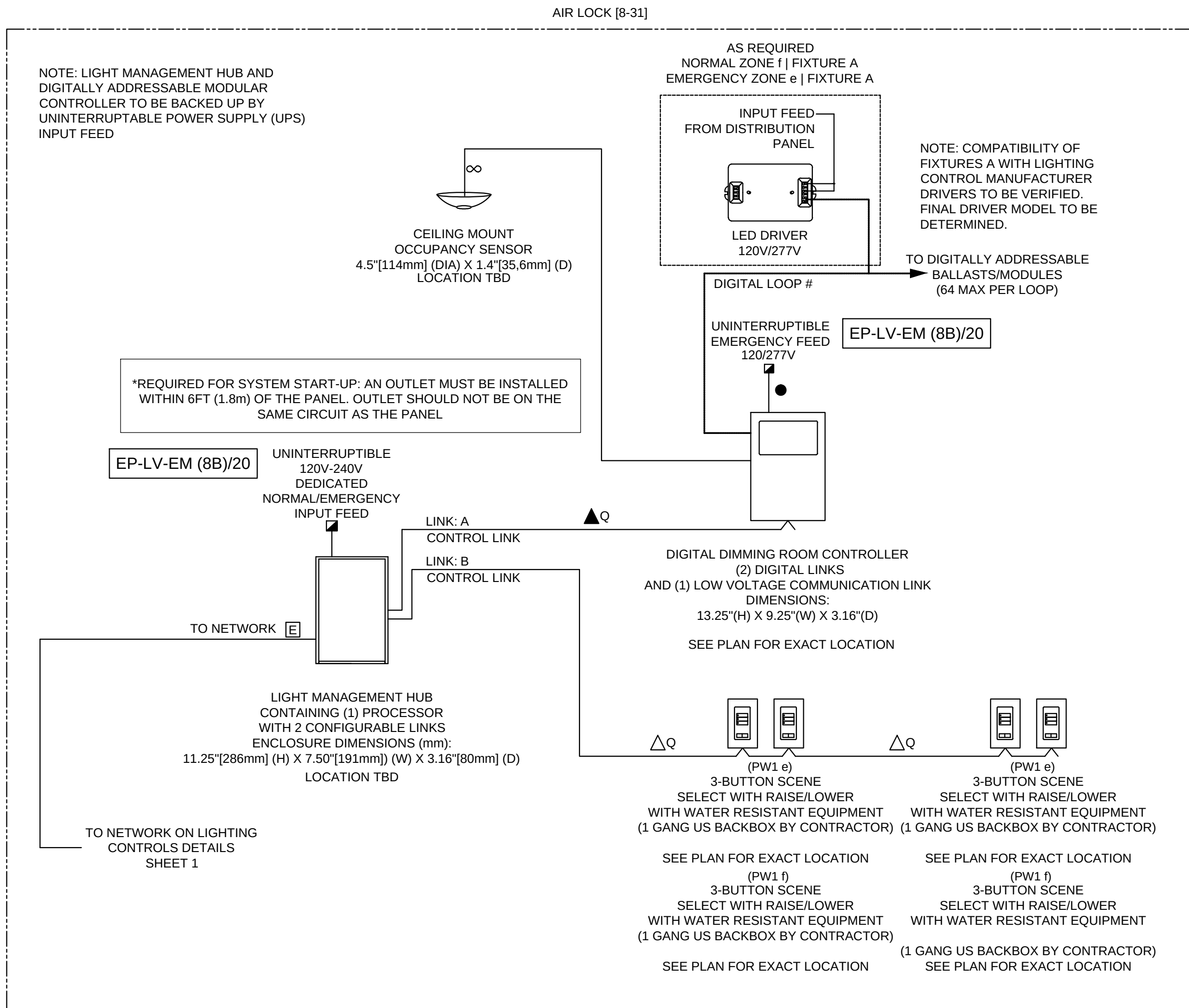
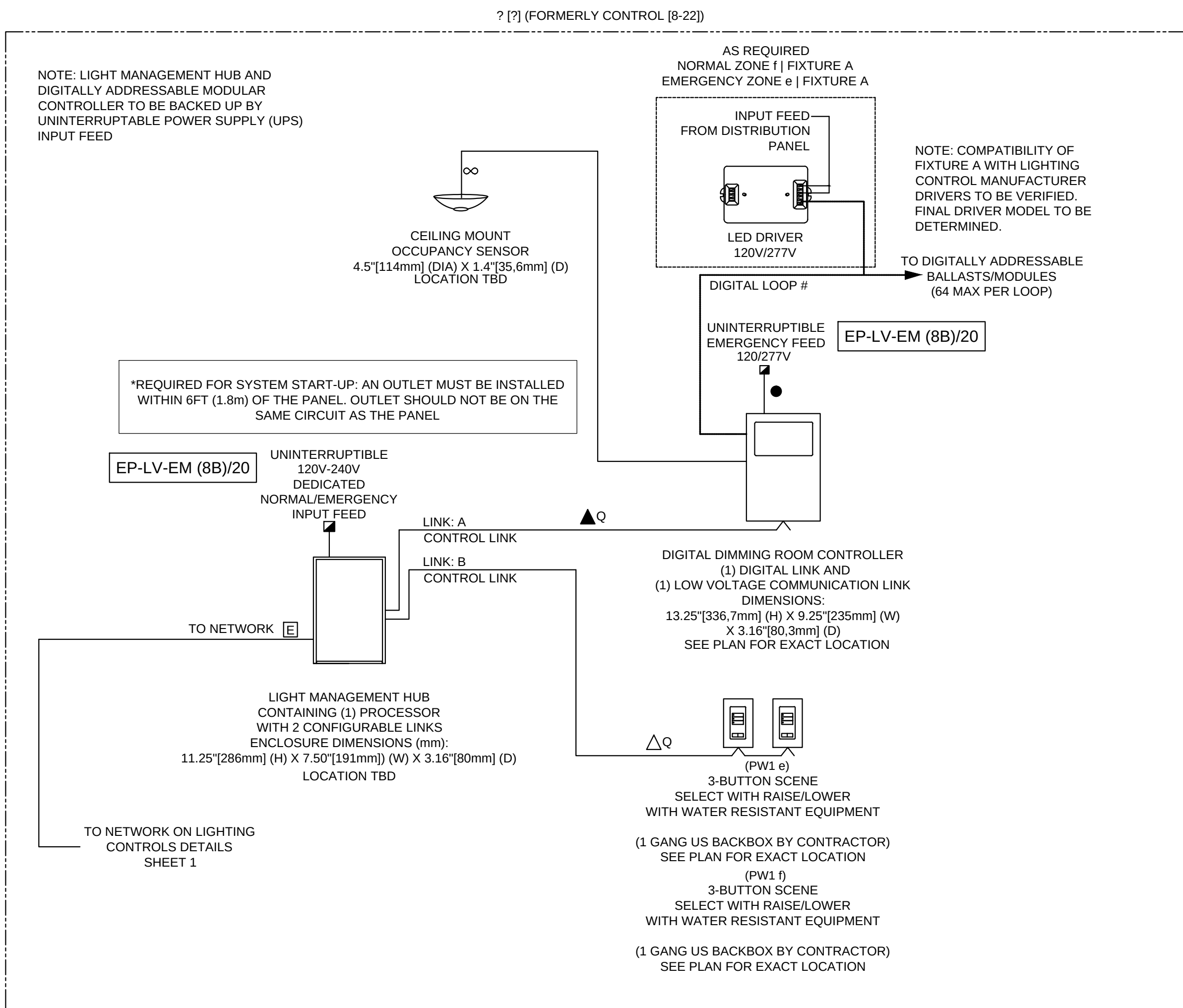
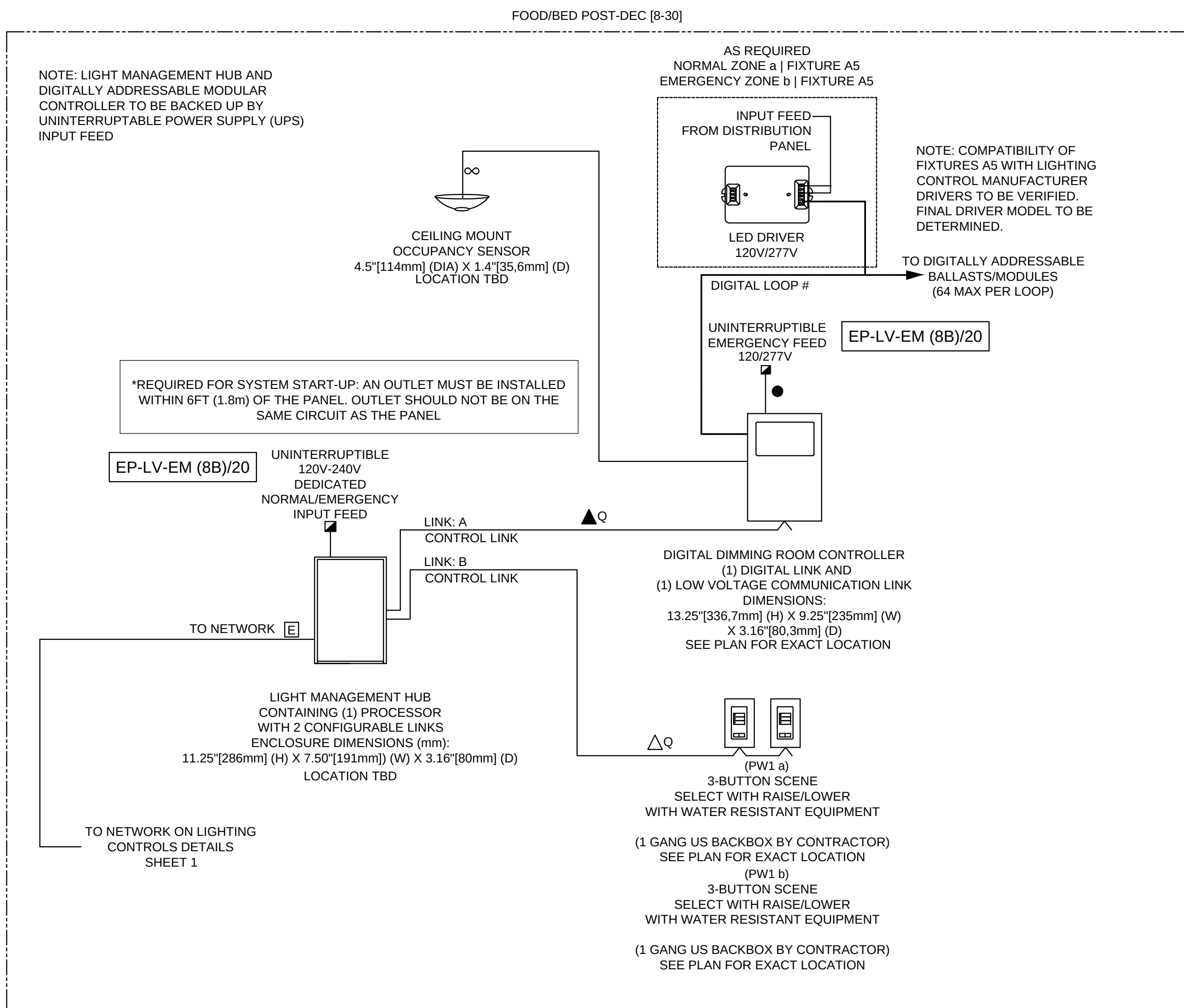
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SAVE DATE: 10/21/2016 7:42 PM

PLOT DATE: 10/21/2016 7:44 PM

LOGIN: Minziou, Michael

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8TH FLOOR SENSITIVE AREAS (VIVARIUM)

LIGHTING CONTROLS DETAILS SHEET 4



DESIGN & CONSTRUCTION

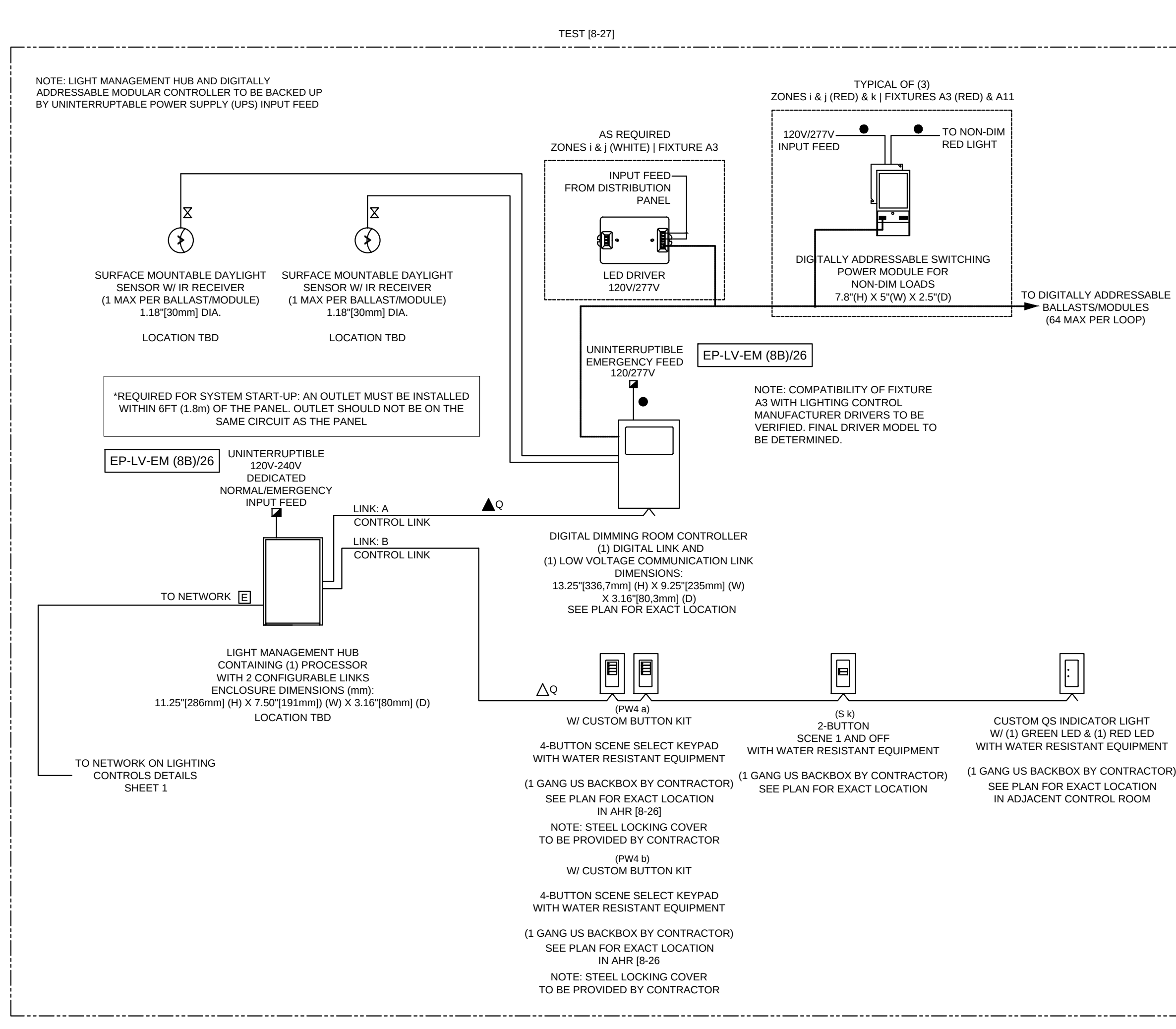
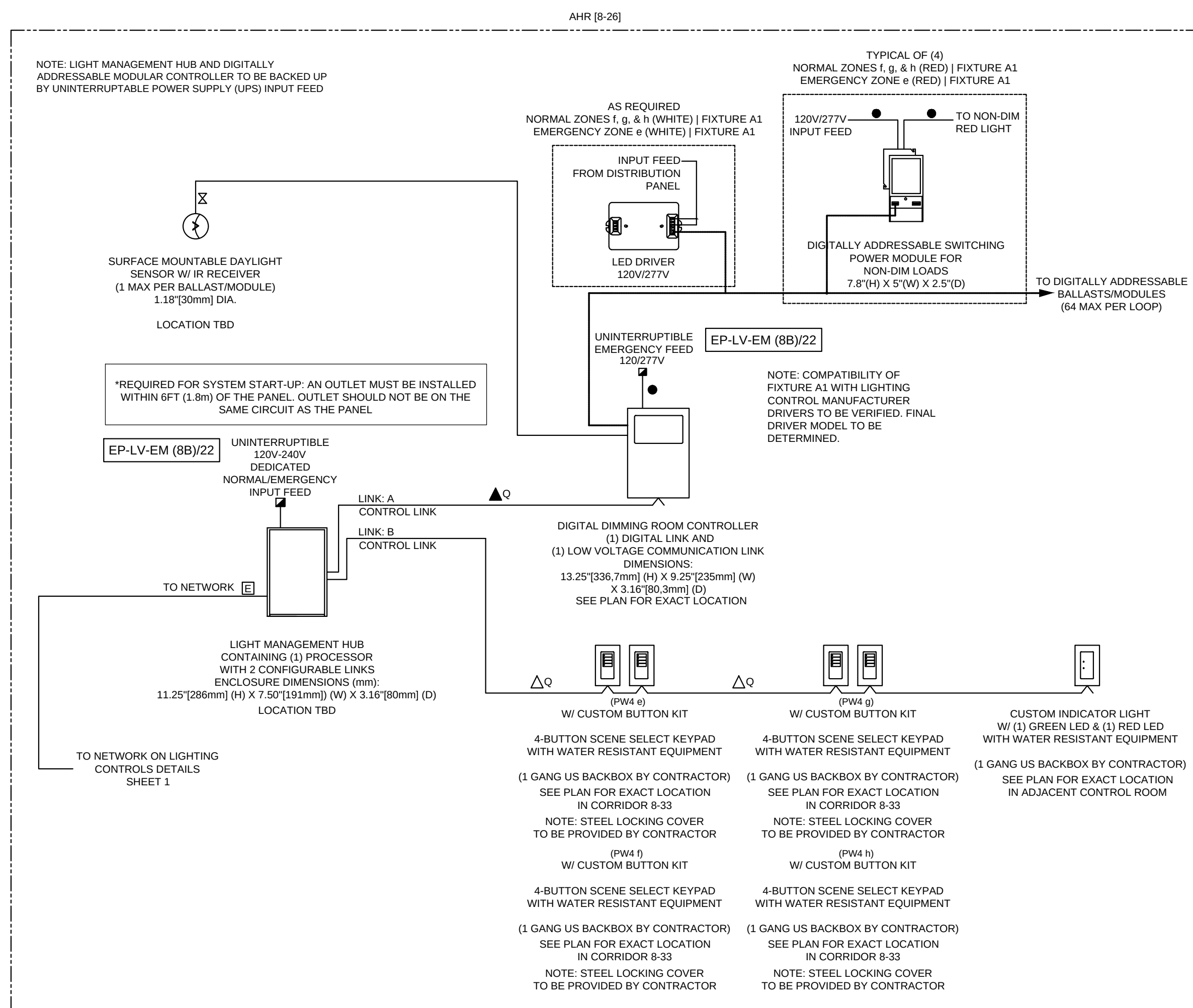
CONSULTANT	
ARCHITECT PERKINS EASTMAN 115 FIFTH AVENUE NEW YORK, NEW YORK 10003	LAB CONSULTANT JACOBS CONSULTANCY 303 SOUTH BROADWAY, SUITE G20 TARRYTOWN, NEW YORK 10591
MEP & LIGHTING AKF GROUP ONE LIBERTY PLAZA 165 BROADWAY, 22ND FLOOR NEW YORK, NEW YORK 10006	ACOUSTICS/ IT /SECURITY CERAMI ASSOCIATES 404 FIFTH AVENUE NEW YORK, NEW YORK 10018
COMMISSIONING ARMAARK 52 JAMES STREET ALBANY, NEW YORK 12207	HAZARDOUS MATERIALS AIRTEK ENVIRONMENTAL CORP. 39-37 29TH STREET LONG ISLAND CITY, NEW YORK 11103
COST ESTIMATING VJ ASSOCIATES 100 DUFFY AVENUE HICKSVILLE, NEW YORK 11801	

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CONTRACT:	CONSTRUCTION
TITLE:	PROVIDE CONVERSION OF 8TH FLOOR TO ANIMAL LAB BUILDING NO. 4
LOCATION:	NEW YORK PSYCHIATRIC INSTITUTE 1051 RIVERSIDE DRIVE NEW YORK, NY 10032
CLIENT:	NEW YORK STATE OFFICE OF METAL HEALTH

PROJECT NUMBER:	44219-C
DESIGNED BY:	
DRAWN BY:	MM
FIELD CHECK:	ZH
APPROVED:	
SHEET TITLE:	ELECTRICAL DETAILS
DRAWING NUMBER:	E-506
SHEET	56 OF 91



LIGHTING CONTROLS DETAILS SHEET 5

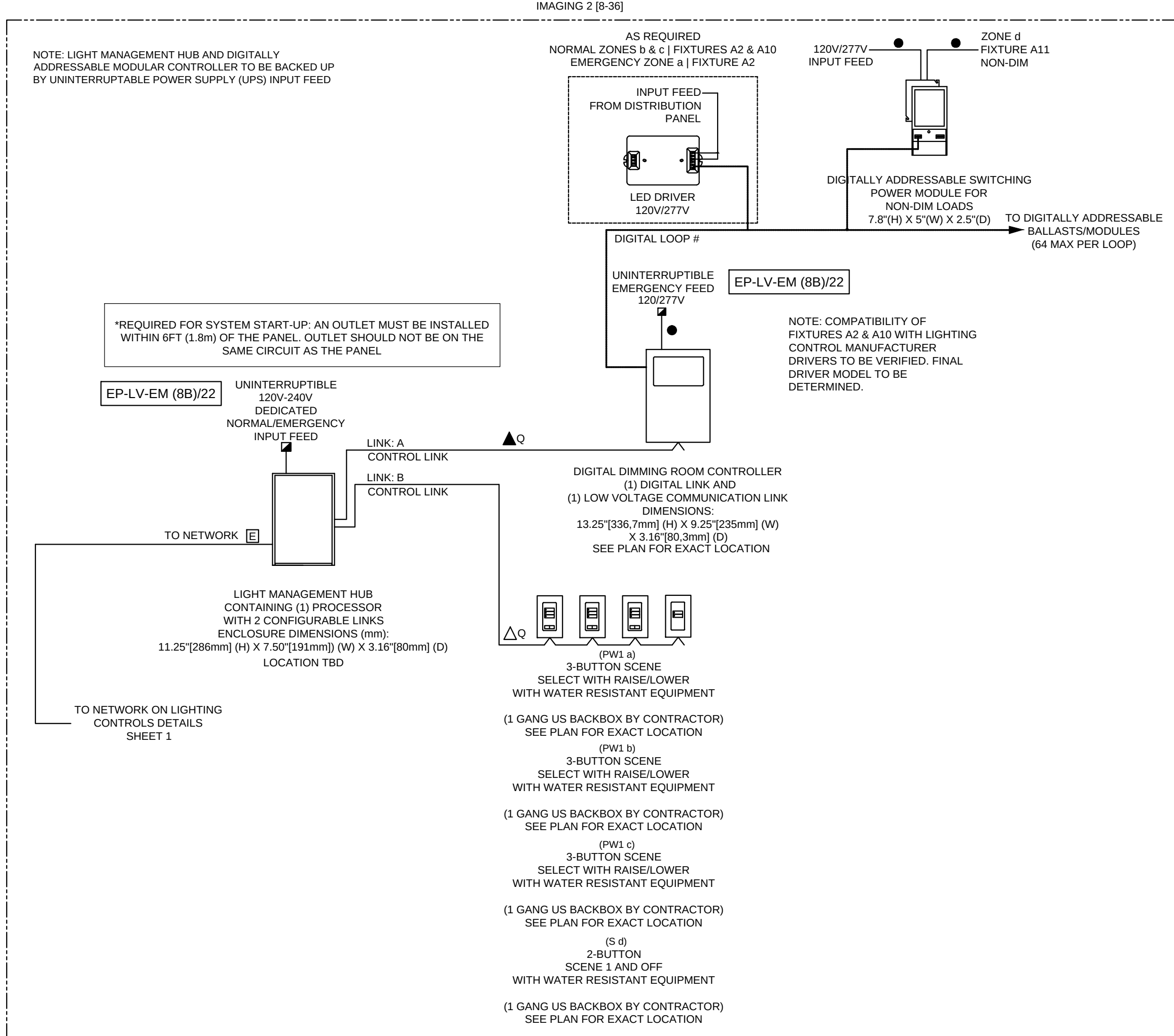
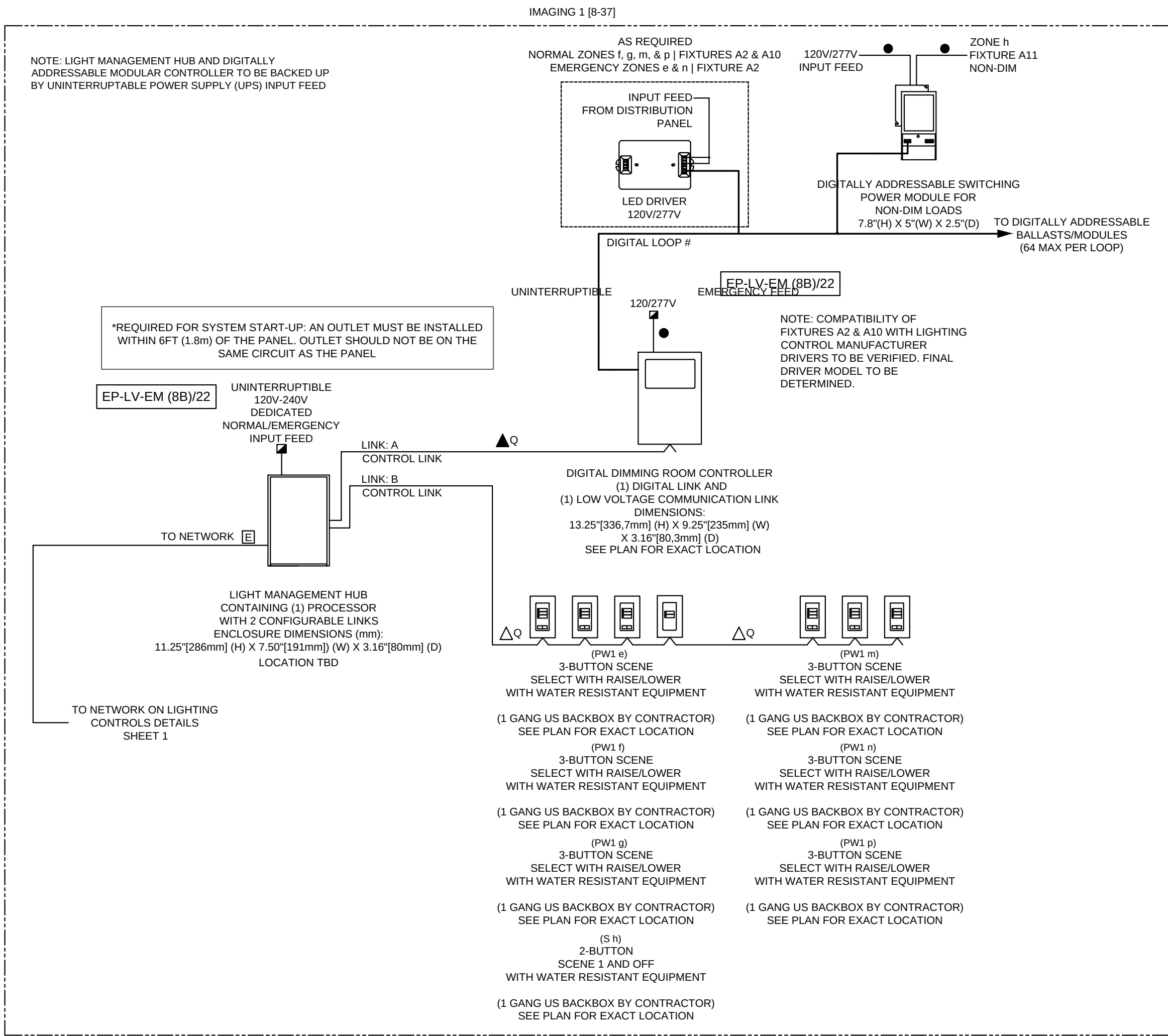
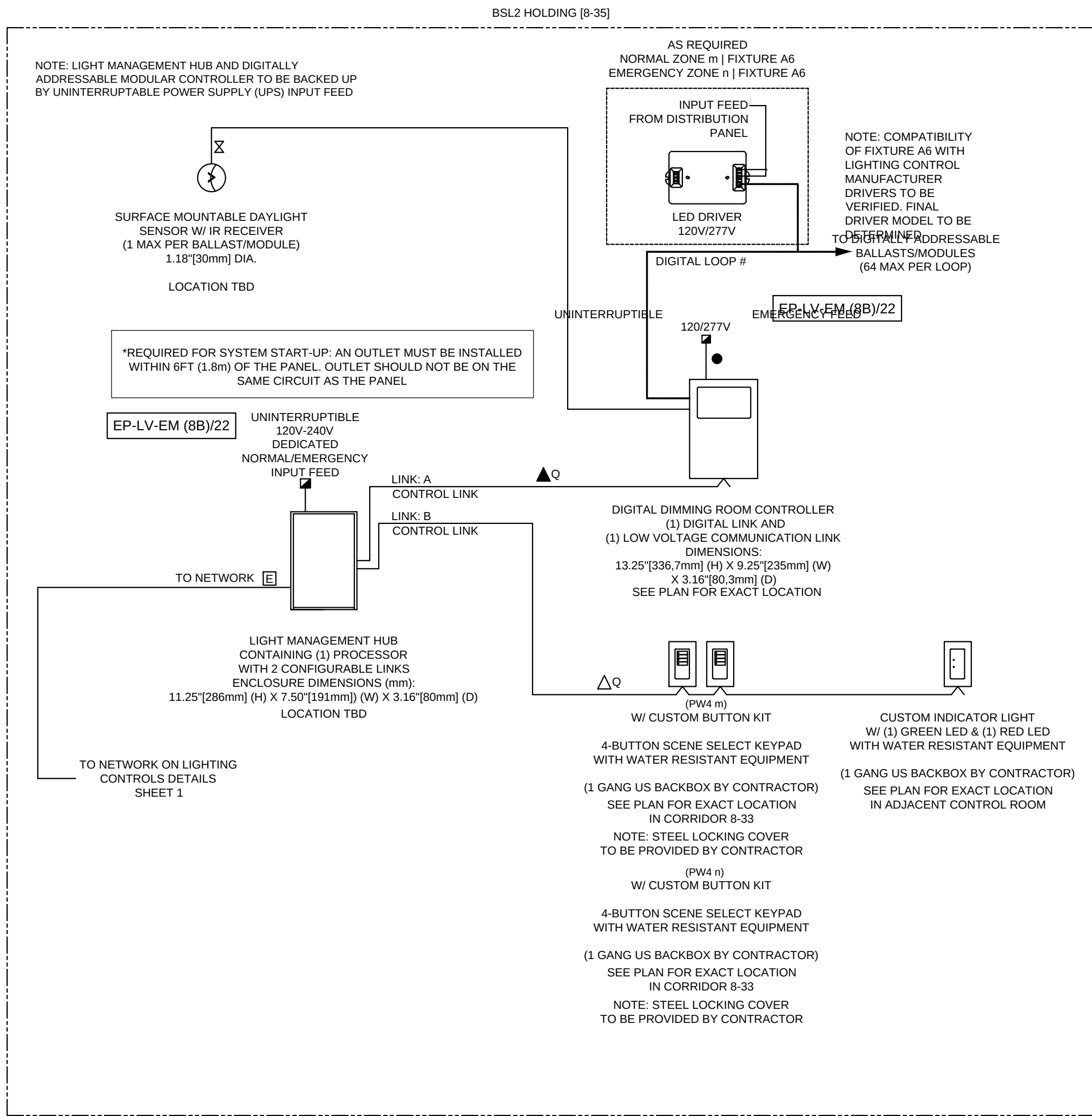
01	10/24/2016	ADDENDUM #2 
	07/13/2016	FINAL SUBMISSION
	06/29/2015	100% CD SUBMISSION
MARK	DATE	DESCRIPTION
PROJECT NUMBER:	44219-C	
DESIGNED BY:		
DRAWN BY:	MM	
FIELD CHECK:	ZH	
APPROVED:		
SHEET TITLE:		
ELECTRICAL DETAILS		
DRAWING NUMBER:		
E-507		
SHEET	57	OF 91

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PLOT DATE: 10/21/2016 7:45 PM

LOGIN: Minziou, Michael

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8TH FLOOR SENSITIVE AREAS (VIVARIUM)

LIGHTING CONTROLS DETAILS SHEET 6



DESIGN & CONSTRUCTION

CONSULTANT

ARCHITECT
PERKINS EASTMAN
115 FIFTH AVENUE
NEW YORK, NEW YORK 10003

LAB CONSULTANT
JACOBS CONSULTANCY
303 SOUTH BROADWAY, SUITE G20
TARRYTOWN, NEW YORK 10591

MEP & LIGHTING
AKF GROUP
ONE LIBERTY PLAZA
165 BROADWAY, 22ND FLOOR
NEW YORK, NEW YORK 10006

ACOUSTICS/ IT /SECURITY
CERAMI ASSOCIATES
404 FIFTH AVENUE
NEW YORK, NEW YORK 10018

COMMISSIONING
ARMARK
52 JAMES STREET
ALBANY, NEW YORK 12207

HAZARDOUS MATERIALS
AIRTEK ENVIRONMENTAL CORP.
39-37 29TH STREET
LONG ISLAND CITY, NEW YORK 11101

COST ESTIMATING
VJ ASSOCIATES
100 DUFFY AVENUE
HICKSVILLE, NEW YORK 11801

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CONSTRUCTION

TITLE:
PROVIDE CONVERSION OF 8TH FLOOR TO ANIMAL LAB BUILDING NO. 4

LOCATION:
NEW YORK PSYCHIATRIC INSTITUTE
1051 RIVERSIDE DRIVE
NEW YORK, NY 10032

CLIENT:
NEW YORK STATE
OFFICE OF METAL HEALTH

MARK	DATE	DESCRIPTION
01	10/24/2016	ADDENDUM #2
	07/13/2016	FINAL SUBMISSION
	06/29/2015	100% CD SUBMISSION

PROJECT NUMBER: 44219-C
DESIGNED BY:
DRAWN BY: MM
FIELD CHECK: ZH
APPROVED:
SHEET TITLE: ELECTRICAL DETAILS

DRAWING NUMBER: E-508
SHEET 58 OF 91

FIRE ALARM SYMBOL LIST

CONTROL UNITS (PANELS) SYMBOLS

	FIRE ALARM CONTROL PANEL
	NOTIFICATION CIRCUIT POWER BOOSTER PANEL
	FIRE ALARM TERMINAL CABINET
	FIRE SUPPRESSION CONTROL PANEL, PRE-ACTION SUPPRESSION TYPE.

NOTIFICATION APPLIANCES SYMBOLS

	NOTIFICATION APPLIANCE SUBSCRIPTS ('XX') WP = WEATHER-RESISTANT
	VISIBLE ONLY (STROBE) - WALL MOUNT CD = CANDELA RATING/SETTING
	COMBINATION SPEAKER/VISIBLE CD = CANDELA RATING/SETTING
	COMBINATION HORN/VISIBLE CD = CANDELA RATING/SETTING PA = ASSOCIATED WITH THE PRE-ACTION SYSTEM

RELATED EQUIPMENT

	DOOR ACCESS CONTROL PANEL LOCATION FOR ELECTRIC DOOR LOCK RELEASE
	MAGNETIC DOOR HOLD-OPEN DEVICE
	FIRE SERVICE OR EMERGENCY PHONE STATION STATION, 'X' DENOTES TYPE: J = JACK, SURFACE MOUNTED H = HANDSET, RECESSED MOUNTED
	FUSED DISCONNECT SWITCH, LOCKABLE TYPE
	FIRE/SMOKE DAMPER
	AIR COMPRESSOR

FIRE ALARM DRAWING LIST	
DRAWING No.	DRAWING TITLE
FA-001	FIRE ALARM COVER SHEET
FA-002	FIRE ALARM NOTES
FA-003	FIRE ALARM PRE-ACTION SYSTEM NOTES AND 8TH FLOOR PLAN
FAR-101	FIRE ALARM 8TH FLOOR REMOVAL PLAN
FA-101	FIRE ALARM 8TH FLOOR PLAN

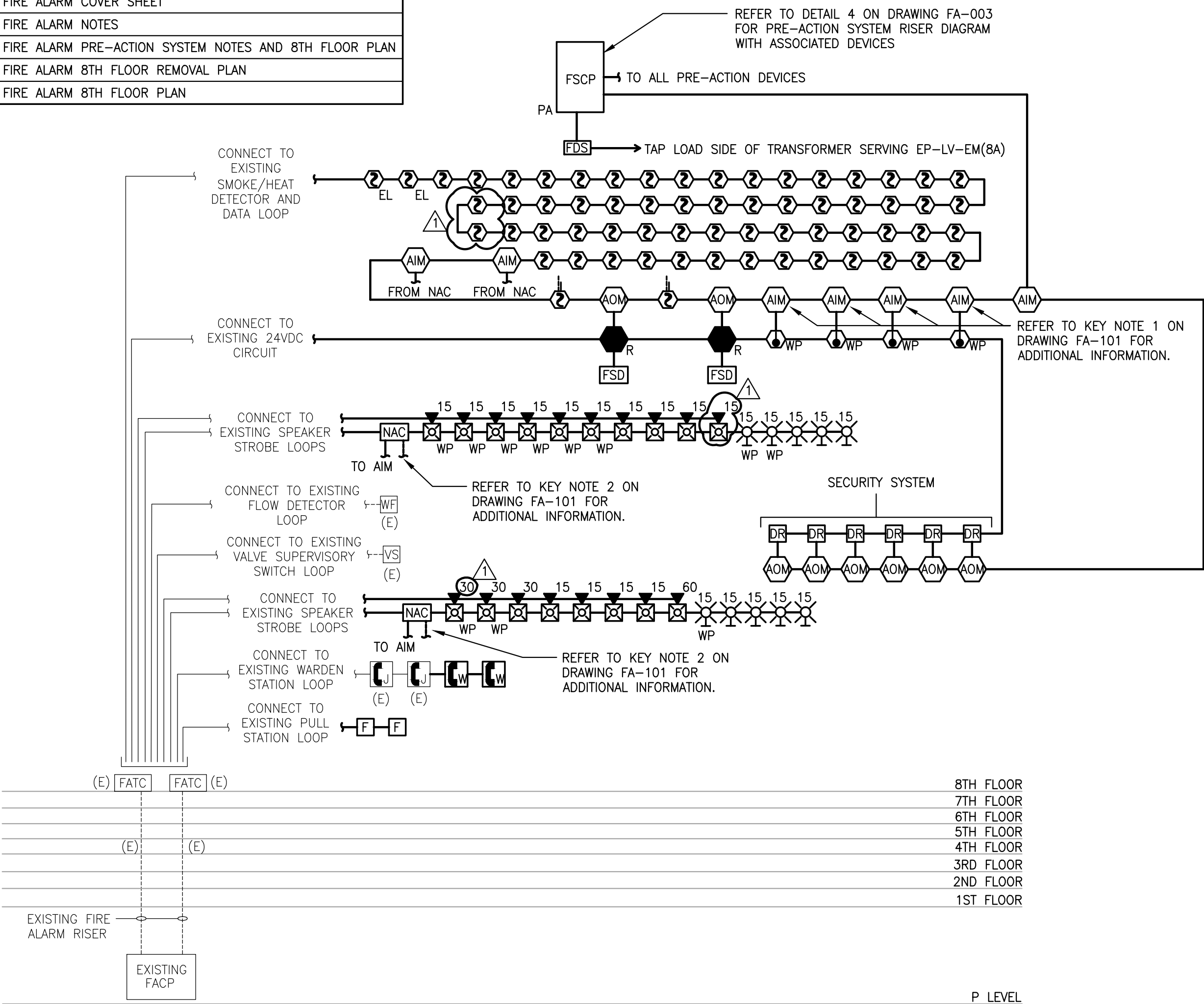
SIGNAL INITIATING DEVICES & ACTIVATION SWITCHES SYMBOLS

	MANUAL STATION - PULL STATION/FIRE ALARM BOX, 'XX' DENOTES TYPE: F = FIRE ALARM PRE = PRE-ACTION RELEASING
	ABORT SWITCH FOR PRE-ACTION SYSTEM
	HEAT DETECTOR/SENSOR (THERMAL DETECTION), 'XX' DENOTES TYPE WP = WEATHER-RESISTANT, FENWAL DETECT-A-FIRE 12-X27121-000
	SMOKE DETECTOR/SENSOR, 'XX' DENOTES TYPE: EL = ELEVATOR RECALL PA = PRE-ACTION SYSTEM
	SMOKE DETECTION/SENSOR FOR DUCT
	FLOW DETECTOR/SWITCH
	PRESSURE DETECTOR/SWITCH FOR PRE-ACTION SYSTEM
	VALVE SUPERVISORY SWITCH
	ADDRESSABLE INPUT MODULE
	ADDRESSABLE OUTPUT MODULE
	ADDRESSABLE INPUT/OUTPUT MODULE # DENOTES NUMBER OF INPUTS AND OUTPUTS
	NON-ADDRESSABLE OUTPUT RELAY
	EXISTING LOW VOLTAGE WIRING AND CONDUIT
	EXISTING 120V WIRING AND CONDUIT
	NEW LOW VOLTAGE WIRING AND CONDUIT
	NEW 120V WIRING AND CONDUIT
	EXISTING TO REMAIN
	RELOCATED EXISTING
	EXISTING TO BE REMOVED
	EXISTING TO BE REMOVED AND RELOCATED
	EXISTING TO BE REMOVED AND RETURNED TO DIRECTOR'S REPRESENTATIVE
	WEATHER-RESISTANT

FIRE ALARM GENERAL NOTES

- DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS AND WORK. FOLLOW DRAWINGS IN LAYING OUT WORK AND CHECK DRAWINGS OF OTHER TRADES TO VERIFY SPACE CONDITIONS. MAINTAIN HEADROOM AND SPACE CONDITIONS.
- SECURE ALL SUPPORTS TO BUILDING STRUCTURE UTILIZING TOGGLE BOLTS (HOLLOW MASONRY), EXPANSION SHIELDS OR INSERTS (CONCRETE AND BRICK), MACHINE SCREWS (METAL), BEAM CLAMPS (FRAMEWORK), WOOD SCREWS (WOOD) OR PAN THRU STRAPS (METAL DECK). NAILS, RAWL PLUGS AND WOOD PLUGS ARE NOT PERMITTED. WHERE REQUIRED BY STRUCTURE, PROVIDE THRU BOLTS AND FISH PLATES. SUPPORT HORIZONTAL RUNS OF METALLIC RACEWAYS NOT MORE THAN 10 FT APART. SUPPORT RACEWAY RISERS AT EACH FLOOR LEVEL. RUN EXPOSED RACEWAYS PARALLEL WITH OR AT RIGHT ANGLES TO WALLS.
- PASS RACEWAYS OVER WATER, STEAM OR OTHER PIPING WHEN PULL BOXES ARE NOT REQUIRED. NO RACEWAY WITHIN 6 INCHES OF STEAM OR HOT WATER PIPES OR APPLIANCES (EXCEPT PIPE CROSSINGS WHERE RACEWAY SHALL BE AT LEAST 3 INCH FROM PIPE COVERS).
- CUT CONDUIT ENDS SQUARE. REAM SMOOTH. PAINT MALE THREAD OF FIELD THREADED RACEWAYS WITH GRAPHITE BASE PIPE COMPOUND. DRAW UP TIGHT WITH RACEWAY COUPLING.
- HORIZONTAL OR CROSS RUNS IN PARTITIONS AND WALLS ARE NOT PERMITTED. DO NOT RUN CONDUIT IN PRECAST ROOF SLABS, IN 2 INCH SLABS OR IN TERRAZZO FLOOR FINISH.
- LEAVE WIRES WITH SUFFICIENT SLACK TO PERMIT MAKING FINAL CONNECTIONS. RACEWAYS OVER 10 FT LONG IN WHICH WIRING IS NOT INSTALLED: FURNISH FISH WIRE.
- SET BOXES SQUARE AND TRUE WITH BUILDING FINISH. ERECT WALL AND SWITCH OUTLETS IN ADVANCE OF FURRING AND FIREPROOFING. SECURE TO BUILDING STRUCTURE BY ADJUSTABLE STRAP IRONS.
- VERIFY LOCATIONS OF FIRE ALARM DEVICES IN FINISHED ROOMS WITH ARCHITECTURAL DRAWINGS OF INTERIOR DETAILS AND FINISH. IN CENTERING OUTLETS AND LOCATING BOXES AND OUTLETS, ALLOW FOR OVERHEAD PIPES, DUCTS AND MECHANICAL EQUIPMENT. VARIATIONS IN FIREPROOFING AND PLASTERING, WINDOW AND DOOR TRIM, PANELING, HUNG CEILINGS AND THE LIKE, CORRECT ANY INACCURACY RESULTING FROM FAILURE TO DO SO WITHOUT EXPENSE TO DIRECTOR'S REPRESENTATIVE.
- COVERS OF JUNCTION AND PULLBOXES SHALL BE READILY ACCESSIBLE.
- PROVIDE PULLBOXES WHERE INDICATED, WHERE REQUIRED BY CODE AND WHEREVER NECESSARY TO FACILITATE PULLING OF WIRE. COORDINATE PULLBOX LOCATIONS WITH OTHER TRADES.
- EMPTY RACEWAY RUNS: PROVIDE PULLBOXES EVERY 100 FT AND AS INDICATED. COORDINATE LOCATIONS WITH OTHER TRADES.
- JUNCTION AND PULLBOXES: LOCATE GENERALLY NOT EXPOSED IN FINISHED SPACES. WHERE NECESSARY, REROUTE RACEWAYS OR MAKE OTHER ARRANGEMENTS FOR CONCEALMENT.
- SUPPORT PANEL, JUNCTION AND PULLBOXES INDEPENDENTLY TO BUILDING STRUCTURE WITH NO WEIGHT BEARING ON RACEWAYS.
- ALL ACCESS DOOR LOCATIONS SHALL BE REVIEWED BY DIRECTOR'S REPRESENTATIVE PRIOR TO INSTALLATION.
- HEIGHTS OF OUTLETS FROM FINISHED FLOOR TO CENTERLINE OF OUTLET:
SPEAKERS & STROBES 6"-8" AFF TO BOTTOM OF LENS OR 6" BELOW CEILING (WHICHEVER IS LOWER)
FA PULL STATIONS 4'-0" TO ACTIVATION HANDLE
FIREFIGHTER TELEPHONES 4'-0"
FA STROBE LIGHTS 6'-8" TO BOTTOM OF LENS
EXCEPTIONS: AT JUNCTION OF DIFFERENT WALL FINISH MATERIALS, ON MOLDING OR BREAK IN WALL SURFACE, IN VIOLATION OF CODE REQUIREMENTS, AS NOTED OR DIRECTED.
OBTAIN APPROVAL OF ANY PROPOSED DEVIATIONS FROM THE REQUIRED NOTIFICATION APPLIANCE MOUNTING HEIGHTS FROM THE DIRECTOR'S REPRESENTATIVE PRIOR TO INSTALLATION.
- INSTALL NEW WORK AND CONNECT TO EXISTING WORK WITH MINIMUM INTERFERENCE TO EXISTING FACILITIES. TEMPORARY SHUTDOWNS: ONLY WITH WRITTEN CONSENT OF DIRECTOR'S REPRESENTATIVE. MAINTAIN CONTINUOUS OPERATION OF EXISTING FACILITIES. ALARM AND EMERGENCY SYSTEMS ARE NOT TO BE INTERRUPTED.
- INSTALL FIRESTOPPING WHENEVER WIRING OR RACEWAYS CROSS FIRE RATED CONSTRUCTION.
- INSTALLATION SHALL CONFORM WITH LOCAL AND NATIONAL CODES AND WITH REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION.
- FOLLOW REQUIREMENTS OF 2010 NYSBC CODE SUBCHAPTER 3, 9 AND RS17-3 AND NFPA 72, 2007 EDITION.
- VISUAL ALARM SIGNALS (STROBES) SHALL BE SYNCHRONIZED.
- MANUAL PULL STATIONS SHALL HAVE PERMANENT LABEL WITH DEVICE ADDRESS.
- PROVIDE CARD LISTING ALL PULL STATION ADDRESSES AT EACH MANUAL PULL STATION AND AT THE FIRE COMMAND STATION.
- PROVIDE FRAMED FIRE ALARM RISER DIAGRAM AT EACH FIRE ALARM CONTROL PANEL.
- THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIAL, EQUIPMENT, AND COORDINATION FOR ALL FIRE ALARM MODIFICATION WORK REQUIRED BY THE CONTRACT DOCUMENTS, TO PROVIDE A COMPLETE, OPERATIONAL, AND CODE COMPLIANT FIRE ALARM SYSTEM, NOT CLEARLY AND SPECIFICALLY LISTED TO BE FURNISHED, INSTALLED AND/OR PROVIDED BY THE OWNER'S FIRE ALARM VENDOR (SIMPLEX GRINNELL) AS DETAILED IN FIRE ALARM GENERAL NOTE 27. CONTACT YEVGENY KOPYLOV OF THE OWNER'S FIRE ALARM VENDOR (SIMPLEX GRINNELL) AT (917) 510-6324.
- CONTRACTOR IS TO REFER TO SPECIFICATIONS FOR GENERAL CONDITIONS.
- A GENERAL OUTLINE OF THE CONTRACTOR'S RESPONSIBILITY, WHICH DOES NOT SUPERSEDE THE REQUIREMENT DETAILED IN FIRE ALARM GENERAL NOTE 24, INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
 - THE COMPLETE RACEWAY SYSTEM, WITH PULL STRINGS, SUPPORTS, BACK BOXES, GROUNDING, ETC. FOR ALL FIRE ALARM EQUIPMENT AND PERIPHERALS.
 - FURNISH AND INSTALLING WATERFLOWS AND TAMPER SWITCHES INCLUDING THE RACEWAY SYSTEM. WIRING SHALL BE PROVIDED BY THE OWNER'S FIRE ALARM VENDOR (SIMPLEX GRINNELL).
 - COORDINATION.
 - TESTING OF EQUIPMENT PROVIDED BY THE CONTRACTOR.
 - PROVIDE ALL 120 VOLT POWER CIRCUITS IN ACCORDANCE WITH NFPA 72 AND THE NEC. THIS INCLUDES BUT IS NOT LIMITED TO EACH FIRE ALARM CONTROL AND NOTIFICATION ALARM CIRCUIT (NAC) PANELS. COORDINATE WITH OWNER'S FIRE ALARM VENDOR (SIMPLEX GRINNELL) FOR QUANTITY AND LOCATIONS.
 - SUBMITTALS AND SHOP DRAWINGS AS REQUIRED BY THE SPECIFICATIONS FOR EQUIPMENT AND MATERIAL PROVIDED BY THE CONTRACTOR.
- THE OWNER'S FIRE ALARM VENDOR'S (SIMPLEX GRINNELL) SCOPE OF WORK SHALL INCLUDE THE FOLLOWING:
 - PROVIDE ALL SPECIALTY FIRE ALARM (SIMPLEX) EQUIPMENT AND PERIPHERALS

- INCLUDING LOW VOLTAGE AND DATA WIRING, WITH THE EXCEPTION OF WATERFLOW DEVICES AND TAMPER SWITCHES (PROVIDED BY THE CONTRACTOR), ON THE RACEWAY SYSTEM PROVIDED BY THE CONTRACTOR'S.
- WIRING FOR WATERFLOW DEVICES AND TAMPER SWITCHES.
- PROGRAMMING.
- TESTING.
- SUBMITTALS AND SHOP DRAWINGS AS REQUESTED BY THE SPECIFICATIONS FOR EQUIPMENT AND MATERIAL PROVIDED BY THE OWNER'S FIRE ALARM VENDOR (SIMPLEX GRINNELL).
- THE OWNER'S FIRE ALARM VENDOR (SIMPLEX GRINNELL) WILL PROVIDE A SIMPLEX 4004R PRE-ACTION RELEASING PANEL AND SPECIALTY DEVICES AND APPLIANCES FOR THE RELIABLE DDX PRE-ACTION SYSTEM AS DETAILED ON DRAWING SP-200.
- PRE-ACTION SYSTEM COMPONENTS SHALL BE PROVIDED BY THE SPRINKLER CONTRACTOR, AND WIRED BY THE ELECTRICAL CONTRACTOR AS PER THE MANUFACTURER'S APPROVED SHOP DRAWINGS AND WIRING DIAGRAMS. REFER TO SPRINKLER DRAWINGS FOR SPECIFICATIONS AND DETAILS. COORDINATE INSTALLATION WITH SPRINKLER CONTRACTOR. ELECTRICAL CONTRACTOR WILL PROVIDE ALL LINE VOLTAGE WIRING FROM THE MAIN EMERGENCY POWER SOURCE AND THE DISCONNECT SWITCH FOR THE PRE-ACTION PANEL. ELECTRICAL CONTRACTOR WILL THEN EXTEND POWER TO THE PRE-ACTION SYSTEM.
- ALL FIRE ALARM SYSTEM RACEWAYS ARE PROVIDED BY THE ELECTRICAL CONTRACTOR. ALL LOW VOLTAGE WIRING IS PULLED AND TERMINATED AND ALL DEVICES ARE INSTALLED (INCLUDING DUCT-MOUNTED SMOKE DETECTORS) BY THE SIMPLEX ELECTRICIAN ONLY.
- ALL SMOKE DETECTORS MUST MAINTAIN A DISTANCE OF THREE FEET FROM THE EDGE OF ANY SUPPLY DIFFUSER, EXHAUST REGISTER, OR RETURN GRILLE.
- ALL WALL-MOUNTED FIRE ALARM DEVICES SHALL NOT INTERFERE WITH SLIDING DOORS, CASEWORK, OPTIRACKS, OR ANY OTHER FURNITURE/EQUIPMENT.
- NEW FIRE ALARM DEVICES SHALL MATCH BUILDING EXISTING FIRE ALARM DEVICES AND SHALL BE MANUFACTURER'S LATEST SYSTEM COMPATIBLE MODELS.
- SCHEDULE SYSTEM SHUTDOWNS AND PRE-INSPECTION TESTS WITH DIRECTOR'S REPRESENTATIVE.
- CONTRACT WITH THE BUILDING FIRE ALARM SYSTEM VENDOR TO PROVIDE ALL NECESSARY EQUIPMENT, WIRING DIAGRAMS, SHOP DRAWINGS SYSTEM REPROGRAMMING ETC. TO ENSURE PROPER SYSTEM OPERATION.
- FURNISH, INSTALL AND WIRE COMPLETE ALL REQUIRED DEVICE MONITOR MODULES ASSOCIATED WITH ALL NON-ADDRESSABLE TYPE FIRE ALARM DEVICES AND ALL CONTROL DEVICE MODULES AND SHUTDOWN RELAYS ASSOCIATED WITH ALL HVAC UNITS AND FIRE/SMOKE DAMPERS SHOWN ON FLOOR PLANS.
- EACH ELECTRIC DOOR LOCK OR ELECTRIC STRIKE ASSOCIATED WITH CARD KEY READERS LOCATED IN THE EGRESS PATH SHALL BE CONNECTED TO BUILDING EXISTING FIRE ALARM SYSTEM (FIRE ALARM CONTROL PANEL) FOR DOOR RELEASE UNDER A FIRE ALARM CONDITION ORIGINATED FROM THE FLOOR. REFER TO ARCHITECTURAL DRAWINGS FOR CARD READERS LOCATIONS. PROVIDE ALL REQUIRED ADDRESSABLE MODULES, RELAYS, POWER WIRING AND CONTROL WIRING AND CONDUIT. COORDINATE WORK AND EXACT WIRING WITH THE FIRE ALARM VENDOR AND SECURITY SYSTEMS CONTRACTOR.
- WHEN NYCFD APPROVED FIRE ALARM CABLES ARE RUNNING EXPOSED ABOVE THE HUNG CEILINGS, THEY SHALL BE PROPERLY SUPPORTED INDEPENDENTLY FROM THE STRUCTURE ABOVE (CEILING SLAB) AS REQUIRED. CABLES SHALL NOT DEPEND ON CEILING MEDIA, PIPES, DUCTS, CONDUITS OR EQUIPMENT FOR SUPPORT. SECURE CABLES BY CABLE TIES, STRAPS OR SIMILAR FITTINGS, SO DESIGNED AND INSTALLED AS TO NOT DAMAGE THE CABLE. SECURE CABLES IN PLACE AT INTERVALS NOT EXCEEDING 5'-0" ON CENTERS AND WITHIN 12" OF EVERY ASSOCIATED CABINET, BOX OR FITTING. UNDER NO CIRCUMSTANCES CABLES SHALL LAY ON CEILING SURFACE (TILES OR PLASTER TYPE SUSPENDED CEILINGS, ETC.).
- ALL EXISTING AND NEW HVAC UNITS SHOWN ON FIRE ALARM PLANS AND ASSOCIATED DUCT MOUNTED SMOKE DETECTORS, FIRE/SMOKE DAMPERS, ETC. ARE SHOWN FOR SHUTDOWN PURPOSES VIA THE FIRE ALARM SYSTEM (FACP). PROVIDE ALL REQUIRED SHUTDOWN RELAYS, INTERFACING RELAYS, CONTROL MODULES, ETC. AND ASSOCIATED WIRING, CONDUIT AND PROGRAMMING IN ORDER TO OPERATE PER BUILDING STANDARD FIRE ALARM SEQUENCE OF OPERATION. COORDINATE WORK WITH HVAC CONTRACTOR AND FIRE ALARM VENDOR.
- FOR ALL FIRE ALARM RELATED DEVICES SHOWN, VERIFY THEIR PROPER SEQUENCE OF OPERATION PER BUILDING STANDARD FIRE ALARM SEQUENCE OF OPERATION AFTER COMPLETION.
- WITHIN MECHANICAL SPACES, SHAFTS, UNFINISHED AREAS (NO HUNG CEILING AND NO DRY WALL PARTITION IS AVAILABLE) AND WHERE REQUIRED BY BUILDING EXISTING FIRE ALARM SYSTEM TYPE, RUN FIRE ALARM WIRING/CABLES ASSOCIATED WITH ALL FIRE ALARM DEVICES AND FIRE/SMOKE DAMPERS IN RIGID STEEL CONDUIT THROUGHOUT THE SPACE. EXPOSED WIRING/CABLES WILL NOT BE ALLOWED.
- SUBMIT THE FOLLOWING SHOP DRAWINGS FOR REVIEW AND APPROVAL: FIRE ALARM DEVICES AND ASSOCIATED EQUIPMENT CATALOG CUTS (HIGHLIGHT CATALOG NUMBER, ACCESSORIES, OPTIONS, ETC.); FIRE ALARM DEVICES AND ASSOCIATED EQUIPMENT TYPICAL WIRING DIAGRAMS; FLOOR PLAN TO SHOW ALL FIRE ALARM EQUIPMENT AND ASSOCIATED FIRE ALARM DEVICES, CONTROL RELAYS, INTERFACE RELAYS, MONITOR MODULES, ETC.; CLEARLY INDICATE ALL ASSOCIATED INTERCONNECTING WIRING (NUMBER OF WIRES, WIRE SIZE AND WIRE/CABLE TYPE FOR EACH CONNECTION) AND INTERFACE WITH BUILDING EXISTING FIRE ALARM SYSTEM. NEXT TO EACH FIRE ALARM INITIATING DEVICE AND FIRE ALARM INTERFACE RELAY INDICATE ASSOCIATED ADDRESS (POINT #) AT THE FIRE ALARM CONTROL PANEL (FACP). SHOW POINTS LIST OF RISER DRAWING.
- SPRINKLER PRE-ACTION SYSTEM: FIRE ALARM SUB-SYSTEM PROVIDED BY OTHERS, UNDER A SEPARATE CONTRACT (SEPARATE FIRE ALARM DRAWINGS PREPARED BY ANOTHER TRADE). TYPICAL FOR SPRINKLER PRE-ACTION SYSTEM CONTROL PANEL: INTERFACE EACH PANEL WITH BUILDING EXISTING FIRE ALARM SYSTEM TO PROVIDE THE FOLLOWING REMOTE SIGNALS (ANNUNCIATION AND PROPER IDENTIFICATION BY FLOOR AND SIGNAL TYPE) AT THE MAIN FIRE ALARM CONTROL PANEL (FACP): 1ST FLOOR IMAGING 1 8-37, 1ST FLOOR IMAGING 2 8-36 SPRINKLER PRE-ACTION SYSTEM ALARM SIGNAL, TROUBLE SIGNAL, AND SUPERVISORY SIGNAL.
- THE ELECTRICAL CONTRACTOR IS TO CREATE A COMPLETE SET OF "AS-BUILT" FIRE ALARM DRAWINGS RELATED TO THE PROJECT (ALL FIRE ALARM FLOOR PLANS WITH FIRE ALARM EQUIPMENT AND DEVICES LOCATIONS, FLOOR DEVICE INTERCONNECTIONS AND CABLE ROUTINGS, FIRE ALARM RISER DIAGRAMS WITH ALL FIRE ALARM RELATED EQUIPMENT AND DEVICES SHOWN INCLUDING INTERCONNECTIONS AND CABLES TYPE, FIRE ALARM DEVICES TYPICAL WIRING DIAGRAMS, APPLICABLE DETAILS, ETC.) ACCEPTABLE TO THE FDNY. THE BID PRICE SHALL INCLUDE ALL ASSOCIATED COSTS. NEXT TO EACH FIRE ALARM INITIATING DEVICE AND FIRE ALARM INTERFACE RELAY INDICATE ASSOCIATED ADDRESS (POINT #) AT THE FIRE ALARM CONTROL PANEL (FACP). SHOW POINTS LIST ON THE DRAWING.
- NEW FIRE ALARM DEVICES SEQUENCE OF OPERATION SHALL MATCH EXISTING BUILDING STANDARD SEQUENCE OF OPERATION FOR SIMILAR DEVICES.



FIRE ALARM RISER MODIFICATION

SCALE: NONE

- ELECTRICAL WORK SHALL COMPLY WITH THE 2008 NEC AND NYSBC.
- INSTALLATION SHALL COMPLY WITH THE 2010 NYSBC AND NYSBC.
- ALL PRE-ACTION SYSTEM WIRING SHALL BE IN EMT.
- PROVIDE QUANTITY OF CONTROL MODULES AND MONITOR MODULES AS REQUIRED PER SEQUENCE OF OPERATION.

DESIGN & CONSTRUCTION

CONSULTANT	
ARCHITECT PERKINS EASTMAN 115 FIFTH AVENUE NEW YORK, NEW YORK 10003	LAB CONSULTANT JACOBS CONSULTANCY 303 SOUTH BROADWAY, SUITE G20 TARRYTOWN, NEW YORK 10591
MEP & LIGHTING AKF GROUP ONE LIBERTY PLAZA 165 BROADWAY, 22ND FLOOR NEW YORK, NEW YORK 10006	ACOUSTICS/ IT/SECURITY CERAMI ASSOCIATES 404 FIFTH AVENUE NEW YORK, NEW YORK 10018
COMMISSIONING ARMARK 52 JAMES STREET ALBANY, NEW YORK 12207	HAZARDOUS MATERIALS AIRTEK ENVIRONMENTAL CORP. 39-37 29TH STREET LONG ISLAND CITY, NEW YORK 11101
COST ESTIMATING VJ ASSOCIATES 100 DUFFY AVENUE HICKSVILLE, NEW YORK 11801	

WARNING:

THE ALTERATION OF THIS MATERIAL IN ANY WAY, UNLESS DONE UNDER THE DIRECTION OF A COMPARABLE PROFESSIONAL, I.E. ARCHITECT FOR AN ARCHITECT, ENGINEER FOR AN ENGINEER OR LANDSCAPE ARCHITECT FOR A LANDSCAPE ARCHITECT, IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW AND/OR REGULATIONS AND IS A CLASS 'A' MISDEMEANOR.



CONSTRUCTION

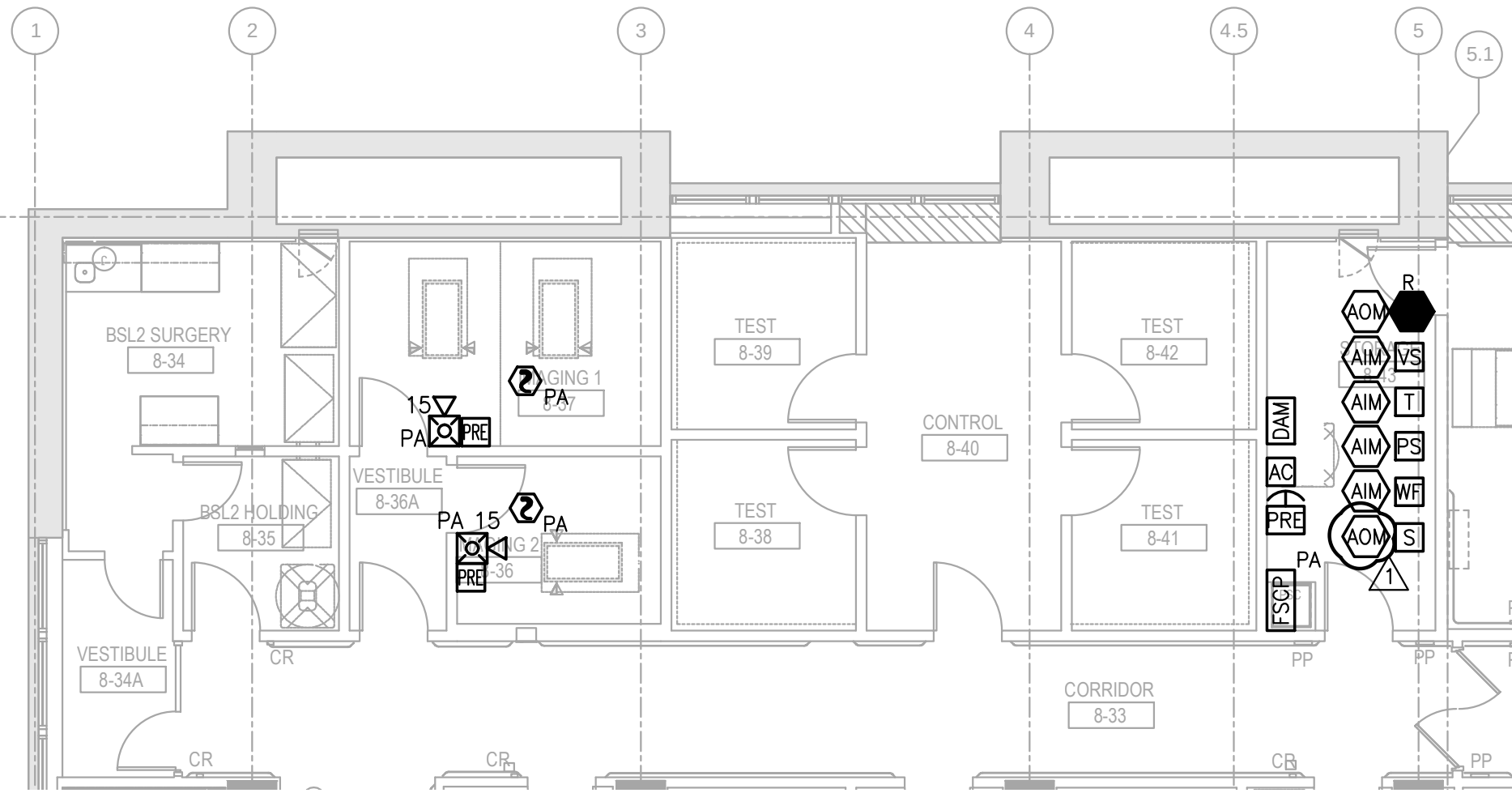
TITLE:	PROVIDE CONVERSION OF 8TH FLOOR TO ANIMAL LAB BUILDING NO. 4
LOCATION:	NEW YORK PSYCHIATRIC INSTITUTE 1051 RIVERSIDE DRIVE NEW YORK, NY 10032
CLIENT:	NEW YORK STATE OFFICE OF METAL HEALTH

MARK	DATE	DESCRIPTION
01	10/24/2016	ADDENDUM #2
	07/13/2016	FINAL SUBMISSION
	06/29/2015	100% CD SUBMISSION
PROJECT NUMBER: 44219-C		
DESIGNED BY:		
DRAWN BY: MM		
FIELD CHECK: ZH		
APPROVED:		
SHEET TITLE:		

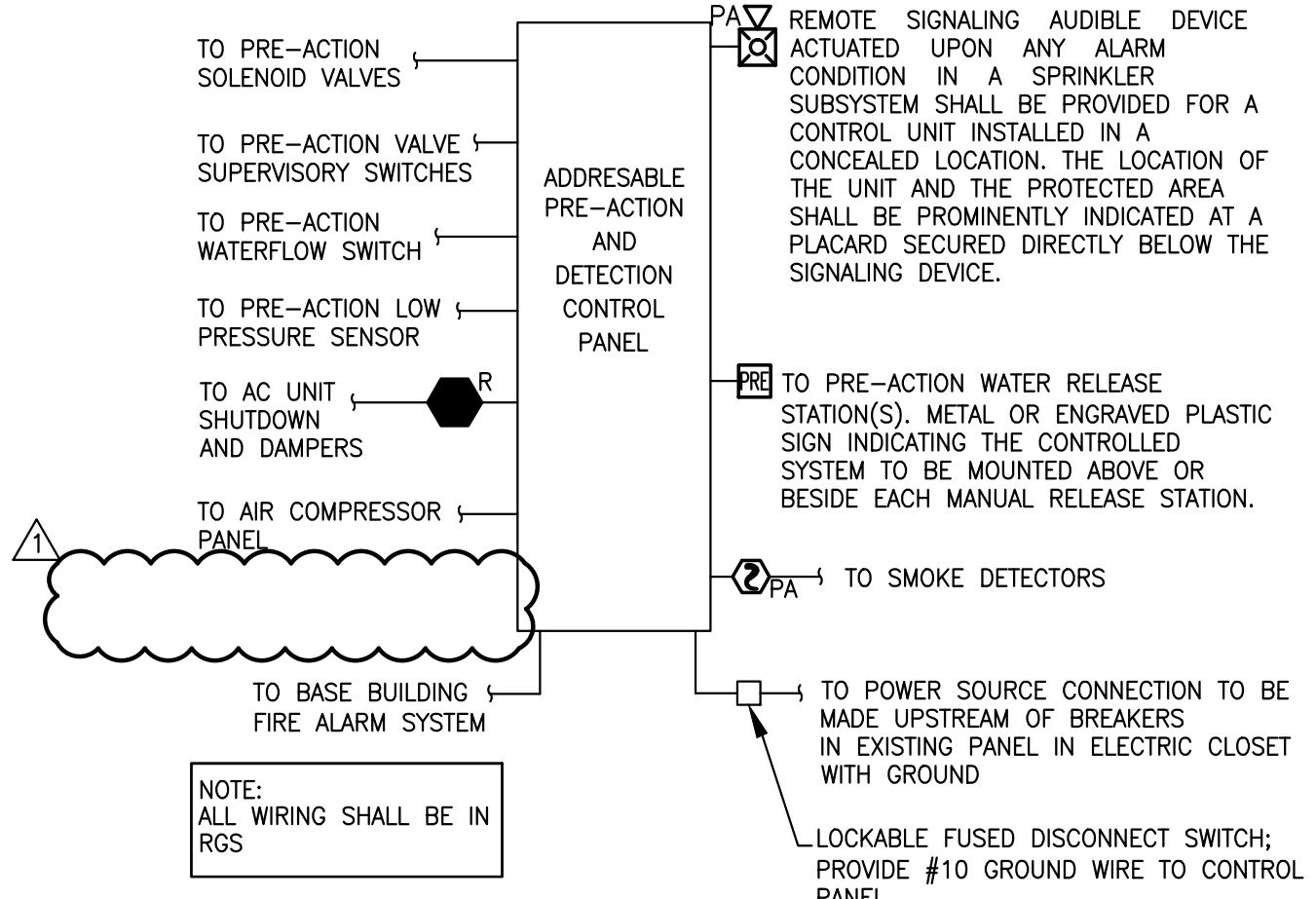
FIRE ALARM COVER SHEET

SYMBOLS

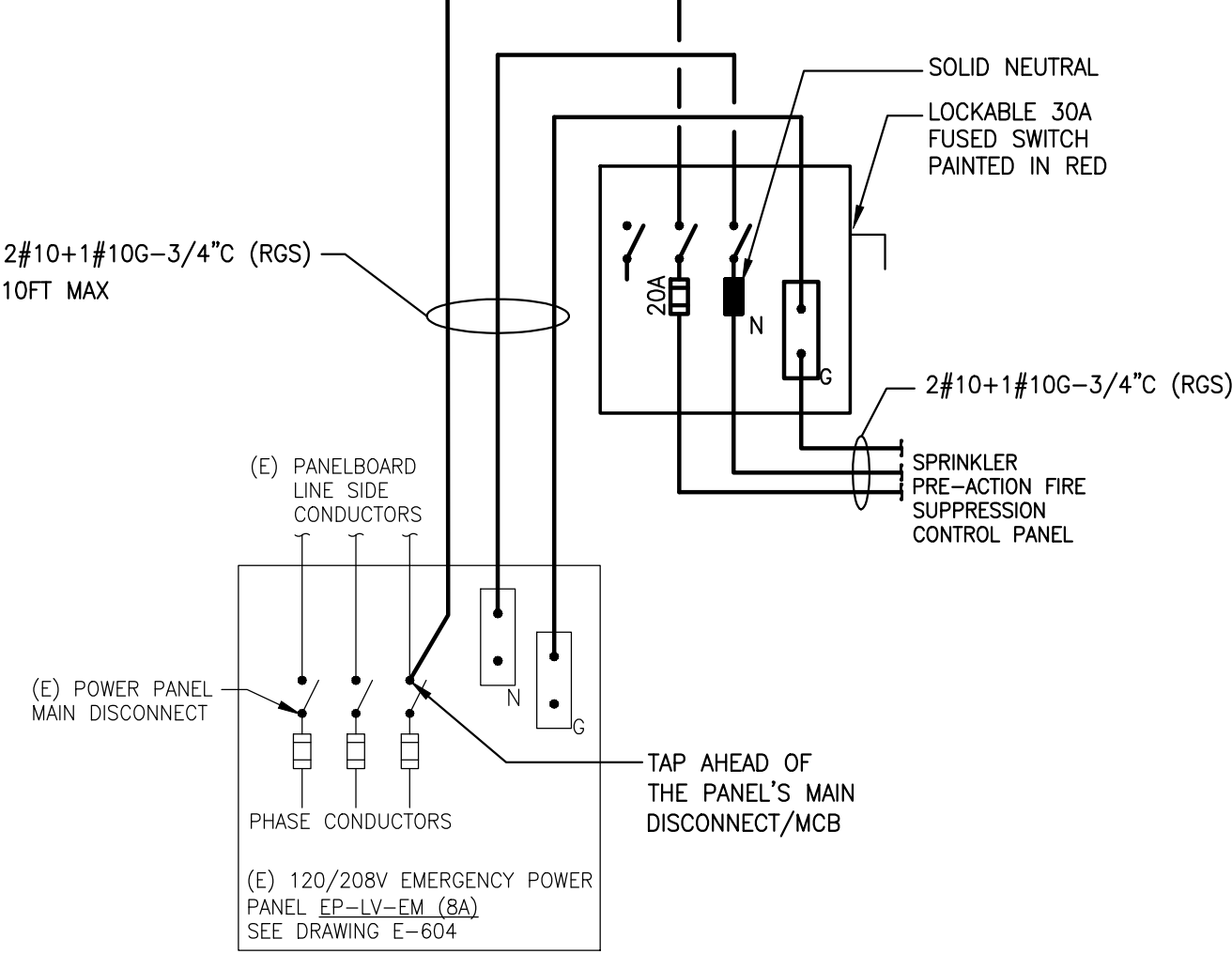
- [FSCP] PA FIRE SUPPRESSION CONTROL PANEL, PRE-ACTION SUPPRESSION TYPE
- [DAM] DETECTOR ADDRESS MAP, FURNISHED AND INSTALLED BY FIRE PROTECTION CONTRACTOR. REFER TO FIRE PROTECTION DRAWINGS FOR ADDITIONAL INFORMATION. CONTRACTOR SHALL SUBMIT DETAIL OF THE PANEL AS PART OF SHOP DRAWING SUBMITTAL FOR REVIEW.
- [PRE] MANUAL STATION - PULL STATION/FIRE ALARM BOX, PRE-ACTION RELEASING
- [2] PA SMOKE DETECTOR/SENSOR, PHOTOELECTRIC TYPE, ASSOCIATED WITH THE PRE-ACTION SYSTEM
- [T] TROUBLE
- [PS] LOW AIR PRESSURE SENSOR
- [VS] VALVE SUPERVISORY SWITCH
- [WF] WATERFLOW SWITCH
- [S] SOLENOID VALVE RELAY
- [AIM] ADDRESSABLE INPUT MODULE
- [R] NON-ADDRESSABLE OUTPUT RELAY
- [CD] [X] PA COMBINATION HORN/VISIBLE
CD = CANDELA RATING/SETTING
PA = ASSOCIATED WITH THE PRE-ACTION SYSTEM
- [FDS] LOCKABLE FUSED DISCONNECT SWITCH
- [AC] AIR COMPRESSOR



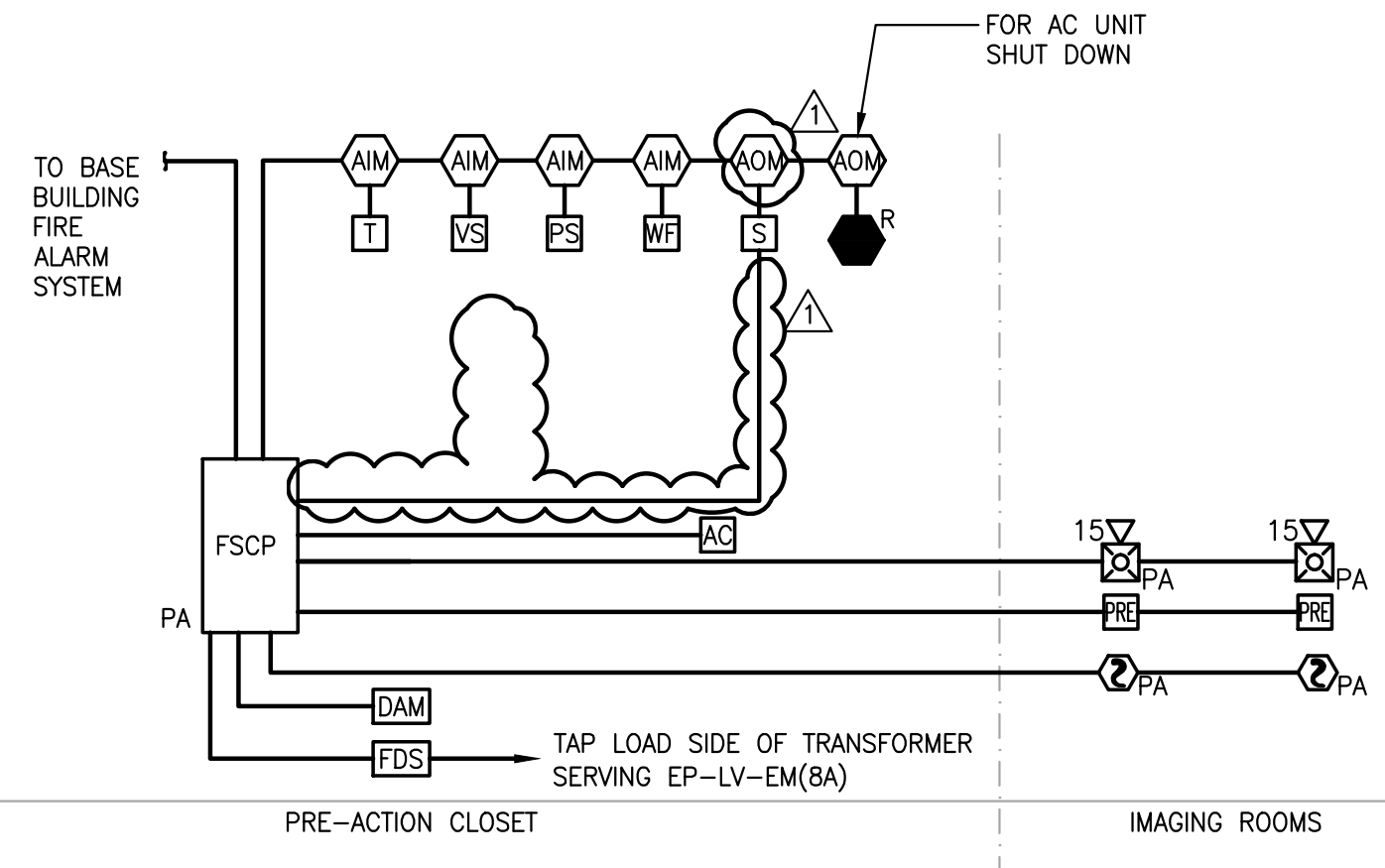
1 PRE-ACTION SYSTEM PART PLAN
SCALE: 1/8"=1'-0"



2 PRE-ACTION SPRINKLER AND SMOKE DETECTION SCHEMATIC WIRING DIAGRAM
SCALE: NONE



3 FIRE ALARM FUSED DISCONNECT TYPICAL WIRING DIAGRAM
SCALE: NONE



4 PRE-ACTION SYSTEM RISER DIAGRAM
SCALE: NONE

EXACT WIRING DIAGRAMS SHALL BE AS PREPARED BY THE PRE-ACTION SYSTEM MANUFACTURER AND SPRINKLER VENDOR.

	ACTIVATE COMMON ALARM SIGNAL (LED)	ACTIVATE AUDIBLE ALARM SIGNAL	ACTIVATE COMMON SUPERVISORY SIGNAL (LED)	ACTIVATE COMMON SUPERVISORY SIGNAL (BUZZER)	PAINT A CHANGE OF STATUS AT THE SYSTEM PRINTER	ACTIVATE COMMON TROUBLE SIGNAL (LED)	ANNUNCIATE ALARM DEVICE BY FLOOR (LED)	ANNUNCIATE SUPERVISORY DEVICE BY FLOOR (LED)	NOTIFY FIRE ACTION SYSTEM (ALARM)	NOTIFY BASE BUILDING FIRE ALARM SYSTEM (NEAR VALVE LOCATION)	NOTIFY BASE BUILDING FIRE ALARM SYSTEM OF SUPERVISORY CONDITION	NOTIFY BASE BUILDING FIRE ALARM SYSTEM OF TROUBLE CONDITION	SHUTDOWN HVAC UNITS SERVING THE AREA
MANUAL PULL STATION	X	X					X	X	X	X		X	
AREA SMOKE DETECTOR	X	X					X	X	X	X		X	X
WATER FLOW SWITCH	X	X					X	X	X	X			
VALVE SUPERVISORY ("TAMPER") SWITCH			X	X				X			X		
LOW AIR PRESSURE SUPERVISORY SWITCH			X	X				X			X		
PRE-ACTION PANEL/AC POWER FAILURE					X	X		X					
PRE-ACTION PANEL LOW BATTERY					X	X		X					
OPEN CIRCUIT					X	X		X					
GROUND FAULT					X	X		X					
NOTIFICATION APPLIANCE CIRCUIT SHORT CIRCUIT					X	X		X					

5 PRE-ACTION SYSTEM INPUT/OUTPUT MATRIX
SCALE: NONE

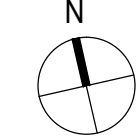
RISER DIAGRAM NOTES

- FIRE ALARM RISER DIAGRAM WIRING IS DIAGRAMMATIC ONLY.
- DEVICES AND CONNECTIONS SHOWN ARE FOR INFORMATION ONLY. IT IS THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR TO FIELD VERIFY THE AS-BUILT CONDITIONS PRIOR TO THE START OF ANY WORK.
- CONTRACTOR SHALL VERIFY ALL WIRING WITH BASE BUILDING FIRE ALARM VENDOR AND OBTAIN WIRING DIAGRAMS BEFORE PROCEEDING WITH THE START OF ANY WORK.
- ALL EQUIPMENT SHALL BE COMPATIBLE WITH BASE BUILDING SYSTEM AND UL LISTED AND IN COMPLIANCE WITH ADA REQUIREMENTS.
- FINAL CONNECTIONS ARE TO BE DONE BY ELECTRICAL CONTRACTOR UNDER THE SUPERVISION OF BASE BUILDING FIRE ALARM VENDOR. PROVIDE ADEQUATE SLACK FOR TERMINATIONS.
- PROVIDE FAN SHUT DOWN CAPABILITY FOR FANS WITH A RATING LARGER THAN 2,000 CFM. SHUT DOWN SHALL BE ACCOMPLISHED BY ONE OR MORE OUTPUT CONTROL POINTS FROM THE PRE-ACTION SYSTEM TO RELAYS FOR SHUTDOWN. PROVIDE CONTROL AND MONITORING FOR ALL RELAYS. PROVIDE POWER, CONTROL RELAYS, MONITORING AND WIRING FOR ALL FIRE/SMOKE DAMPERS. DAMPER MONITORING SHALL BE FROM AN END SWITCH ON THE DAMPER VIA A RELAY.
- EXISTING BUILDING SYSTEMS NOT SHOWN (UNLESS A PART OF ONE INSTALLATION) SHALL REMAIN INTACT. DO NOT REMOVE EXISTING BASE BUILDING FIRE ALARM DEVICES UNLESS SPECIFICALLY DIRECTED. RE-INSTALL ALL EXISTING FIRE ALARM EQUIPMENT, WHICH IS TO REMAIN IF REMOVED FOR INSTALLATION OF NEW CEILING OR DUE TO DEMOLITION. ELECTRICAL CONTRACTOR SHALL PROVIDE NEW CABLES TO ALL EXISTING FIRE ALARM EQUIPMENT THAT IS RELOCATED. COORDINATE EXISTING WORK WITH EXISTING BUILDING FIRE ALARM SYSTEMS. THE CONTRACTOR SHALL VERIFY THAT ANY MODIFICATIONS TO EXISTING SYSTEMS ARE COMPLETED AND IN WORKING ORDER.
- PROVIDE ALL REQUIRED EXPANSION PANELS, PC BOARDS, POWER SUPPLIES, BATTERIES, FUSE COUTOUTS AND BRANCH CIRCUITS, ETC, FOR A COMPLETE AND OPERATION FIRE ALARM SYSTEM.
- SPEAKERS AND STROBES SHALL BE WIRED ON ALTERNATING A-B CIRCUITING IN ALL AREAS UNDER SEPARATE APPLICATION.
- FA CIRCUITS MINIMUM SURVIVABILITY SHALL BE CLASS B LEVEL 1.

PRE-ACTION SPRINKLER SYSTEM

- A. WORK INCLUDED:
- PROVIDE SINGLE INTERLOCKED PRE-ACTION INTEGRATED FIRE PROTECTION SYSTEM COMPLETE WITH APPROPRIATE SIGNAGE FOR ALL WALL MOUNTED A/V DEVICES AND ASSOCIATED PULL STATION(S).
 - PROVIDE AND INSTALL DEVICES SUCH AS SMOKE DETECTORS, MANUAL PULL STATIONS, ALARM BELLS, AND STROBE LIGHTS AS SPECIFIED AND AS INDICATED ON THE DRAWINGS.
 - PROVIDE ALL ELECTRICAL WIRING BETWEEN SMOKE DETECTORS, AUDIBLE AND VISUAL ALARM UNITS, MANUAL PULL STATIONS AND THE INTEGRATED PANEL SYSTEM.
 - THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIAL, EQUIPMENT, AND COORDINATION FOR ALL REQUIRED BY THE CONTRACT DOCUMENTS, TO PROVIDE A COMPLETE, OPERATIONAL AND CODE COMPLIANT PRE-ACTION SYSTEM, NOT CLEARLY AND SPECIFICALLY LISTED TO BE FURNISHED, INSTALLED AND/OR PROVIDED BY THE OWNER'S FIRE ALARM VENDOR (SIMPLEX GRINNELL) AS DETAILED IN PRE-ACTION SPRINKLER SYSTEM GENERAL NOTE 4. CONTACT YEVGENY KOPYLOV OF THE OWNER'S FIRE ALARM VENDOR (SIMPLEX GRINNELL) AT (917) 510-6324.
 - A GENERAL OUTLINE OF THE CONTRACTOR'S RESPONSIBILITY, WHICH DOES NOT SUPERSEDE THE REQUIREMENT DETAILED IN PRE-ACTION SPRINKLER SYSTEM GENERAL NOTE 4, INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
 - PROVIDE A COMPLETE RACEWAY SYSTEM, WITH PULL STRINGS, SUPPORTS, BACK BOXES, GROUNDING, ETC... FOR ALL RELEASING PANEL AND NOTIFICATION EQUIPMENT AND PERIPHERALS. COORDINATION.
 - TESTING OF EQUIPMENT PROVIDED BY THE CONTRACTOR.
 - PROVIDE ALL 120 VOLT POWER CIRCUITS IN ACCORDANCE WITH NFPA 72 AND THE NEC. COORDINATE WITH OWNER'S FIRE ALARM VENDOR (SIMPLEX GRINNELL) FOR EXACT LOCATION.
 - SUBMITTALS AND SHOP DRAWINGS AS REQUIRED BY THE SPECIFICATIONS FOR EQUIPMENT AND MATERIAL PROVIDED BY THE CONTRACTOR.
 - ALL SPRINKLER WORK INCLUDING PIPING, FITTINGS, SUPPORTS, ETC...
- B. ELECTRICAL REQUIREMENTS:
- ALL ELECTRICAL POWER WIRING TO THE CONTROL PANEL, TAMPER SWITCH AND FLOW SWITCH WIRING AND LOW AIR PRESSURE SWITCH TO THE BUILDING'S FIRE ALARM SYSTEM WILL BE BY OTHERS. ALL OTHER INTERCONNECTING WIRING REQUIRED TO RENDER THE SYSTEM OPERATIONAL SHALL BE BY THIS CONTRACTOR.
 - ALL CONDUCTORS SHALL BE INSULATED WITH APPROVED TYPE "THHN" OR "THWN" INSULATION AS APPROVED BY THE AUTHORITIES HAVING JURISDICTION. THE SYSTEM CONDUCTORS SHALL BE NO. 14 AWG FOR STATIONS AND DETECTORS, AND #12 AWG FOR OTHER CIRCUITS. ALL CONDUCTORS SHALL BE INSTALLED WITHOUT THE USE OF SPLICES OR LUBRICANTS, EXCEPT POWDERED SOAPSTONE. ALL WIRE SHALL BE COLOR CODED.
 - WIRING ABOVE CEILING SHALL BE TEFLON TYPE. WIRING IN EXPOSED AREAS AND BELOW RAISED FLOOR SHALL BE RUN IN EMT. REFER TO THE ELECTRICAL SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
 - ELECTRICAL CONTRACTOR TO PROVIDE THE PRE-ACTION SYSTEM AND EMPTY CONDUIT FOR ALL PRE-ACTION SYSTEM DEVICES. CABLING WILL BE FURNISHED AND INSTALLED BY PRE-ACTION CONTRACTOR.
 - THE SYSTEM SHALL BE WIRED USING CLASS "A" WIRING CONFIGURATION.

- C. INSTALLATION:
- THE ENTIRE PRE-ACTION SPRINKLER SYSTEM INSTALLATION SHALL COMPLY WITH THE NEW YORK CITY BUILDING CODE AND THE RULES AND REGULATIONS OF THE FIRE DEPARTMENT OF THE CITY OF NEW YORK.
 - THE PRE-ACTION SYSTEM SHALL OPERATE IN ACCORDANCE WITH THE SEQUENCE OF OPERATION PROVIDED ON THE DRAWINGS.
 - REFER TO SPRINKLER SPECIFICATION FOR ADDITIONAL INFORMATION.



NEW YORK STATE OF OPPORTUNITY | **Office of General Services**

DESIGN & CONSTRUCTION

CONSULTANT

ARCHITECT: PERKINS EASTMAN, 115 FIFTH AVENUE, NEW YORK, NEW YORK 10003

LAB CONSULTANT: JACOBS CONSULTANCY, 303 SOUTH BROADWAY, SUITE G20, TARRYTOWN, NEW YORK 10591

MEP & LIGHTING: AKF GROUP, ONE LIBERTY PLAZA, 165 BROADWAY, 22ND FLOOR, NEW YORK, NEW YORK 10006

ACOUSTICS/IT/SECURITY: CERAMI ASSOCIATES, 404 FIFTH AVENUE, NEW YORK, NEW YORK 10018

COMMISSIONING: ARAMARK, 52 JAMES STREET, ALBANY, NEW YORK 12207

HAZARDOUS MATERIALS: AIRTEK ENVIRONMENTAL CORP., 39-37 29TH STREET, LONG ISLAND CITY, NEW YORK 11101

COST ESTIMATING: VJ ASSOCIATES, 100 DUFFY AVENUE, HICKSVILLE, NEW YORK 11801

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ALEXANDER DUTY, 074572, PROFESSIONAL SEAL

CONTRACT: CONSTRUCTION

TITLE: PROVIDE CONVERSION OF 8TH FLOOR TO ANIMAL LAB BUILDING NO. 4

LOCATION: NEW YORK PSYCHIATRIC INSTITUTE, 1051 RIVERSIDE DRIVE, NEW YORK, NY 10032

CLIENT: NEW YORK STATE OFFICE OF METAL HEALTH

01 10/24/2016 ADDENDUM #2

07/13/2016 FINAL SUBMISSION

06/29/2015 100% CD SUBMISSION

MARK DATE DESCRIPTION

PROJECT NUMBER: 44219-C

DESIGNED BY:

DRAWN BY: MM

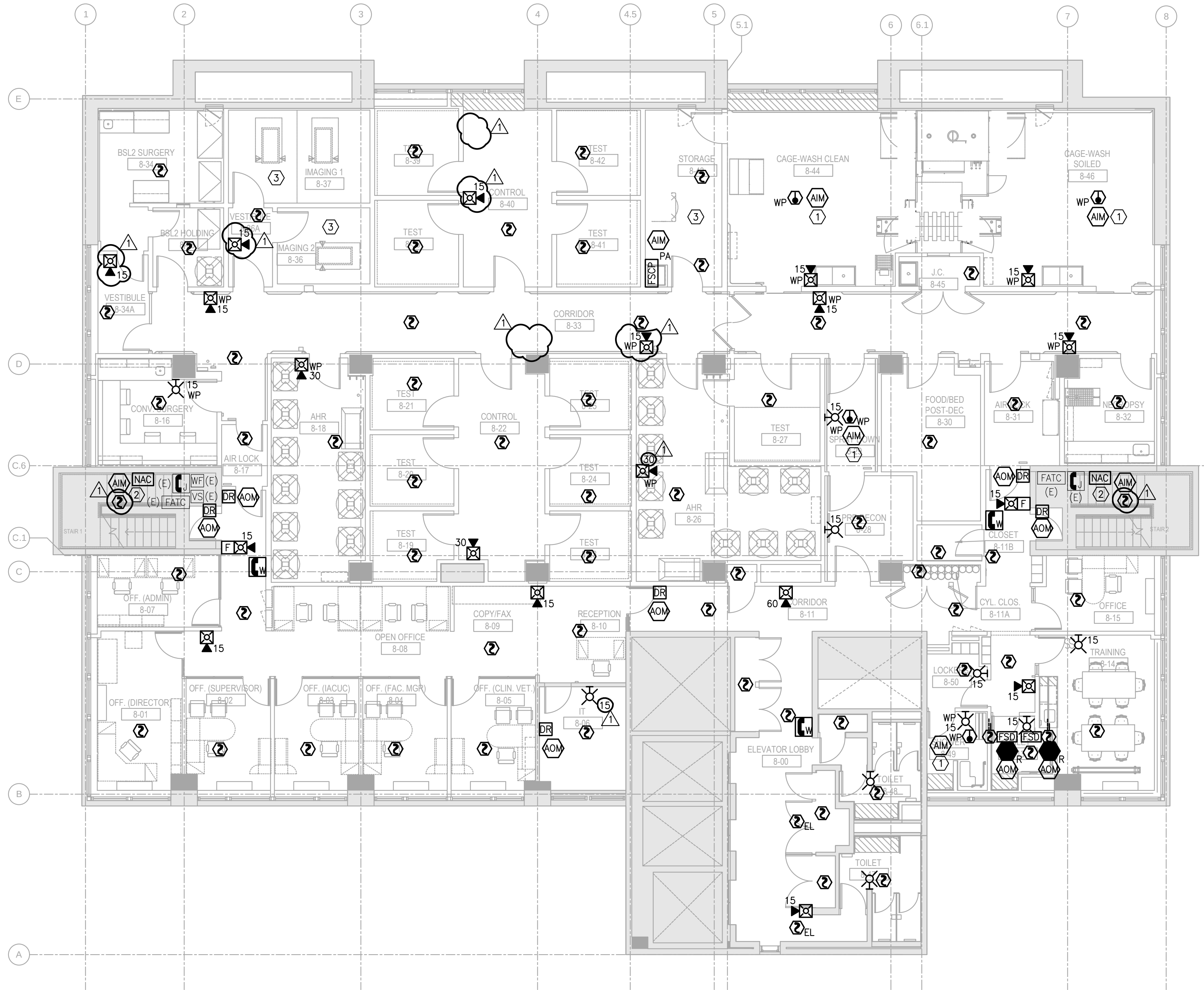
FIELD CHECK: ZH

APPROVED:

SHEET TITLE: FIRE ALARM PRE-ACTION SYSTEM NOTES AND 8TH FLOOR PLAN

DRAWING NUMBER: FA-003

SHEET 67 OF 91



GENERAL NOTES:

1. SURFACE MOUNT PULL STATIONS ON BRICK WALLS ADJACENT TO STAIRWELLS, NOT ON SHEETROCK WALLS.
2. RECESS WARDEN PHONES IN SHEETROCK WALLS.
3. REFER TO DETAIL ON DRAWING FA-003 FOR PRE-ACTION SYSTEM DETAILS.
4. REFER TO SECURITY SYSTEM BLOCK DIAGRAM ON DRAWING SE-100 FOR ADDITIONAL INFORMATION REGARDING THE ELECTRIC DOOR LOCK RELEASE.

KEY NOTES:

- ① ADDRESSABLE INPUT MODULE IS ASSOCIATED WITH THE CONVENTIONAL-TYPE (NON-ADDRESSABLE) WEATHER-RESISTANT HEAT DETECTOR LOCATED IN THE ROOM. MODULE TO BE LOCATED ABOVE THE CEILING, WITHIN 3 FEET OF THE HEAT DETECTOR. PROVIDE AN ACCESS DOOR IN THE HARD CEILING FOR ACCESS TO THE MODULE IF THE SPACE DOES NOT HAVE A HUNG CEILING. COORDINATE WORK WITH THE FIRE ALARM SYSTEM VENDOR.
- ② CONNECT TO A SPARE 20A/1P CIRCUIT BREAKER IN EXISTING EMERGENCY PANEL EP-LV-EM (8B), LOCATED IN THE ELECTRICAL CLOSET ADJACENT TO ELEVATOR LOBBY 8-00. PROVIDE 2#10+1#10G-3/4" C. CIRCUIT BREAKER SHALL BE LOCKABLE IN THE CLOSED POSITION. REFER TO DRAWING E-102 FOR THE LOCATION OF PANEL EP-LV-EM (8B). THIS CIRCUIT SHALL BE A DEDICATED CIRCUIT AND SHALL HAVE THE WORDS "FIRE ALARM CIRCUIT" INCLUDED WITHIN THE CIRCUIT'S DESCRIPTION IN THE PANEL SCHEDULE.
- ③ REFER TO DRAWING FA-003 FOR ADDITIONAL EQUIPMENT IN THIS ROOM ASSOCIATED WITH THE PRE-ACTION SYSTEM.

DESIGN & CONSTRUCTION

CONSULTANT

ARCHITECT

PERKINS EASTMAN
115 FIFTH AVENUE
NEW YORK, NEW YORK 10003

LAB CONSULTANT

JACOBS CONSULTANCY
303 SOUTH BROADWAY, SUITE G20
TARRYTOWN, NEW YORK 10591

MEP & LIGHTING

AKF GROUP
ONE LIBERTY PLAZA
165 BROADWAY, 22ND FLOOR
NEW YORK, NEW YORK 10006

ACOUSTICS/IT/SECURITY

CERAMI ASSOCIATES
404 FIFTH AVENUE
NEW YORK, NEW YORK 10018

COMMISSIONING

ARAMARK
52 JAMES STREET
ALBANY, NEW YORK 12207

HAZARDOUS MATERIALS

AIRTEK ENVIRONMENTAL CORP.
39-37 29TH STREET
LONG ISLAND CITY, NEW YORK 11103

COST ESTIMATING

VJ ASSOCIATES
100 DUFFY AVENUE
HICKSVILLE, NEW YORK 11801

WARNING:

THE ALTERATION OF THIS MATERIAL IN ANY WAY, UNLESS DONE UNDER THE DIRECTION OF A COMPARABLE PROFESSIONAL, I.E. ARCHITECT FOR AN ARCHITECT, ENGINEER FOR AN ENGINEER OR LANDSCAPE ARCHITECT FOR A LANDSCAPE ARCHITECT, IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW AND/OR REGULATIONS AND IS A CLASS "A" MISDEMEANOR.



CONTRACT:

CONSTRUCTION

TITLE:

PROVIDE CONVERSION OF 8TH
FLOOR TO ANIMAL LAB
BUILDING NO. 4

LOCATION:

NEW YORK PSYCHIATRIC INSTITUTE
1051 RIVERSIDE DRIVE
NEW YORK, NY 10032

CLIENT:

NEW YORK STATE
OFFICE OF METAL HEALTH

MARK	DATE	DESCRIPTION
01	10/24/2016	ADDENDUM #2
	07/13/2016	FINAL SUBMISSION
	06/29/2015	100% CD SUBMISSION

PROJECT NUMBER: 44219-C

DESIGNED BY:

DRAWN BY: MM

FIELD CHECK: ZH

APPROVED:

SHEET TITLE:

FIRE ALARM 8TH FLOOR PLAN

DRAWING NUMBER:

FA-101

SHEET 69 OF 91

SECTION 087100
FINISH HARDWARE

PART 1 GENERAL

1.01 RELATED WORK IN OTHER SECTIONS

- A. Section 081113 – Hollow Metal Doors and Frames.
- B. Section 081416 – Flush Wood Doors.
- C. Section 281300 – Access Control

1.02 REFERENCES

- A. NFPA 80 Fire Doors and Windows (2007).
- B. NFPA 101 Life Safety Code (2006).
- C. Building Code of New York State (2010).
- D. ICC/ANSI A117.1-2003 Accessible and Usable Buildings and Facilities.
- E. ANSI/BHMA Standard A156.1 Butts and Hinges (2006).
- F. ANSI/BHMA Standard A156.4 Door Controls – Closers (2008).
- G. ANSI/BHMA Standard A156.6 Architectural Door Trim (2005).
- H. ANSI/BHMA Standard A156.7 Template Hinge Dimensions (2009).
- I. ANSI/BHMA Standard A156.8 Door Controls – Overhead Stops and Holders (2005).
- J. ANSI/BHMA Standard A156.13 Mortise Locks and Latches Series 1000 (2005).
- K. ANSI/BHMA Standard A156.16 Auxiliary Hardware (2008).
- L. ANSI/BHMA Standard A156.18 Materials and Finishes (2006).
- M. ANSI/BHMA Standard A156.22 Door Gasketing Systems (2005).
- N. ANSI/BHMA Standard A156.26 Continuous Hinges (2006).
- O. DHI - Door and Hardware Institute.
- P. NAAM Standard HMMA 800-96- Hollow Metal Manufacturers Association.

- Q. NAAM Standard HMMA 831-97 Recommended Hardware Locations for Custom Hollow Metal Doors and Frames.
- R. 2010 Standards for State and Local Government Facilities: Title II.

1.03 DEFINITIONS

- A. Architectural Hardware Consultant (AHC): A Door and Hardware Institute certified expert in complex architectural openings requiring advanced knowledge of model building codes and safety standards, ADA requirements, access control knowledge and installation expertise.
- B. Architectural Hardware Distributor: A company that regularly purchases architectural hardware from manufacturers and specializes in the sale, service and support of that hardware to contractors and/or end users.
- C. Company Field Advisor(s): Hardware manufacturers' representatives who are certified in writing by manufacturer to be technically qualified in design, installation, and servicing of products.
- D. Installation Supervisor: Designated supervisor/installer, who has a minimum three years' experience in finish hardware installation, and is qualified and responsible to ensure approved finish hardware is installed, adjusted, and operates properly.
- E. Benchmark: Finish hardware installed on full size door and frame assembly that is constructed on-site. Benchmarks are constructed to verify qualities of materials and execution; to review coordination between frames, doors, and architectural hardware; to show interface between partitions and frames; and to demonstrate compliance with specified installation tolerances. Benchmarks are not samples. Unless otherwise indicated, approved benchmarks establish the standard by which the Work will be judged. The approved benchmark may be incorporated into the work of this section.

1.04 SUBMITTALS

- A. Waiver of Submittals: The Waiver of Certain Submittal Requirements in Section 013300 does not apply to this Section.
- B. Re-Evaluation Fee: In accordance with the General Conditions 07213 Article 4.7.
- C. Submittal Package Cover Sheets: The Hardware Distributor shall provide a cover sheet, which identifies each package by:
 - 1. OGS project number.
 - 2. Project name.
 - 3. Facility name and location.
 - 4. Submittal Package name.
 - 5. Specification section name and number.

6. Construction Contractor's company name, address, e-mail address, and telephone number.
7. Finish Hardware Distributor's company name, address, e-mail address, and telephone number.
8. Certified Architectural Hardware Consultant's name, company name, address, e-mail address, and telephone number.
9. Submittal Date.

D. Submittal Packages

1. Quality Control Package: Do not submit balance of packages until this package is approved.
 - a. Architectural Hardware Consultant Data:
 - 1) Provide name, business address, and telephone number of DHI certified Architectural Hardware Consultant.
 - 2) Submit photocopy of Door and Hardware Institute's certificate demonstrating individual is an Architectural Hardware Consultant.
 - b. Company Field Advisor Data:
 - 1) Provide name, business address, and telephone number of Company Field Advisor(s) for continuous hinges, door bolts, locksets, overhead stops, door closers, and gaskets.
 - 2) List services and products for which company field advisor(s) is/are certified by manufacturer. Provide written certifications.
 - c. Hardware Distributor's Qualification Data:
 - 1) Provide the Finish Hardware Distributor's company name, address, e-mail address, and telephone number.
 - 2) Provide the hardware distributor's company history, including number of years in the hardware distribution business, the number of AHC's employed, and the number of employees. Describe the distributor's major market.
 - 3) Include the names and contact information of physical plant managers for 3 facilities, similar to this project, for which the distributor has furnished architectural hardware within the past 2 years.
 - d. Supervisor's/Installer's Qualification Data:
 - 1) Name of Supervisor and each installer performing Work, and employer's name, business address and telephone number.
 - 2) Names and addresses, and contact information of physical plant managers for 3 facilities, similar to this project, on which each installer has worked on during past 2 years.
2. Finish Hardware Package:
 - a. Finish Hardware Schedule: Use vertical format and indicate finish hardware items, both mechanical and electrical in one document, required to complete Work of this section. Submit Hardware Schedule that includes complete hardware sets for each door and frame shown on Door Schedule.
 - 1) Preface schedule with following:

- a) Certified Architectural Hardware Consultant's statement of preparation of/or certification of, Finish Hardware Schedule.
 - b) Index.
 - c) List of manufacturers.
 - d) List of finishes.
 - e) Explanation of abbreviations.
 - f) Keying instructions and key schedule.
 - 2) Create hardware groups, each group consisting of similar doors and hardware. Do not combine labeled and non-labeled openings. Do not combine doors and frames with dissimilar door sizes and/or materials.
 - 3) For each opening include the following:
 - a) Door and frame materials and dimensions.
 - b) Fire rating.
 - c) Door number, location and handing.
 - d) Degree of opening required for closer and/or overhead stop.
 - e) Installation and detailing notes.
 - 4) Under each group heading, list hardware items in detail, required for ordering. For each hardware item include:
 - a) Type (Hinges).
 - b) Quantity (Hinges 3ea).
 - c) Manufacturers' name (Hinges 3ea Stanley).
 - d) Catalog number (Hinges 3ea Stanley FBB199).
 - e) Size (Hinges 3ea Stanley FBB199 4 ½ x 4 ½).
 - f) Options or accessories (Hinges HTFBB199 4 ½ x 4 ½).
 - g) Finish (Hinges HTFBB199 4 ½ x 4 ½ x 630).
 - h) Fasteners (Hinges HTFBB199 4 ½ x 4 ½ x 630 x torx with center security pin).
 - i) Indicate location of protection plates: Push side or pull side.
 - j) Installation Notes, as written in this section, for each hardware group.
 - 5) Use a separate hardware group in Hardware Schedule that lists attic stock hardware items, key cabinets, key control system, special tools required to install hardware, lubricants, and Operations and Maintenance Manuals.
 - b. Product Data: Furnish six copies of manufacturers' catalog sheets, specifications, sizing charts, and installation instructions, for each item specified. Highlight information pertaining specifically to product (s) submitted.
 - c. Submit samples as requested.
3. Closeout Submittals Package: Submit as a complete package.
- a. Operation and Maintenance Manuals: Furnish 2 hardcover three ring binders with the project name and number displayed on the front cover and spine. Include:
 - 1) List of Manufacturers.
 - 2) Approved Finish Hardware Schedule.

- 3) Approved Manufacturers' Product Data Sheets.
 - 4) Manufacturer's operation, installation, maintenance, and repair instructions for each type of hardware furnished.
 - 5) Templates for kind of hardware furnished.
 - 6) Parts List for each type of finish hardware furnished.
 - 7) Manufacturers' dated written warranty for each type of finish hardware furnished.
 - 8) Certifications: Written certification from Company Field Advisors that their products are installed according to manufacturers' printed installation instructions, are operating properly, and manufacturers' written warranty will be in effect upon physical completion of the Work.
 - 9) Special Tools: List of special tools required to install hardware, and their purpose.
- b. Special Tools:
- 1) At conclusion of finish hardware installation, turn over to Director's Representative 2 of each special tool required to install hardware together with a list of these tools and their purpose.

1.05 TEMPLATES

- A. After receipt of approved submittals, furnish templates to affected trades, to enable fabricators to make provision for finish hardware without delaying the Work of the Project.

1.06 DELIVERY AND STORAGE

- A. Coordinate delivery to avoid delay.
- B. Clearly label each item for identification and installation location as it corresponds to the approved Finish Hardware Schedule and subsequent information bulletins.
- C. Deliver hardware to the jobsite in the manufacturers' original packages complete with fasteners, parts, installation instructions, and templates required for proper installation.
- D. Inventory hardware at jobsite to identify shortages or backorders. Resolve delivery shortages and damaged items prior to installing hardware.
- E. Store finish hardware where directed by Director's Representative. Provide locked, dry storage for finish hardware.

1.07 QUALITY ASSURANCE

- A. Hardware Distributor's Qualification:
 1. Hardware Distributor who has been in the business of furnishing, and/ or installing finish hardware for a minimum of three years.

2. Hardware Distributor shall have the DHI certified Architectural Hardware Consultant prepare or certify the Finish Hardware Submittal meets specification requirements, and the schedule is written accurately and in accordance with DHI recommendations, and requirements of this specification.
- B. Company Field Advisors: Employ advisor(s) for continuous hinges, door bolts, mortise locksets, surface overhead stops, door closers, and gaskets.
 - C. Installation Supervisor: Employ a qualified Installation Supervisor who will be responsible to ensure approved finished hardware is installed, adjusted and operates properly.
 - D. Installers: Employ experienced finish hardware installers who have been regularly employed by a Company installing finish hardware for a minimum of 5 years.
 - E. Pre-submittal Conference: Before Finish Hardware Submittals are written for submission, the Director's Representative will call a teleconference to review Finish Hardware Submittal requirements including but not limited to format, cover sheet, headings, hardware sets, level of detail, installation notes, description of operation, keying, and product data sheets. The Contractor, the Finish Hardware Distributor, the Finish Hardware Detailer, and consulting hardware designer, and OGS Designers shall attend. The OGS Finish Hardware Reviewer shall conduct the conference.
 - F. On Site Pre-installation Conference: Before finish hardware installation begins, the Director's Representative will call a conference at the site to review Finish Hardware Specifications, approved Finish Hardware Submittals, and to discuss requirements for the Work including:
 1. Hardware delivery and storage.
 2. Hardware labeling by door number.
 3. Hardware locations.
 4. Potential location conflicts.
 5. Hardware installation sequence and responsibility.
 6. Required accessories and fasteners.
 7. Continuous hinge installation.
 8. Surface overhead stops and closer template and adjustments.
 9. Special tools and maintenance items.
 10. Hardware Closeout requirements.
 11. Hardware Warranties.
 - G. Pre-installation Conference Attendance: The Construction Contractor, Company Field Advisors, authorized Finish Hardware Installers, and the Finish Hardware Distributor's Architectural Hardware Consultant shall attend the conference. OGS's Finish Hardware Reviewer conducts the meeting. OGS designers and facility personnel may attend. The Company Field Advisors will present installation instruction and advice.
 - H. Pre-Benchmark-Construction Meeting: Prior to the construction of the mock-up, a meeting will be held at the site to review the requirements, and discuss the

intent of the mock-up. The meeting will be scheduled by the Director's Representative and conducted by the Hardware Designer. The meeting shall be attended by the Director's Representative, the Hardware Designer, the Contractor's onsite foreman, the person supervising this phase of the Work (if different), and the person (people) who will be performing the work.

- I. Construction of Benchmark: Before installing portions of the Work requiring benchmarks, install benchmarks for each form of construction required to comply with the following requirements, using materials indicated for the completed Work.
 - 1. Build hardware benchmark in door and frame assembly, specified in section 081102, in locations as directed, and include continuous hinge, lockset, closer, surface overhead stop and gaskets.
 - 2. Notify the Director's Representative in advance of dates and times when benchmark will be constructed.
 - 3. Install benchmark with supervisor oversight and workers who will be employed during the construction of the Work.
 - 4. Construct benchmarks using the exact materials, products, methods, and workmanship that were approved for the Work.
 - 5. Obtain Director's Representative's approval of benchmarks before starting work, fabrication, or construction.
 - 6. Maintain benchmarks during construction in an undisturbed condition as a standard for judging the completed Work.
 - 7. Failure to maintain this standard of quality will be cause for rejection of the Work.
 - 8. Benchmark may be used in the Work unless otherwise indicated.
- J. Uniformity of Hardware and Single Source Responsibility: For each kind of hardware provide product(s) of a single manufacturer.
- K. Size Variations: Manufacturers' products may vary slightly from sizes specified except where minimum size or thickness is specified.

1.08 WARRANTY

- A. Manufacturer's Warranty: Ten year minimum warranty for door closers.
- B. Manufacturer's Warranty: Three year minimum for locksets.

1.09 MAINTENANCE

- A. Special Tools: At the conclusion of finish hardware installation, turn over to Owner's Representative 2 sets of each special tools required for proper installation and adjustment of hardware, together with a list of these tools and their purpose.
- B. Lubricants: Provide manufacturer's recommended lubricants for locksets and closers sufficient for 1 year of maintenance. Turn over to Director's Representative.

PART 2 PRODUCTS

2.01 ACCESSORIES

- A. Provide brackets, plates, arms, spacers, and special templates to mount door closers in combination with overhead stops and coordinators, on narrow top rails and for special ceiling and jamb conditions.
- B. Provide curved lip strikes, with wrought boxes, specific to individual lock functions. Universal strikes that fit a variety of lock functions are not acceptable.

2.02 FASTENINGS

- A. Provide fasteners that harmonize with finish hardware material and finish.
- B. Provide torx center pin security fasteners for exposed hardware, including full mortise hinges.
- C. Provide machine screws for hardware secured to metal; and machine screws and metal expansion shields for attachment to masonry substrates. Self-tapping or self-drilling screws are not acceptable.
- D. Provide undercut shallow head torx center pin security fasteners where necessary for proper seating.
- E. Attach door closers and overhead stops with sex bolts.

2.03 MATERIALS AND FINISHES

- A. General: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in this section and in the Hardware Groups.
- B. Continuous Hinges
 - 1. Full height barrel-type manufactured from 14-gauge 304 stainless steel.
 - 2. .25" diameter stainless steel pins.
 - 3. Provide hinges without covers.
- C. Locks, Latches and Bolts
 - 1. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.
 - 2. Provide 3/4" minimum throw on other latch bolts.
 - 3. Provide 1" minimum throw deadbolts.
- D. Closers and Door Control Devices
 - 1. Closer bodies: Provide closer bodies with the same hole template pattern regardless of type or application.
 - 2. Closer arms: Non-handed forged steel.

3. Closer size: Provide sized closers.
4. Provide all-weather fluid to eliminate seasonal adjustment of closer speed.
5. Powder coat closer body, arm, and adapter plate or pre-treat closer body, arm, and adapter plate with rust-inhibiting coating before painted finish is applied.

2.04 FINISH HARDWARE

- A. Group 1: NOT USED.
- B. Group 1A: NOT USED
- C. Group 1B:
 1. Hinges (by frame manufacturer).
 2. Mortise Lockset: 1ea – Dorma M9050-J-RLM x US26D.
 3. Mortise Lock Cylinder: 1ea – Best compatible with specified lock above with temporary construction core x 626.
 4. Permanent Core: 1 ea – Best (to suit) x US26D
 5. Wall Stop: Trimco 1270WV x US32D
- D. Group 1C:
 1. Hinges (by frame manufacturer).
 2. Mortise Lockset: 1ea – Dorma M9080-J-RLM x US26D
 3. Mortise Lock Cylinder: 1ea – Best compatible with specified lock above with temporary construction core x 626.
 4. Permanent Core: 1 ea – Best (to suit) x US26D
 5. Door Closer (by frame manufacturer)
 6. Wall Stop: Trimco 1270WV x US32D
 7. Electric Strike: (by frame manufacturer)
 8. Power Supply: (by security vendor)
 9. Door Contact: (by security vendor)
 10. Card Reader: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and locked by mortised lock. Upon authorization by card reader, electric strike is unlocked and the door is pulled open for entry. Inside lever is always free for egress.

Emergency Operation: Doors are normally closed and locked by mortised lock. In the event of power failure or fire alarm activation outside lever trim remains locked. Inside lever is always free for egress.

- E. Group 2: NOT USED
- F. Group 3:
 1. Hinges 3ea – PBB BB81 4.5 x 4.5 x US26D.

2. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
3. Mortise Lock Cylinder: 1 ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Wall Stop: 1 ea. - Trimco 1270WV x US32D
6. Kick Plate: 1 ea. - Trimco K0050 16" h x 2" LDW x B3E x 630
7. Silencers: 3 ea. - Trimco 1229 x Black
8. Door Bottom 1 ea. - Zero 3546A-FLO x Alum

G. Group 3A:

1. Hinges (to match existing frame prep) x US26D.
2. Mortise Lockset: 1ea. – Dorma M9080-J-RLM x US26D
3. Mortise Lock Cylinder: 1 ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Mop Plate: 1 ea. - Trimco K0050 12" h x 2" LDW x B3E x 630

H. Group 3B:

1. Hinges 3 ea. – PBB BB81 4.5 x 4.5 x US26D.
2. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
3. Mortise Lock Cylinder: 1 ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Wall Stop: 1 ea. - Trimco 1270WV x US32D
6. Kick Plate: 1 ea. - Trimco K0050 16" h x 2" LDW x B3E x 630
7. Silencers: 3 ea. - Trimco 1229 x Black
8. Lever Protector: 1 ea. – Rockwood R115LPB x US32D

I. Group 3C:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
3. Mortise Lock Cylinder: 1ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Wall Stop: 1 ea. - Trimco 1270WV x US32D
6. Kick Plate: 1 ea. - Trimco K0050 16" h x 2" LDW x B3E x 630
8. Gasketing 1 ea. - Zero 870AA jams/head
9. Door Bottom 1 ea. Zero 3546A-FLO x Alum
10. Lever Protector: 1ea. – Rockwood R115LPB x US32D

J. Group 3D:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
3. Mortise Lock Cylinder: 1ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Door Closer/Stop/Hold Open: 1 ea. Dorma 8616-ISH-FC x Alum
6. Kick Plate: 1 ea. - Trimco K0050 16" h x 2" LDW x B3E x 630

7. Gasketing 1 ea. - Zero 870AA jambs/head
8. Door Bottom 1 ea. Zero 3546A-FLO x Alum
9. Lever Protector: 1ea. – Rockwood R115LPB x US32D

K. Group 3E:

1. Hinges 3 ea. – PBB BB81 4.5 x 4.5 x US26D.
2. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
3. Mortise Lock Cylinder: 1 ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Mop Plate: 1 ea. - Trimco K0050 12” h x 2” LDW x B3E x 630
6. Silencers: 3 ea. - Trimco 1229 x Black

L. Group 4:

1. Hinges 3 ea. – PBB BB81 4.5 x 4.5 x US26D.
2. Mortise Privacy Set: 1 ea. – Dorma M9046-L-RLM x US26D
3. Door Closer: 1 ea. – Dorma 8616-AF-FC x Alum
4. Wall Stop: 1 ea. - Trimco 1270WV x US32D
5. Kick Plate: 1 ea. - Trimco K0050 16” h x 2” LDW x B3E x 630
6. Silencers: 3 ea. - Trimco 1229 x Black

M. Group 4A:

1. Hinges 3 ea. – PBB BB81 4.5 x 4.5 x US26D.
2. Mortise Privacy Set: 1 ea. – Dorma M9046-L-RLM x US26D
3. Wall Stop: 1 ea. - Trimco 1270WV x US32D
4. Kick Plate: 1 ea. - Trimco K0050 16” h x 2” LDW x B3E x 630
5. Silencers: 3 ea. - Trimco 1229 x Black

N. Group 5:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
3. Mortise Lock Cylinder: 1ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Door Closer: 1 ea. – Dorma 8616-AF-FC x Alum
6. Wall Stop: 1 ea. - Trimco 1270WV x US32D
7. Kick Plate: 1 ea. - Trimco K0050 16” h x 2” LDW x B3E x 630
8. Silencers: 3 ea. - Trimco 1229 x Black
9. Electric Strike: 1 ea. Von Duprin 6211 x FSE x US32D
10. Power Supply: (by security vendor)
11. Door Contact: (by security vendor)
12. Card Reader: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and locked by mortised lock. Upon authorization by card reader, electric strike is unlocked and the door is pulled open for entry. Inside lever is always free for egress.

Emergency Operation: Doors are normally closed and locked by mortised lock. In the event of power failure or fire alarm activation outside lever trim remains locked. Inside lever is always free for egress.

O. Group 5A:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
3. Mortise Lock Cylinder: 1ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Door Closer: 1 ea. – Dorma 8616-AF-FC x Alum
6. Wall Stop: 1 ea. - Trimco 1270WV x US32D
7. Armour Plate: 1 ea. - Trimco K0050 34" h x 2" LDW x B3E x 630
8. Gasketing 1 ea. - Zero 870AA jams/head
9. Door Bottom 1 ea. Zero 3546A-FLO x Alum
10. Lever Protector: 1ea. – Rockwood R115LPB x US32D
10. Electric Strike: 1 ea. Von Duprin 6211 x FSE x US32D
11. Power Supply: (by security vendor)
12. Door Contact: (by security vendor)
13. Card Reader: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and locked by mortised lock. Upon authorization by card reader, electric strike is unlocked and the door is pulled open for entry. Inside lever is always free for egress.

Emergency Operation: Doors are normally closed and locked by mortised lock. In the event of power failure or fire alarm activation outside lever trim remains locked. Inside lever is always free for egress.

P. Group 5B: NOT USED

Q. Group 5C:

1. Hinges (by frame manufacturer).
2. Mortise Lockset: 1ea – Dorma M9080-J-RLM x US26D
3. Mortise Lock Cylinder: 1ea – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea – Best (to suit) x US26D
5. Door Closer (by frame manufacturer)
6. Wall Stop: Trimco 1270WV x US32D
7. **Fail Safe** Electric Strike: (by frame manufacturer)
8. Power Supply: (by security vendor)
9. Door Contact: (by security vendor)
10. Card Reader: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and locked by mortised lock. Upon authorization by card reader, electric strike is unlocked and the door is pulled open for entry. Inside lever is always free for egress.

Emergency Operation: Doors are normally closed and locked by mortised lock. In the event of power failure or fire alarm activation outside lever **unlocks automatically**. Inside lever is always free for egress.

R. Group 5D:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
3. Mortise Lock Cylinder: 1ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Door Closer/Stop: 1 ea. – Dorma 8616-IS-FC x Alum
6. Armour Plate: 1 ea. - Trimco K0050 34” h x 2” LDW x B3E x 630
7. Gasketing 1 ea. - Zero 870AA jambs/head
8. Door Bottom 1 ea. Zero 3546A-FLO x Alum
9. Lever Protector: 1ea. – Rockwood R115LPB x US32D
10. Electric Strike: 1 ea. Von Duprin 6211 x FSE x US32D
11. Power Supply: (by security vendor)
12. Door Contact: (by security vendor)
13. Card Reader: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and locked by mortised lock. Upon authorization by card reader, electric strike is unlocked and the door is pulled open for entry. Inside lever is always free for egress.

Emergency Operation: Doors are normally closed and locked by mortised lock. In the event of power failure or fire alarm activation outside lever trim remains locked. Inside lever is always free for egress.

S. Group 6:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Privacy: 1 ea. – Dorma M9040-L-RLM x US26D
3. Door Closer/Stop: 1 ea. – Dorma 8616-IS-FC x Alum
4. Armour Plate: 1 ea. - Trimco K0050 34” h x 2” LDW x B3E x 630
5. Gasketing 1 ea. - Zero 870AA jambs/head
6. Door Bottom 1 ea. Zero 3546A-FLO x Alum
7. Lever Protector: 1ea. – Rockwood R115LPB x US32D

T. Group 7:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D

3. Mortise Lock Cylinder: 1ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Automatic Operator: 1 ea. – Dorma ED900 series x Alum
6. Wall Stop: Trimco 1270WV x US32D
7. Mop Plate: 1 ea. - Trimco K0050 12" h x 2" LDW x B3E x 630
8. Kick Plate: 1 ea. Trimco K0050 16" h x 2" LDW x B3E x 630
9. Gasketing 1 ea. Zero 429A head only
10. Gasketing 1 ea. - Zero 870AA jambs only
11. Door Bottom 1 ea. – Zero 3546A-FLO x Alum
12. Push Plate Switch 1 ea. – Wikk SFA-2
13. Magnetic Lock 1 ea. – Dorma EML310-DP
14. Electric Strike 1 ea. – Von Duprin 6211 x FSE x US32D
15. Emergency Door Release 1 ea. – Deltrex A130-GM2PCE99
16. Power Supply: (by security vendor)
17. Door Contact: (by security vendor)
18. Card Reader: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and locked by mortised lock. Upon authorization by card reader, electric strike is unlocked and the door is automatically opened. Inside lever is always free for egress. Push Plate switch inside, unlocks electric strike and signals automatic operator to open door.

Interlock: Doors are electrically interlocked with door 8-17A by magnetic locks so that only one opening can be unlocked from the locked closed position at any time. When signaled from the fire alarm system or loss of power magnet locks unlock.

Emergency Operation: Doors are normally closed and locked by mortised lock. In the event of power failure or fire alarm activation outside lever trim remains locked. Inside lever is always free for egress.

U. Group 7A:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
3. Mortise Lock Cylinder: 1ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Automatic Operator: 1 ea. – Dorma ED900 series x Alum
6. Wall Stop: Trimco 1270WV x US32D
7. Mop Plate: 1 ea. - Trimco K0050 12" h x 2" LDW x B3E x 630
8. Kick Plate: 1 ea. Trimco K0050 16" h x 2" LDW x B3E x 630
9. Gasketing 1 ea. Zero 429A head only
10. Gasketing 1 ea. - Zero 870AA jambs only
11. Door Bottom 1 ea. – Zero 3546A-FLO x Alum
12. Push Plate Switch 1 ea. – Wikk SFA-2

13. Magnetic Lock 1 ea. – Dorma EML310-DP
14. Electric Strike 1 ea. – Von Duprin 6211 x FSE x US32D
15. Emergency Door Release 1 ea. – Deltrex A130-GM2PCE99
16. Power Supply: (by security vendor)
17. Door Contact: (by security vendor)
18. Card Reader: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and locked by mortised lock. Upon authorization by card reader, electric strike is unlocked and the door is automatically opened. Inside lever is always free for egress. Push Plate switch inside, unlocks electric strike and signals automatic operator to open door.

Interlock: Doors are electrically interlocked with door 8-22 by magnetic locks so that only one opening can be unlocked from the locked closed position at any time. When signaled from the fire alarm system or loss of power magnet locks unlock.

Emergency Operation: Doors are normally closed and locked by mortised lock. In the event of power failure or fire alarm activation outside lever trim remains locked. Inside lever is always free for egress.

V. Group 8:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Passage: 1 ea. – Dorma M9010-L-RLM x US26D
3. Automatic Operator: 1 ea. – Dorma ED900 series x Alum
4. Wall Stop: Trimco 1270WV x US32D
5. Kick Plate: 1 ea. Trimco K0050 16" h x 2" LDW x B3E x 630
6. Gasketing 1 ea. Zero 429A head only
7. Gasketing 1 ea. - Zero 870AA jams only
8. Door Bottom 1 ea. – Zero 3546A-FLO x Alum
9. Push Plate Switch 2 ea. – Wikk SFA-2
10. Magnetic Lock 1 ea. – Dorma EML310-DP
11. Electric Strike: 1 ea. – Von Duprin 6211 x FSE x US32D
12. Emergency Door Release 1 ea. – Deltrex A130-GM2PCE99
13. Power Supply: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and unlocked. Push Plate switch on either side of the door, unlocks electric strike and signals automatic operator to open door.

Interlock: Doors are electrically interlocked with door 8-17 by magnetic locks so that only one opening can be unlocked from the locked closed position at any

time. When signaled from the fire alarm system or loss of power magnet locks unlock.

Emergency Operation: Doors are normally closed and unlocked. Inside lever is always free for egress.

W. Group 8A:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Passage: 1 ea. – Dorma M9010-L-RLM x US26D
3. Automatic Operator: 1 ea. – Dorma ED900 series x Alum
4. Wall Stop: Trimco 1270WV x US32D
5. Kick Plate: 1 ea. Trimco K0050 16” h x 2” LDW x B3E x 630
6. Gasketing 1 ea. Zero 429A head only
7. Gasketing 1 ea. - Zero 870AA jams only
8. Door Bottom 1 ea. – Zero 3546A-FLO x Alum
9. Push Plate Switch 2 ea. – Wikk SFA-2
10. Magnetic Lock 1 ea. – Dorma EML310-DP
11. Electric Strike 1 ea. – Von Duprin 6211 x FSE x US32D
12. Emergency Door Release 1 ea. – Deltrex A130-GM2PCE99
13. Power Supply: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and unlocked. Push Plate switch on either side of the door, unlocks electric strike and signals automatic operator to open door

Interlock: Doors are electrically interlocked with door 8-17 by magnetic locks so that only one opening can be unlocked from the locked closed position at any time. When signaled from the fire alarm system or loss of power magnet locks unlock.

Emergency Operation: Doors are normally closed and unlocked. Inside lever is always free for egress.

X. Group 9:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Lockset: 1 ea. – Dorma M9070-J-RLM x US26D
3. Mortise Lock Cylinder: 1ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Door Closer/Stop: 1 ea. – Dorma 8616-IS-FC x Alum
6. Armour Plate: 1 ea. - Trimco K0050 34” h x 2” LDW x B3E x 630
7. Gasketing 1 ea. - Zero 870AA jams/Head
8. Door Bottom 1 ea. – Zero 3546A-FLO x Alum
9. Lever Protector Rockwood R115LPB x US32D

Y. Group 9A:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Lockset: 1 ea. – Dorma M9070-J-RLM x US26D
3. Mortise Lock Cylinder: 1ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Door Closer: 1 ea. – Dorma 8616-AF-FC x Alum
6. Wall Stop: 1 ea. – Trimco 1270WV x US32D
7. Armour Plate: 1 ea. - Trimco K0050 34" h x 2" LDW x B3E x 630
8. Gasketing 1 ea. - Zero 870AA jambs/Head
9. Door Bottom 1 ea. – Zero 3546A-FLO x Alum
10. Lever Protector Rockwood R115LPB x US32D

Z. Group 9B:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Lockset: 1 ea. – Dorma M9070-J-RLM x US26D
3. Mortise Lock Cylinder: 1ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Door Closer/Stop: 1 ea. – Dorma 8616-IS-FC x Alum
6. Armour Plate: 1 ea. - Trimco K0050 34" h x 2" LDW x B3E x 630
7. Silencers: 3 ea. – Trimco 1229A
8. Lever Protector Rockwood R115LPB x US32D

AA. Group 10:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Passage: 1 ea. – Dorma M9010-L-RLM x US26D
3. Door Closer: 1 ea. – Dorma 8616-AF-FC x Alum
4. Wall Stop: 1 ea. – Trimco 1270WV x US32D
5. Armour Plate: 1 ea. - Trimco K0050 34" h x 2" LDW x B3E x 630
6. Gasketing 1 ea. - Zero 870AA jambs/Head
7. Door Bottom 1 ea. – Zero 3546A-FLO x Alum

BB. Group 10A:

1. Hinge (to match existing frame prep) x US26D
2. Mortise Passage: 1 ea. – Dorma M9010-L-RLM x US26D
3. Door Closer: 1 ea. – Dorma 8616-AF-FC x Alum
4. Wall Stop: 1 ea. – Trimco 1270WV x US32D
5. Kick Plate: 1 ea. - Trimco K0050 16" h x 2" LDW x B3E x 630

CC. Group 11:

The door manufacturer will furnish all hardware.

DD. Group 12:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
3. Mortise Lock Cylinder: 1ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Automatic Operator: 1 ea. – Dorma ED900 series x Alum

6. Wall Stop: Trimco 1270WV x US32D
7. Mop Plate: 1 ea. - Trimco K0050 12" h x 2" LDW x B3E x 630
8. Kick Plate: 1 ea. Trimco K0050 16" h x 2" LDW x B3E x 630
9. Gasketing 1 ea. Zero 429A head only
10. Gasketing 1 ea. - Zero 870AA jambs only
11. Door Bottom 1 ea. – Zero 3546A-FLO x Alum
12. Push Plate Switch 1 ea. – Wikk SFA-2
13. Magnetic Lock 1 ea. – Dorma EML310-DP
14. Electric Strike 1 ea. – Von Duprin 6211 x FSE x US32D
15. Emergency Door Release 1 ea. – Deltrex A130-GM2PCE99
16. Power Supply: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and locked by mortised lock. Access by key only outside. Inside lever is always free for egress. Push Plate switch inside, unlocks electric strike and signals automatic operator to open door.

Interlock: Doors are electrically interlocked with doors 8-28A and 8-29 by magnetic locks so that only one opening can be unlocked from the locked closed position at any time. When signaled from the fire alarm system or loss of power magnet locks unlock.

Emergency Operation: Doors are normally closed and locked by mortised lock. Inside lever is always free for egress.

EE. Group 13:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Passage: 1 ea. – Dorma M9010-L-RLM x US26D
3. Automatic Operator: 1 ea. – Dorma ED900 series x Alum
4. Wall Stop: Trimco 1270WV x US32D
5. Kick Plate: 1 ea. Trimco K0050 16" h x 2" LDW x B3E x 630
6. Gasketing 1 ea. - Zero 870AA jambs/head
7. Door Bottom 1 ea. – Zero 3546A-FLO x Alum
8. Push Plate Switch 2 ea. – Wikk SFA-2
9. Magnetic Lock 1 ea. – Dorma EML310-DP
10. Electric Strike 1 ea. – Von Duprin 6211 x FSE x US32D
12. Emergency Door Release 1 ea. – Deltrex A130-GM2PCE99
13. Power Supply: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and unlocked. Push Plate switch on either side of the door, unlocks electric strike and signals automatic operator to open door

Interlock: Doors are electrically interlocked with doors 8-28 and 8-29 by magnetic locks so that only one opening can be unlocked from the locked closed position at any time. When signaled from the fire alarm system or loss of power magnet locks unlock.

Emergency Operation: Doors are normally closed and unlocked. Inside lever is always free for egress.

FF. Group 13A:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Mortise Lockset: 1 ea. – Dorma M9070-J-RLM x US26D
3. Mortise Lock Cylinder: 1ea. – Best compatible with specified lock above with temporary construction core x 626.
4. Permanent Core: 1 ea. – Best (to suit) x US26D
5. Automatic Operator: 1 ea. – Dorma ED900 series x Alum
6. Wall Stop: Trimco 1270WV x US32D
7. Mop Plate: 1 ea. - Trimco K0050 12” h x 2” LDW x B3E x 630
8. Kick Plate: 1 ea. Trimco K0050 16” h x 2” LDW x B3E x 630
9. Gasketing 1 ea. Zero 429A head only
10. Gasketing 1 ea. - Zero 870AA jams only
11. Door Bottom 1 ea. – Zero 3546A-FLO x Alum
12. Push Plate Switch 2 ea. – Wikk SFA-2
13. Magnetic Lock 1 ea. – Dorma EML310-DP
14. Electric Strike 1 ea. – Von Duprin 6211 x FSE x US32D
15. Emergency Door Release 1 ea. – Deltrex A130-GM2PCE99
16. Power Supply: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and unlocked by mortised lock. Door can be locked if required. Inside lever is always free for egress. Push Plate switch on both sides of the door, unlocks electric strike and signals automatic operator to open door.

Interlock: Doors are electrically interlocked with doors 8-28A and 8-28 by magnetic locks so that only one opening can be unlocked from the locked closed position at any time. When signaled from the fire alarm system or loss of power magnet locks unlock.

Emergency Operation: Doors are normally closed and unlocked by mortised lock. Inside lever is always free for egress.

GG. Group 14:

1. Continuous Hinge 1 ea. – PBB CH51SS.
2. Push Plates 2 ea. – Trimco 1001-3 x US32D
3. Automatic Operator: 2 ea. – Dorma ED900 series x Alum
4. Wall Stop: 2 ea. - Trimco 1270WV x US32D
5. Armour Plate: 4 ea. - Trimco K0050 34” h x 2” LDW x B3E x 630

6. Gasketing 1 ea. - Zero 870AA jambs/head
7. Door Bottom 2 ea. – Zero 367A
8. Astragal 1 ea. – Anemostat DE-FMA x US32D
9. Push Plate Switch 2 ea. – Wikk SFA-2

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and unlocked. Push Plate switch on either side of the door, signals automatic operator to open door.

Emergency Operation: Doors are normally closed and unlocked. Always free for egress.

HH. Group 15:

1. Hinges 6 ea. – PBB BB81 4.5 x 4.5 x US26D.
2. Flush Bolts 2 ea. – Trimco W3917 x US26D
3. Dustproof Strike 1 ea. – Trimco 3910 x US26D
4. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
5. Mortise Lock Cylinder: 1 ea. – Best compatible with specified lock above with temporary construction core x 626.
6. Permanent Core: 1 ea. – Best (to suit) x US26D
7. Mop Plate: 1 ea. - Trimco K0050 12” h x 2” LDW x B3E x 630
8. Silencers: 2 ea. - Trimco 1229 x Black

II. Group 15A:

1. Hinges 6 ea. – PBB BB81 4.5 x 4.5 x US26D.
2. Flush Bolts 1 ea. – Trimco W3917 x US26D Top Only
3. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
4. Mortise Lock Cylinder: 1 ea. – Best compatible with specified lock above with temporary construction core x 626.
5. Permanent Core: 1 ea. – Best (to suit) x US26D
6. Mop Plate: 2 ea. - Trimco K0050 12” h x 2” LDW x B3E x 630
7. Gasketing: 1 ea. – Zero 870AA jambs/head
8. Door Bottom: 2 ea. Zero 3546A-FLO
9. Astragal Seals: 2 ea. – Zero 326A x 326A

JJ. Group 15B:

1. Hinges – (to match existing frame prep) x US26D.
2. Flush Bolts 2 ea. – Trimco W3917 x US26D
3. Dustproof Strike 1 ea. – Trimco 3910 x US26D
4. Mortise Lockset: 1 ea. – Dorma M9080-J-RLM x US26D
5. Mortise Lock Cylinder: 1 ea. – Best compatible with specified lock above with temporary construction core x 626.
6. Permanent Core: 1 ea. – Best (to suit) x US26D
7. Mop Plate: 2 ea. - Trimco K0050 12” h x 2” LDW x B3E x 630
8. Gasketing: 1 ea. – Zero 870AA jambs/head
9. Door Bottom: 2 ea. Zero 3546A-FLO
10. Astragal Seals: 2 ea. – Zero 326A x 326A

KK. Group 16:

1. Hinges – (to match existing frame prep) x US26D
2. Electric Hinge (to match) x US26D
3. Electric Lockset: 1ea – Dorma M9080EL-J-RLM x US26D
4. Mortise Lock Cylinder: 1ea – Best compatible with specified lock above with temporary construction core x 626.
5. Permanent Core: 1 ea – Best (to suit) x US26D
6. Door Closer: Dorma 8616-AF-FC x Alum
7. Wall Stop: Trimco 1270WV x US32D
8. Power Supply: (by security vendor)
9. Door Contact: (by security vendor)
10. Card Reader: (by security vendor)

DESCRIPTION OF OPERATION

Normal Operation: Doors are normally closed and locked by electric lock. Upon authorization by card reader, electric lock is unlocked and the door is pulled open for entry. Inside lever is always free for egress.

Emergency Operation: Doors are normally closed and locked by electric lock. In the event of power failure or fire alarm activation outside lever unlocks automatically. Inside lever is always free for egress.

2.05 KEYING

- A. Continue existing Best key system established for Facility.
 1. Stamp key symbol on one side of key, and “Do Not Duplicate” on other side of key.
 3. Furnish one copy of factory biting list to facility.
 4. Factory key cylinders.
 5. Furnish 3 cut keys for each master key.
 6. Furnish 7 cut keys for each keyed lockset.
 7. These cut key quantities are for bidding purposes only. Actual number of cut keys required will be determined at keying meeting.
 8. When lockset and cylinder are by different manufacturers, identify and furnish correct cylinder cam to operate lockset.
 9. Provide compression rings and spacers to achieve proper spacing relationship between cylinder and face of door.
- B. Keying Conference
 1. Immediately following contract award, Director’s Representative will schedule a keying conference to develop a written key schedule that reflects Facility’s specific keying requirements. Facility Representative(s), Hardware Distributor, Consulting Hardware Designer, and OGS’s Hardware Designer will attend.
 2. Incorporate this schedule in Finish Hardware Submittals for approval.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine doors and frames and related items for conditions such as, but not limited to, incorrect handing, hardware preparation, misaligned lock and strike preparations, that would prevent proper application of finish hardware. Do not proceed until defects are corrected.
- B. Report conditions or hardware applications that are incorrect to the Director's Representative.

3.02 INSTALLATION

- A. Do not proceed with installation of finish hardware prior to attending referenced pre-installation conference.
- B. Installation Sequence: Use proper installation sequence, i.e., install coordinators, and overhead stops and holders before surface mounted door closers.
- C. Install hardware in accordance with manufacturer's printed installation instructions, and adjust for smooth operation, free of sticking, binding or rattling.
 - 1. Template surface overhead stops and holders for proper operation
 - 2. Template and adjust closers for proper operation.
- D. Use proper tools and methods to prevent scratches, burrs or other defacement.
- E. Threshold Installation:
 - 1. Drill holes 3 inches from each end of threshold and intermediate holes 12 inches maximum o.c. for required fasteners. Prepare holes for countersunk fasteners.
 - 2. Level and align thresholds with frames and doors. Where required, use non-corrosive shims.
 - 3. Exterior Doors: Set thresholds in a solid bed of Type 3 sealant.
 - 4. Secure thresholds to substrate with countersunk fasteners.
- F. Door Bottom Installation:
 - 1. Mount sweep type door bottom protection/drip caps on exterior side of doors.
 - 2. Before mounting apply Type 2 sealant on the back side of bearing surface. Secure to door with required fasteners.
- G. Gasket Installation:
 - 1. Install continuous stripping at each opening without unnecessary interruptions.
 - 2. Where fasteners are required, secure fasteners for stripping and seals so they will not work loose during door operation. Exposed heads of fasteners shall be free of sharp edges.
 - 3. Coordinate meeting stile gasket with hardware before installation.

4. Install units plumb and level at the optimum location to maintain a permanent effective seal.
- H. After installation, cover and protect hardware to prevent damage during remaining construction. Remove protection upon completion of construction.

3.03 LOCATIONS

- A. Locate hardware as follows:
1. Door Closers: Template for maximum door swing allowed by wall placement and jamb conditions. Where overhead stop prevents door from swinging to wall, template the closer to exceed degree of opening allowed by overhead stop.
 2. Protection Plates: 1/8 inch from door bottom.
 3. Wall Stops: Centerline of bumper to match centerline of locking trim.

3.04 FIELD QUALITY CONTROL

- A. Post Installation Review: After hardware is adjusted for proper operation, Director's Representative will hold a Post-Installation Review with the Contractor, Hardware Designer, Company Field Advisors, Hardware Distributor and Hardware Installers.
1. Physically inspect to verify proper application, installation, adjustment and operation of finish hardware, and in particular that:
 - a) Latches engage freely without binding. Filing of strike plates to relieve latch bind is not acceptable.
 - b) Closers are adjusted for proper spring power; sweep speed, latching speed; and hydraulic back check.
 - c) Locations and proper attachment of installed protective hardware are as specified.
 - d) There is no field modification of fasteners.
 - e) Damaged fasteners are replaced.
 2. Defective hardware is repaired or replaced.
 3. Hardware is to be left clean and free from disfigurement.
- B. Turn referenced Operations and Maintenance Manuals over to Facility through Director's Representative.

END OF SECTION

SECTION 265100
INTERIOR LIGHTING

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.

1.02 SUMMARY

- A. Section Includes:

1. Interior lighting fixtures, lamps, and drivers.
2. Exit signs.
3. Lighting fixture supports.

- B. Related Sections:

1. Section 260943 "Network Lighting Controls " for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 260943 "Network Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.
3. Section 262726 "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

1.03 DEFINITIONS

- A. BF: Ballast factor.
- B. CCT: Correlated color temperature.
- C. CRI: Color-rendering index.
- D. HID: High-intensity discharge.
- E. LER: Luminaire efficacy rating.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting fixture, including ballast housing or driver if provided.

1.04 SUBMITTALS

- A. Waiver of Submittals: The “Waiver of Certain Submittal Requirements” in Section 013300 does not apply to this Section.
- B. Submittal Packages: Submit the shop drawings and the product data specified below at the same time as a package.
- C. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.
 - 3. Ballast, including BF.
 - 4. Energy-efficiency data.
 - 5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
 - 6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
 - a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
 - b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- D. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- E. Samples: For each lighting fixture indicated in the Interior Lighting Fixture Schedule. Each Sample shall include the following:
 - 1. Lamps and drivers, installed.
 - 2. Cords and plugs.
 - 3. Pendant support system.
- F. Installation instructions.
- G. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Lighting fixtures.

2. Suspended ceiling components.
 3. Partitions and millwork that penetrate the ceiling or extends to within 12 inches (305 mm) of the plane of the luminaires.
 4. Ceiling-mounted projectors.
 5. Structural members to which suspension systems for lighting fixtures will be attached.
 6. Other items in finished ceiling including the following:
 - a. Air outlets and inlets.
 - b. Speakers.
 - c. Sprinklers.
 - d. Smoke and fire detectors.
 - e. Occupancy sensors.
 - f. Access panels.
 7. Perimeter moldings.
- H. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.
- I. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.
- J. Field quality-control reports.
- K. Warranty: Sample of special warranty.
- L. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.
- M. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
 2. Plastic Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
 3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.
 4. Fluorescent-fixture-mounted, emergency battery pack: One for every 20 <twenty> emergency lighting unit.

1.05 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as

defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.
- E. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- F. Mockups: Provide interior lighting fixtures for room or module mockups, complete with power and control connections.
 - 1. Obtain Architect's approval of fixtures for mockups before starting installations.
 - 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.07 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Emergency Lighting Unit Batteries: 10 <Ten> years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
 - 2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven <7> years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.02 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.
- C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- D. LED Fixtures: Comply with UL 1598.
- E. Metal Parts: Free of burrs and sharp corners and edges.
- F. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- H. Diffusers and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
- I. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp and ballast characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter code (T-4, T-5, T-8, T-12, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
 - c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
 - d. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
 - e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
 - f. CCT and CRI for all luminaires.

- J. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast / driver indicated to require a filter.

2.03 BALLASTS FOR LINEAR FLUORESCENT LAMPS

- A. General Requirements for Electronic Ballasts:
 - 1. Comply with UL 935 and with ANSI C82.11.
 - 2. Designed for type and quantity of lamps served.
 - 3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
 - 4. Sound Rating: Class A.
 - 5. Total Harmonic Distortion Rating: Less than 10 percent.
 - 6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
 - 7. Operating Frequency: 42 kHz or higher.
 - 8. Lamp Current Crest Factor: 1.7 or less.
 - 9. BF: 0.88 or higher.
 - 10. Power Factor: 0.95 or higher.
 - 11. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.
- B. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.
- C. Electronic Programmed-Start Ballasts for T5, T8, T5HO, T5 and T5HO Lamps: Comply with ANSI C82.11 and the following:
 - 1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
 - 2. Automatic lamp starting after lamp replacement.
- D. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.
 - 1. Ballast Manufacturer Certification: Indicated by label.
- E. Single Ballasts for Multiple Lighting Fixtures: Factory wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.
- F. Ballasts for Low-Temperature Environments:
 - 1. Temperatures 0 Deg F (Minus 17 Deg C) and Higher: Electronic type rated for 0 deg F (minus 17 deg C) starting and operating temperature with indicated lamp types.
 - 2. Temperatures Minus 20 Deg F (Minus 29 Deg C) and Higher: Electromagnetic type designed for use with indicated lamp types.
- G. Ballasts for Residential Applications: Fixtures designated as "Residential" may use low-power-factor electronic ballasts having a Class B sound rating and total harmonic distortion of approximately 30 percent.

- H. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.
- I. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.
 - 1. Dimming Range: 100 to 5 percent of rated lamp lumens.
 - 2. Ballast Input Watts: Can be reduced to 20 percent of normal.
 - 3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
 - 4. Control: Coordinate wiring from ballast to control device to ensure that the ballast, controller, and connecting wiring are compatible.
- J. Ballasts for Bi-Level Controlled Lighting Fixtures: Electronic type.
 - 1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.
 - a. High-Level Operation: 100 percent of rated lamp lumens.
 - b. Low-Level Operation: 30 percent of rated lamp lumens.
 - 2. Ballast shall provide equal current to each lamp in each operating mode.
 - 3. Compatibility: Certified by manufacturer for use with specific bi-level control system and lamp type indicated.
- K. Ballasts for Tri-Level Controlled Lighting Fixtures: Electronic type.
 - 1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.
 - a. High-Level Operation: 100 percent of rated lamp lumens.
 - b. Low-Level Operation: 30 and 60 percent of rated lamp lumens.
 - 2. Ballast shall provide equal current to each lamp in each operating mode.
 - 3. Compatibility: Certified by manufacturer for use with specific tri-level control system and lamp type indicated.

2.04 BALLASTS FOR COMPACT FLUORESCENT LAMPS

- A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
 - 1. Lamp end-of-life detection and shutdown circuit.
 - 2. Automatic lamp starting after lamp replacement.
 - 3. Sound Rating: Class A.
 - 4. Total Harmonic Distortion Rating: Less than 20 percent.
 - 5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
 - 6. Operating Frequency: 20 kHz or higher.
 - 7. Lamp Current Crest Factor: 1.7 or less.

8. BF: 0.95 or higher unless otherwise indicated.
9. Power Factor: 0.95 or higher.
10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.05 EMERGENCY FLUORESCENT POWER UNIT

- A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
 1. Emergency Connection: Operate one fluorescent lamp(s) continuously at an output of 1100 lumens each.
 2. Nightlight Connection: Operate one fluorescent lamp continuously.
 3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 4. Battery: Sealed, maintenance-free, nickel-cadmium type.
 5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
 6. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
- B. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from lighting fixture. Comply with UL 924.
 1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
 2. Nightlight Connection: Operate one fluorescent lamp in a remote fixture continuously.
 3. Battery: Sealed, maintenance-free, nickel-cadmium type.
 4. Charger: Fully automatic, solid-state, constant-current type.
 5. Housing: NEMA 250, Type 1 enclosure.
 6. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 7. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 8. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
 9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.06 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.
 - 2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
 - 3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
 - g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
 - 4. Master/Remote Sign Configurations:
 - a. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in LED power supply for power connection to remote unit.
 - b. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.
- C. Self-Luminous Signs: Powered by tritium gas, with universal bracket for flush-ceiling, wall, or end mounting. Signs shall be guaranteed by manufacturer to maintain the minimum brightness requirements in UL 924 for 10 years.
- D. Self-Luminous Signs: Using strontium oxide aluminate compound to store ambient light and release the stored energy when the light is removed. Provide with universal bracket for flush-ceiling, wall, or end mounting.

2.07 FLUORESCENT LAMPS

- A. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches (1220 mm), 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500K, and average rated life 20,000 hours unless otherwise indicated.
- B. T8 rapid-start lamps, rated 17 W maximum, nominal length of 24 inches (610 mm), 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 3500K, and average rated life of 20,000 hours unless otherwise indicated.
- C. T5 rapid-start lamps, rated 28 W maximum, nominal length of 45.2 inches (1150 mm), 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 3000K, and average rated life of 20,000 hours unless otherwise indicated.
- D. T5HO rapid-start, high-output lamps, rated 54 W maximum, nominal length of 45.2 inches (1150 mm), 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 4100K, and average rated life of 20,000 hours unless otherwise indicated.
- E. Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature 3000K, average rated life of 10,000 hours at three hours operation per start unless otherwise indicated.
 - 1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
 - 2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
 - 3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
 - 4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
 - 5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
 - 6. 57 W: T4, triple tube, rated 4300 initial lumens (minimum).
 - 7. 70 W: T4, triple tube, rated 5200 initial lumens (minimum).

2.08 LED FIXTURES

- A. The LED fixture shall be operated at constant and carefully regulated current levels. LEDs shall not be overdriven beyond their specified nominal voltage and current.
- B. For wet and damp use, LED-based fixture itself shall be sealed, rated, and tested for appropriate environmental conditions, not accomplished by using an additional housing or enclosure.
- C. LED fixture housing shall be designed to transfer heat from the LED board to the outside environment.
- D. All hardwired connections to LED fixtures shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
- E. All LED fixtures and power/data supplies shall be provided by a single manufacturer to ensure compatibility.
- F. Manufacturer of LED systems shall utilize an advanced production LED binning process to maintain color consistency.

- G. Manufacturer shall ensure that products undergo and successfully meet appropriate design and manufacturability testing including Design FMEA, Process FMEA, Environmental Engineering Considerations and Laboratory Tests, IEC standards and UL/CE testing.
- H. Manufacturer shall provide photometric data in IES file format in accordance with IES LM-63-2002, based on test results from an independent testing lab.
- I. Manufacturer shall have at least five years of experience designing, selling and supporting intelligent LED systems.

2.09 LED DRIVERS

A. MANUFACTURERS

- 1. Acceptable Manufacturer: Lutron Electronics Co., Inc.
- 2. [Basis of design product: Lutron or subject to compliance and prior approval with specified requirements of this section, one of the following:]
 - a. Lutron EcoSystem
 - b. <Insert manufacturer's name>
- 3. Substitutions: Under provisions of Division 012500.
 - a. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders.
 - b. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
 - c. Any substitutions provided by the contractor shall be reviewed at the contractor's expense by the electrical engineer at a rate of [\$200.00] per hour.
 - d. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.
 - e. Provide complete engineered shop drawings (including power wiring) with deviations for the original design highlighted in an alternate color to the engineer for review and approval prior to rough-in.
- 4. GENERAL
 - a. Ten-year operational life while operating with a case temperature range of 0 degrees C to 62 degrees C and 90 percent non-condensing relative humidity.
 - b. Designed and tested to withstand electrostatic discharges up to 15,000 V without impairment per IEC 801-2.
 - c. Electrolytic capacitors to operate at least 20 degrees C below the capacitor's maximum temperature rating when the driver is under fully-loaded conditions and case temperature is 62 degrees C.
 - d. Maximum inrush current of 2 amperes for 120V and 277 V drivers.
 - e. Withstand up to a 4,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A.
 - f. Manufactured in a facility that employ ESD reduction practices in compliance with ANSI/ESD S20.20.
 - g. Inaudible in a 27 dBA ambient.
 - h. No visible change in light output with a variation of +/- 10 percent line voltage input.
 - i. Total Harmonic Distortion less than [20] [] percent and meet ANSI C82.11 maximum allowable THD requirements.
 - j. Drivers to track evenly across:

- 1) Multplie fixtures.
 - 2) All light levels.
- k. Stand by power is <1.0Watts when using digital EcoSystem controls.
- l. Compatibility of driver and LED light engine must be tested and ensured by driver manufacturer.
- 5. 3-WIRE CONTROL
 - a. Continuous dimming from 100 percent to 1 percent relative light output.
 - b. Provide integral fault protection to prevent ballast failure in the event of an input mis-wire.
- 6. ECOSYSTEM CONTROL
 - a. Ability to operate with installed or specified building control system.
- 7. SOURCE QUALITY CONTROL
 - a. Perform full-function testing on 100 percent of all drivers at the factory.
 - b. Perform burn-in at 40 degrees C (104 degrees F) ambient temperature on 100 percent of all drivers at the factory.

2.10 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).
- F. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.11 LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER	LAMP QTY.	WATTS / LAMP	LAMP TYPE	TOTAL WATTS	CONTROL	VOLTAGE	COMMENTS	LOCATION
A	RECESSED LED 2X4 CLEANROOM TROFFER NOMINAL HOUSING DIMENSIONS 24" W X 48" L X 4.5"H OF ALUMINUM HOUSING. DOOR FRAME OF 18 GA CRS WITH CLOSED CELL MICROCELLULAR EXTRUDED GASKET WITH VULCANIZED CORNERS FOR ONE-PIECE GASKET. .135" THICK ACRYLIC WITH P12 INVERTED PRISMATIC PATTERN SEALED TO DOOR WITH RTV SILICONE. 92% WHITE REFLECTOR. WET LOCATION. LISTING: ETL, IP66	KURTZON KLEAN LOCK ADVANCED SERIES KL-G-7-2X4-3ILED35-UNV INTEGRAL DRIVER: 0-10v DIMMING	1	123w	LED: 3500K 80 CRI DELIVERED LUMENS: 11,670 by LIGHTING MANUFACTURER	123	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS.	OPERATING ROOMS, CONTROL ROOMS, NECROPSY, AIR-LOCK
A1	RECESSED LED 2X4 CLEANROOM TROFFER WITH RED-LIGHT NOMINAL HOUSING DIMENSIONS 24" W X 48" L X 4.5"H OF ALUMINUM HOUSING. DOOR FRAME OF 18 GA CRS WITH CLOSED CELL MICROCELLULAR EXTRUDED GASKET WITH VULCANIZED CORNERS FOR ONE-PIECE GASKET. .135" THICK ACRYLIC WITH P12 INVERTED PRISMATIC PATTERN SEALED TO DOOR WITH RTV SILICONE. 92% WHITE REFLECTOR. PROVIDE WITH CIRCUITS FOR SEPARATE CONTROL OF WHITE & RED LIGHT. WET LOCATION. LISTING: ETL, IP66	KURTZON KLEAN LOCK ADVANCED SERIES KL-G-7-2X4-4ILED35-UNV-2/ED-RL1 TWO (2) INTEGRAL DRIVERS: 0-10v DIMMING FOR WHITE LIGHT AND SWITCHED FOR RED LIGHT	1	153w	LED: 3500K 80 CRI & RED LIGHT ARRAY DELIVERED LUMENS: 14,600 by LIGHTING MANUFACTURER	153	LUTRON : 30FC 100FC RED LIGHT	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS. WHITE LIGHT & RED LIGHT ARE SEPARATELY CONTROLLED AND SHOULD OPERATE AT THE SAME TIME. THERE ARE 2 LEVELS OF WHITE LIGHT AT 30FC AND 70FC.	ANIMAL HOLDING ROOMS
A2	RECESSED LED 1X4 CLEANROOM TROFFER NOMINAL HOUSING DIMENSIONS 12" W X 48" L X 4.5"H OF ALUMINUM HOUSING. DOOR FRAME OF 18 GA CRS WITH CLOSED CELL MICROCELLULAR EXTRUDED GASKET WITH VULCANIZED CORNERS FOR ONE-PIECE GASKET. .135" THICK ACRYLIC WITH P12 INVERTED PRISMATIC PATTERN SEALED TO DOOR WITH RTV SILICONE. 92% WHITE REFLECTOR. WET LOCATION. LISTING: ETL, IP66	KURTZON KLEAN LOCK ADVANCED SERIES KL-G-7-1X4-2ILED35-UNV INTEGRAL DRIVER: 0-10v DIMMING	1	76w	LED: 3500K 80 CRI DELIVERED LUMENS: 6,568 by LIGHTING MANUFACTURER	76	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS.	IMAGING 1 & 2
A3	RECESSED LED 1X4 CLEANROOM TROFFER WITH RED-LIGHT NOMINAL HOUSING DIMENSIONS 12" W X 48" L X 4.5"H OF ALUMINUM HOUSING. DOOR FRAME OF 18 GA CRS WITH CLOSED CELL MICROCELLULAR EXTRUDED GASKET WITH VULCANIZED CORNERS FOR ONE-PIECE GASKET. .135" THICK ACRYLIC WITH P12 INVERTED PRISMATIC PATTERN SEALED TO DOOR WITH RTV SILICONE. 92% WHITE REFLECTOR. PROVIDE WITH CIRCUITS FOR SEPARATE CONTROL OF WHITE & RED LIGHT. WET LOCATION. LISTING: ETL, IP66	KURTZON KLEAN LOCK ADVANCED SERIES KL-G-7-1X4-2ILED35-UNV-2/ED-RL1 TWO (2) INTEGRAL DRIVERS: 0-10v DIMMING FOR WHITE LIGHT AND SWITCHED FOR RED LIGHT	1	76w	LED: 3500K 80 CRI & RED LIGHT ARRAY DELIVERED LUMENS: 6,568 by LIGHTING MANUFACTURER	76	LUTRON 30FC 70FC RED LIGHT	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS. WHITE LIGHT & RED LIGHT ARE SEPARATELY CONTROLLED AND SHOULD OPERATE AT THE SAME TIME. THERE ARE 2 LEVELS OF WHITE LIGHT AT 30FC AND 70FC.	TEST (SOUTH OF CORRIDOR)
A4	RECESSED LED 2X2 CLEANROOM TROFFER NOMINAL HOUSING DIMENSIONS 24" W X 24" L X 4.5"H OF ALUMINUM HOUSING. DOOR FRAME OF 18 GA CRS WITH CLOSED CELL MICROCELLULAR EXTRUDED GASKET WITH VULCANIZED CORNERS FOR ONE-PIECE GASKET. .135" THICK ACRYLIC WITH P12 INVERTED PRISMATIC PATTERN SEALED TO DOOR WITH RTV SILICONE. 92% WHITE REFLECTOR. WET LOCATION. LISTING: ETL, IP66	KURTZON KLEAN LOCK ADVANCED SERIES KL-G-7-2X2-3ILED35-UNV INTEGRAL DRIVER: 0-10v DIMMING	1	63w	LED: 3500K 80 CRI DELIVERED LUMENS: 5,302 by LIGHTING MANUFACTURER	63	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS.	VESTIBULE, LAB CORRIDOR, CHEMICAL STORAGE, JANITOR CLOSET
A5	RECESSED LED 2X2 CLEANROOM TROFFER NOMINAL HOUSING DIMENSIONS 24" W X 24" L X 4.5"H OF ALUMINUM HOUSING. DOOR FRAME OF 18 GA CRS WITH CLOSED CELL MICROCELLULAR EXTRUDED GASKET WITH VULCANIZED CORNERS FOR ONE-PIECE GASKET. .135" THICK ACRYLIC WITH P12 INVERTED PRISMATIC PATTERN SEALED TO DOOR WITH RTV SILICONE. 92% WHITE REFLECTOR. WET LOCATION. LISTING: ETL, IP66	KURTZON KLEAN LOCK ADVANCED SERIES KL-G-7-2X2-2ILED35-UNV INTEGRAL DRIVER: 0-10v DIMMING	1	78w	LED: 3500K 80 CRI DELIVERED LUMENS: 5,598 by LIGHTING MANUFACTURER	78	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS.	CAGE WASH CLEAN & SOILED, FOOD/BED POST DEC ROOM.

A6	RECESSED LED 2X2 CLEANROOM TROFFER WITH RED-LIGHT NOMINAL HOUSING DIMENSIONS 24" W X 24" L X 4.5" H OF ALUMINUM HOUSING. DOOR FRAME OF 18 GA CRS WITH CLOSED CELL MICROCELLULAR EXTRUDED GASKET WITH VULCANIZED CORNERS FOR ONE-PIECE GASKET. .135" THICK ACRYLIC WITH P12 INVERTED PRISMATIC PATTERN SEALED TO DOOR WITH RTV SILICONE. 92% WHITE REFLECTOR. PROVIDE WITH CIRCUITS FOR SEPARATE CONTROL OF WHITE & RED LIGHT. WET LOCATION. LISTING: ETL, IP66	KURTZON KLEAN LOCK ADVANCED SERIES KL-G-7-2X2-3/LEDH35-UNV-2/ED-RL1 TWO (2) INTEGRAL DRIVERS: 0-10V DIMMING FOR WHITE LIGHT AND SWITCHED FOR RED LIGHT	1	117w	LED 3500K 80 CRI DELIVERED LUMENS: 8,585 by LIGHTING MANUFACTURER	117	LUTRON: 30FC 70FC RED LIGHT	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS. WHITE LIGHT & RED LIGHT ARE SEPARATELY CONTROLLED AND SHOULD OPERATE AT THE SAME TIME. THERE ARE 2 LEVELS OF WHITE LIGHT AT 30FC AND 70FC.	TEST (NORTH OF CORRIDOR), BSL HOLDING, IMAGING CORRIDOR
A7	NOT USED									
A8	RECESSED LED 2X4 CLEAN ROOM TROFFER NOMINAL HOUSING DIMENSIONS 23.68" W X 48" L X 3.25" H OF EXTRUDED ALUMINUM INJECTED MOLDED END PLATES. OPTICAL GRADE ACRYLIC LENS. VISCOELASTIC ACRYLIC POLYMER LENS GASKET. LISTING: NSF2, IP66, cULus-1598	COOPER LIGHTING FAIL-SAFE EN-W-24-4-LD2-45-3500K-ENC-CA08-UNV-EDC1 INTEGRAL DRIVER: NON-DIM, 1 CIRCUIT	1	47W	LED: 3500K 85 CRI DELIVERED LUMENS: 4504	47	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS.	STORAGE
A9	RECESSED LED 2X2 CLEANROOM TROFFER NOMINAL HOUSING DIMENSIONS 24" W X 24" L X 4.5" H OF ALUMINUM HOUSING. DOOR FRAME OF 18 GA CRS WITH CLOSED CELL MICROCELLULAR EXTRUDED GASKET WITH VULCANIZED CORNERS FOR ONE-PIECE GASKET. .135" THICK ACRYLIC WITH P12 INVERTED PRISMATIC PATTERN SEALED TO DOOR WITH RTV SILICONE. 92% WHITE REFLECTOR. WET LOCATION. LISTING: ETL, IP66	KURTZON KLEAN LOCK ADVANCED SERIES KL-G-7-2X2-3/LEDH35-UNV INTEGRAL DRIVER: 0-10V DIMMING	1	117w	by LIGHTING MANUFACTURER	117	LUTRON BSL HOUSING 30FC 90FC REDLIGHT	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS.	AIR-LOCK, CONTROL, SPRAY DOWN, CORR PRE-DECON, FOOD/BED POST DEC, VESTIBULE,
A10	RECESSED LED 1X1 DARK ROOM DOWNLIGHT NOMINAL HOUSING DIMENSIONS 13.88" W X 13.88" L X 6" H OF ALUMINUM HOUSING. DOOR FRAME OF 20 GA 4B SATIN POLISHED STAINLESS STEEL WITH NEOPRENE GASKET TO HOUSING WITH CAPTIVE STEEL FASTENERS & INTEGRAL LIGHT TRAP TO CONTAIN STRAY LIGHT. .156" C73 PRISMATIC TEMPERED GLASS WITH CLOSED CELL NEOPRENE GASKET. REMOVABLE INTEGRAL 22 GA CRS PANEL WITH WHITE URETHANE POWDER COAT 88% REFLECTIVITY. WET LOCATION. LISTING: UL	KURTZON DARKROOM SAFELIGHT SERIES DS-F/G-4-1X1-LED3-120-660 INTEGRAL DRIVER: 0-10V DIMMING	1	7.5w	LED: RED AT 660 NM DELIVERED LUMENS: 420 by LIGHTING MANUFACTURER	7.5	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS.	IMAGING 1 & 2
A11	WALL MOUNT BACKLIT LED "IN USE" SIGN NOMINAL HOUSING DIMENSIONS 3.27" W X 14" L X 8.8" H OF HIGH IMPACT INJECTION MOLDED POLYCARBONATE WITH .120" INJECTION MOLDED CLEAR POLYCARBONATE WITH CONTINUOUS CLOSED CELL SILICONE GASKET TO HOUSING. LISTING: UL, WET	KENALL MILLENNIUM METREX SERIES METMSW-MW-R-1U-DT INTEGRAL DRIVER: NON-DIM	1	2.18w	LED: RED DELIVERED LUMENS: by LAMP MANUFACTURER	2.18		UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS.	IMAGING 1 & 2 ENTRIES AT CORRIDOR
A12	PENDANT MOUNTED 1X4 LED WRAP NOMINAL HOUSING DIMENSIONS 6.75" W X 48" L X 4.25" H. CONSTRUCTED OF CORROSION RESISTANT WHITE FIBERGLASS HOUSING, CONTINUOUS CLOSED CELL GASKET, RIBBED ACRYLIC DIFFUSER, TOGGLE LATCHES AND END PLUGS. RIBBED FROSTED 85/15 DR ACRYLIC DIFFUSER. WET LOCATION. LISTING: ETL, IP67	NULITE INT LED SERIES INT-4-50-L35-UNV-DIM-OS85 INTEGRAL DRIVER: 0-10V	1	52w	LED: 3500K 90 CRI DELIVERED LUMENS: 4979lm/ft. by LIGHTING MANUFACTURER	52	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS . PROVIDE ACCESSORIES AS REQUIRED FOR A COMPLETE INSTALLATION. NOTE, THIS FIXTURE REQUIRES COORDINATION AMONGST THE TRADES. PENDANT MOUNT FIXTURES AROUND OBSTRUCTIONS.	CAGE WASH CLEAN & SOILED.
A13	RECESSED LED PERIMETER WALL GRAZER NOMINAL HOUSING DIMENSIONS 6.75" W X LENGTH AS SHOWN X 8.5" H OF EXTRUDED ALUMINUM. PROVIDE WITH 3" REGRESSED LENS WITH ACRYLIC ASYMMETRIC WALL GRAZER LENS. LISTING: UL	PRUDENTIAL BIONIC WALL GRAZER SERIES BIO-PSTD-REG3-LED35-SO-LENGTHS AS SHOWN-TMW-AWW-D1G-WTW-SC-UNV-VERIFY-ND INTEGRAL DRIVER: NON-DIM	1	10w/ft.	LED: 3500K 84 CRI DELIVERED LUMENS: 625lm/ft. by LIGHTING MANUFACTURER	VERIFY	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS . PROVIDE ACCESSORIES AS REQUIRED FOR A COMPLETE INSTALLATION. NOTE, THIS FIXTURE REQUIRES COORDINATION AMONGST THE TRADES.	RECEPTION COPY/FAX

A14	RECESSED LED 4" DOWNLIGHT NOMINAL HOUSING DIMENSIONS 14" W X 48" L X 3.875" H OF 20 GA GALVANIZED STEEL. UPPER REFLECTOR IS HIGHLY SPECULAR ANODIZED ALUMINUM WITH INTEGRAL LENS TO SHIELD & DIFFUSE LEDS. LOWER REFLECTOR IS A COMPOUND PARABOLIC WITH 55-DEGREE CUTOFF OF ANODIZED ALUMINUM WITH SEMI-SPECULAR FINISH AND SOLITE LENS. LISTING: CSA, WET	ZUMTOBEL BASYS LED II SERIES BR4DLED2-N-14W-835-M5-D/BR4DLED2-N-M5-CS-N-SL INTEGRAL DRIVER: 0-10V	1	14w	LED: 3500K 85 CRI DELIVERED LUMENS: 1000lm by LIGHTING MANUFACTURER	14	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS . NEED TO MATCH EXISTING MANUFACTURER ON 4TH FLOOR RENOVATION	PUBLIC CIRCULATION, ELEVATOR LOBBY, PUBLIC TOILET
A15	RECESSED LED 2X4 TROFFER NOMINAL HOUSING DIMENSIONS 24" W X 48" L X 3.875" H OF 20 GA CRS STEEL. DIE FORMED CRS REFLECTOR. FULL LENS WITH MICROCONICAL STRUCTURES WITH 92% TRANSMISSION, 55-DEGREE CUTOFF. LISTING: UL	AXIS PLANO SERIES POLED-24-B2-4500-35-VL-W-UNV-D-1-VERIFY-DS# INTEGRAL DRIVER: 0-10V	1	45w	LED: 3500K 8 CRI DELIVERED LUMENS: 4500lm by LIGHTING MANUFACTURER	45	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS. NEED TO MATCH EXISTING MANUFACTURER ON 4TH FLOOR RENOVATION	PRIVATE OFFICES
A16	RECESSED LED 4" WALLWASHER NOMINAL HOUSING DIMENSIONS 14" W X 15.25" L X 5.375" H OF 20 GA GALVANIZED STEEL. UPPER REFLECTOR IS HIGHLY SPECULAR ANODIZED ALUMINUM WITH INTEGRAL LENS TO SHIELD & DIFFUSE LEDS. LOWER REFLECTOR IS A COMPOUND PARABOLIC WITH 55-DEGREE CUTOFF OF ANODIZED ALUMINUM WITH SEMI-SPECULAR FINISH AND SOLITE LENS. LISTING: CSA, WET	ZUMTOBEL BASYS LED II SERIES BR4WLED2-N-22W-835-D/BR4WLED2-N-M5-CS-N INTEGRAL DRIVER: 0-10V	1	22w	LED: 3500K 85 CRI DELIVERED LUMENS: 980lm by LIGHTING MANUFACTURER	22	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS. NEED TO MATCH EXISTING MANUFACTURER ON 4TH FLOOR RENOVATION	ELEVATOR LOBBY
A17	RECESSED LED 2X2 TROFFER NOMINAL HOUSING DIMENSIONS 24" W X 48" L X 3.875" H OF 20 GA CRS STEEL. DIE FORMED CRS REFLECTOR. FULL LENS WITH MICROCONICAL STRUCTURES WITH 92% TRANSMISSION, 55-DEGREE CUTOFF. LISTING: UL	AXIS PLANO SERIES POLED-22-B2-2500-35-VL-W-UNV-D-1-VERIFY INTEGRAL DRIVER: 0-10V	1	27w	LED: 3500K 8 CRI DELIVERED LUMENS: 2500lm by LIGHTING MANUFACTURER	27	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS. NEED TO MATCH EXISTING MANUFACTURER ON 4TH FLOOR RENOVATION	OFFICE CIRCULATION, OPEN OFFICE.
A18	SURFACE MOUNTED LINEAR COVE LED LINE VOLTAGE MODULAR STRIP. NOM.: 1'D. LENGTH AS PER PLAN. PROVIDED WITH GREY INJECTION MOLDED HOUSING AND POLYCARBONATE LENS. END TO END CONNECTORS AND INTEGRAL DRIVER LISTING: UL, CUL	PHILIPS CWL SERIES CWL271212-3W-27K-ACCESSORIES AS REQUIRED INTEGRAL DRIVER: ELV	1	3w/FT	LED: 2700K 8 CRI DELIVERED LUMENS: 38 by LIGHTING MANUFACTURER	VARIES		120	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS . CONTROL SYSTEM TO PROVIDE DALI COMPATIBLE MODULE.	ELEVATOR LOBBY
A19	RECESSED LED 6" DEAD FRONT SHOWERLIGHT NOMINAL HOUSING DIMENSIONS 13.19" W X 15.875" L X 7.625" H OF 16 GA GALVANIZED STEEL. IMPACT MODIFIED ACRYLIC REGRESSED LENS, NON-CONDUCTIVE. LISTING: CSA, IP65	GOTHAM EVO SERIES EVO-35/10-35-6-DFR INTEGRAL DRIVER: 0-10V	1	9.6w	LED: 3500K 85 CRI DELIVERED LUMENS: 1000lm by LIGHTING MANUFACTURER	9.6	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS .	SHOWER
A20	RECESSED LED 3" SLOT TROFFER NOMINAL HOUSING DIMENSIONS 3.41" W X 96" L X 4.75" H OF EXTRUDED ALUMINUM. WHITE POWDER COATED STEEL REFLECTOR. ONE-PIECE CONTINUOUS SPOTLESS ACRYLIC LENS. PROVIDE WITH 2-CIRCUITS, ONE FOR LINEAR AND ONE FOR MR16 LED ACCENTS. PROVIDE ONE MR16 LED ACCENT AT EITHER END OF 8FT RUN. LISTING: UL	AXIS BEAM 3SERIES BMRLD-B3-500-35-SO-RG-8-MR16LED/2EACH END-W-UNV-D-4-1+1MR-VERIFY-DS# TWO (2) INTEGRAL DRIVERS: 0-10V	1	5w/ft. and (2) 6w	LED: 3500K 85 CRI DELIVERED LUMENS: 1000lm by LIGHTING MANUFACTURER (2) 300lm MR16 LED	52	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS . PROVIDE WATTAGE RESTRICTION LABEL FOR MR16 LEDS AT LED WATTAGE MAX.	TRAINING ROOM
A21	SURFACE MOUNTED LED UNDERCABINET FIXTURE NOM.: 0.85" H X 3.3" W. LENGTH AS PER PLAN ON 6" INCREMENTS FOR CONTINUOUS RUNS. PROVIDED WITH ANODIZED ALUMINUM HOUSING, WHITE POWDER COAT FINISH, DIFFUSE LENS. INTEGRAL VACANCY /OCCUPANCY SENSOR, AND INTEGRAL DIMMER AND CONSTANT CURRENT DRIVER. LISTING: UL	BOCA FLASHER TASK SERIES TASK-M-3500K-120V-W-OCVS-120-LB-HW-46 INTEGRAL DRIVERS: 0-10V	1	7.5w/ft.	LED: 3500K 85 CRI DELIVERED LUMENS: 1000lm by LIGHTING MANUFACTURER (2) 300lm MR16 LED	30	INTEGRAL OCCUPANCY	120	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS . VERIFY RUN LENGTH WITH ARCHITECTURAL & MILLWORK DRAWINGS. 46" LENGTH ASSUMED BASED ON PLANS.	TRAINING ROOM

A22	SURFACE MOUNT LED WRAP NOMINAL HOUSING DIMENSIONS 2" W X 45" L X 4" H OF EXTRUDED ALUMINUM HOUSING & MACHINED ALUMINUM END CAPS. FROSTED EXTRUDED ALUMINUM LENS. LISTING: UL	BARTCO BSS210 SERIES BSS210-45-35-S-SM-SIN-OCC-FW INTEGRAL DRIVER: NON-DIM	1	5.5w/ft.	LED: 3500K 84 CRI DELIVERED LUMENS: 551 lm/ft. by LIGHTING MANUFACTURER	22	INTEGRAL OCCUPANCY	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS.	CYLINDER CLOSET
A23	RECESSED LED 1X4 TROFFER NOMINAL HOUSING DIMENSIONS 12" W X 48" L X 5.625" H OF HEAVY GAUGE STEEL HOUSING. DIE FORMED FLAT STEEL DOOR WITH #12 PATTERN PRISMATIC ACRYLIC LENS. LISTING: DLC	METALUX 14GR LED SERIES 14GR-604-20-F1-UNV-GL-L835-NONDIM-1 INTEGRAL DRIVER: NON-DIM, 1 CIRCUIT	1	20w	LED: 3500K 85 CRI DELIVERED LUMENS: 2,000 by LIGHTING MANUFACTURER	20	LUTRON	UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS.	STORAGE
X	INTERIOR LED EDGE LIT EXIT SIGN NOMINAL HOUSING DIMENSIONS 4.25" W X 13" L X 11.75" H OF EXTRUDED BRUSHED ALUMINUM WITH CLEAR EDGE LIT ACRYLIC PANELS. LISTING: UL	LITHONIA EDGR SERIES EDGR-VERIFY-1-VERIFY INTEGRAL DRIVER: NON-DIM	1	3.8w	LED: GREEN OR RED, TBD DELIVERED LUMENS: by LAMP MANUFACTURER	3.8		120	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS.	FOH
EX1	SURFACE MOUNT WIPE DOWN LED EXIT SIGN NOMINAL HOUSING DIMENSIONS 3.27" W X 14" L X 8.8" H OF HIGH IMPACT INJECTION MOLDED POLYCARBONATE WITH .120" INJECTION MOLDED CLEAR POLYCARBONATE WITH CONTINUOUS CLOSED CELL SILICONE GASKET TO HOUSING. LISTING: UL, IP64	KENALL MILLENIUM METREX SERIES METDU-MW-G-DT INTEGRAL DRIVER: NON-DIM	1	2.18w	LED: GREEN DELIVERED LUMENS: by LAMP MANUFACTURER	2.18		UNV	COORDINATE MOUNTING WITH ARCHITECTURAL DRAWINGS.	BOH

LIGHTING FIXTURE SCHEDULE GENERAL NOTE:

1 LAMPS AND DRIVER:

1.1 PROVIDE SUBMITTAL CUT SHEETS AND PERFORMANCE DATA FOR EACH SPECIFIC TYPE OF LAMP AND DRIVER.

1.2 DIMMING DRIVERS: ELECTRICAL CONTRACTOR TO VERIFY COMPATIBILITY WITH DIMMING SYSTEM.

1.3 BALLAST/DRIVER DIMENSIONS SHALL BE COORDINATED WITH DRIVER MANUFACTURER AND FIXTURE MANUFACTURER.

2.1 CONTINUOUS LINEAR LIGHTING: PROVIDE THE BEST COMBINATION OF 2FT AND 4FT LED STRIPS ONLY TO COMPLETE RUNS WITH MINIMAL SEAMS.

2.2 CONTINUOUS LINEAR LIGHTING: ELECTRICAL CONTRACTOR TO PROVIDE DRAWINGS TO MANUFACTURER.

2.3 ALL FINAL COLOR TRIMS FINISH TO BE APPROVED BY ARCHITECT.

3 COORDINATION

3.1 ELECTRICAL CONTRACTOR TO CONFIRM VOLTAGE.

3.2 ALL LIGHTING FIXTURES WITH REMOTE DRIVERS TO BE LOCATED IN A HIDDEN, ACCESSIBLE AND VENTILATED LOCATION, UNLESS OTHERWISE NOTED.

3.3 ELECTRICAL CONTRACTOR TO COORDINATE LOCATION OF VACANCY SENSORS ON AVAILABLE TILES, ARCHITECT TO APPROVE FINAL LOCATIONS.

3.4 ELECTRICAL CONTRACTOR TO COORDINATE WITH ARCHITECT LOCATION OF LIGHTING SWITCHES AND DIMMERS.

4 SPECIFICATION CUTS REFER TO LIGHTING FIXTURE CUT SHEETS IN SEPARATE DOCUMENT.

5 GENERAL NOTE:

LIGHT-TRANSMITTING PLASTIC PANELS AND LIGHT-DIFFUSER PANELS THAT ARE INSTALLED IN APPROVED ELECTRICAL LUMINAIRES SHALL COMPLY WITH THE REQUIREMENTS OF CHAPTER 8 FOR FLAME SPREAD AND SMOKE DEVELOPED INDEXES PER ASTM E84, SEE SECTION 2606.7.5. CONTRACTOR TO SUBMIT DETAILS DEMONSTRATING COMPLIANCE.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Lighting fixtures:
 - 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
 - 2. Install lamps in each luminaire.
- B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- C. Remote Mounting of Ballasts: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.
- D. Lead lengths to LED light engine/array not to exceed three feet (.9m).
- E. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
 - 1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
 - 2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
 - 4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- F. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
 - 4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.
- G. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.
- H. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

- I. Connect lighting fixtures to associated lighting control switches as indicated on the drawings. Provide all required control wiring and conduit.
- J. Low-Voltage Lighting Fixtures Transformers:
 - 1. For low voltage (12V or 24V) lighting fixtures, install and wire lighting fixture(s) associated step-down transformer(s) (277/24V/12V or 120V/24V/12V) per manufacturer's instructions and wiring diagrams.
 - 2. Locate lighting fixtures associated step-down transformers as close as possible to the lighting fixtures input.
 - 3. Transformers shall be located above a removable ceiling tile and shall be readily visible and accessible. Coordinate transformers exact locations with architect.
 - 4. Run minimum #10 wires on secondary side of transformers and associated lighting fixtures.
 - 5. Wire transformers per manufacturer's approved shop drawings and wiring diagrams.
 - 6. Refer to lighting fixture schedules and specifications on architectural drawings for lighting fixtures type, description, operating voltage and additional information.
 - 7. All low voltage lighting fixtures associated step-down transformers shall be furnished by the lighting fixture manufacturer.
 - 8. Each step-down transformer associated with one low voltage fixture or a group of low voltage fixtures shall be properly sized (kVA) by the lighting fixture manufacturer.
 - 9. Coordinate work with lighting fixtures vendor.

3.02 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260501 "Basic Electrical Materials and Methods"

3.03 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Verify that self-luminous exit signs are installed according to their listing and the requirements in NFPA 101.
- C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.04 STARTUP SERVICE

- A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage.

3.05 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
 - 1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION

SECTION 270500

COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Communications equipment coordination and installation
2. Grounding and bonding for communications systems
3. Hangers and supports for communications systems
4. Conduits and back boxes for communications systems
5. Cable trays for communications systems
6. Surface raceways for communications systems
7. Underground ducts and raceways for communications systems
8. Utility poles for communications systems
9. Vibration and seismic controls for communications systems
10. Identification for communications systems
11. Common communications installation requirements

1.2 RELATED DOCUMENTS

- A. Division 00 "Procurement & Contracting Requirements Group"
- B. Division 01 "General Requirements"
- C. Division 07 Section "Fire and Smoke Protection"
- D. Division 26 Section "Cable Trays for Electrical Systems"
- E. Division 26 Section "Identification for Electrical Systems"
- F. Division 26 Section "Grounding and Bonding for Electrical Systems"
- G. Division 26 Section "Hangers and Supports for Electrical Systems"
- H. Division 26 Section "Vibration and Seismic Controls for Electrical Systems"
- I. Division 26 Section "Overcurrent Protective Device Coordination Study"
- J. Division 26 Section "Raceway and Boxes for Electrical Systems"
- K. Division 27 Section "Communication Rooms Fittings"
- L. Division 27 Section "Communications Backbone Cabling"
- M. Division 27 Section "Communications Horizontal Cabling"

- N. Division 27 Section "Communications Connecting Cords, Devices and Adapters"
- A. Division 27 Section "Commissioning of Communications"

1.3 DEFINITIONS

- A. ANSI: American National Standards Institute
- B. ASTM: American Society for Testing and Materials
- C. ARC: Aluminum rigid conduit
- D. BICSI: Building Industry Consulting Service International.
- E. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- F. Coated RMC: PVC Coated Rigid Metallic Conduit
- G. cULus: Listed by Underwriters Laboratories based on both Canadian and US (United States) standards requirements.
- H. EIA: Electronic Industries Alliance
- I. EPDM: Ethylene-propylene-diene terpolymer rubber
- J. EMI: Electromagnetic Interference
- K. EMT: Electrical Metallic Tubing
- L. ENT: Electrical Non-metallic Tubing
- M. ER: Equipment Room
- N. GRC: Galvanized rigid steel conduit
- O. IMC: Intermediate metal conduit
- P. IDF: Intermediate Distribution Frame
- Q. LAN: Local Area Network
- R. LMC: Liquidtight Metal Conduit
- S. MDF: Main Distribution Frame
- T. NBR: Acrylonitrile-butadiene rubber
- U. RCDD: Registered Communications Distribution Designer
- V. RGS: Rigid Galvanized Steel

- W. TIA: Telecommunications Industry Association
- X. TR: Telecommunications Room
- Y. UTP: Unshielded Twisted Pairs

1.4 CODES, REGULATIONS, AND STANDARDS

- A. All equipment shall be equal to or exceed the minimum requirements of OSHA, NEMA, IEEE, ASME, ANSI, NEC and Underwriters Laboratories.
- B. The installation shall comply fully with all applicable local, county and state laws and ordinances, regulations and codes.
- C. Local electrical and building codes in New York may be more stringent than national codes, recommendations or practice. Follow the most restrictive code or recommendations.
- D. All products, services and materials provided and performed under the scope of this specification shall conform to the following codes and standards. Refer to the most recent version, update or addenda.
 - 1. ANSI X3T9.5 FDDI
 - 2. ANSI X3T9.5 CDDI
 - 3. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual - latest edition
 - 4. Building Industry Consulting Service International (BICSI) Information Transport Systems Installation Manual (ITSIM) – latest edition
 - 5. ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard
 - 6. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard
 - 7. ANSI/TIA-569, Commercial Building Standards for Telecommunications Pathways and Spaces
 - 8. ANSI/TIA-606-B, Administration Standard for Commercial Telecommunications Infrastructure
 - 9. ANSI/TIA-607-B, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
 - 10. ANSI/TIA-942, Telecommunications Infrastructure for Data Centers
 - 11. ANSI/TIA/EIA-455-57-B, FOTP-57, Preparation and Examination of Optical Fiber End Face for Testing Purposes
 - 12. ANSI/TIA-455-78-B FOTP-78, Measurement Methods and Test Procedures – Attenuation
 - 13. ANSI/TIA-455-95-A FOTP-95, Absolute Optical Power Testing for Optical Fiber and Cables
 - 14. ANSI/TIA-455-133-A FOTP-133, Measurement Methods and Test Procedures – Length Measurement
 - 15. ANSI/TIA-492AAAC-A, Detail specification for 850 nm Laser-Optimized, 50- μ m Core Diameter/125- μ m Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers
 - 16. ANSI/TIA-492CAAB, Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak

17. ANSI/TIA-526-7, OFSTP-7, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
18. ANSI/TIA-526-14-A, OFSTP-14 Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant
19. EIA RS-232 Serial Communications Electrical Interface
20. EIA RS-310-C Racks, Panels and Associated Equipment
21. FCC Part 15
22. FCC Part 68
23. IEEE 802.12, 100Base-TX Ethernet
24. IEEE 802.3ab, 1000Base-T Ethernet Specification
25. IEEE 802.11, Wireless Ethernet Specifications, including 802.11a, 802.11b, 802.11g and 802.11n.
26. NEC Article 770, Optical Fiber Cables
27. NEC Article 800, Communications Circuits
28. NFPA 70, National Electrical Code
29. NFPA 75, Protection of Electronic Computer / Data Processing Equipment

1.5 SUBMITTALS

A. General Procedures

1. All submittals shall comply with the requirements of Division 01.

B. List of Submittals:

1. Pre-Construction Submittals:
 - a. Qualifications and Certificates
 - b. Product Data for every product installed
 - c. Manufacturer quality assurance tests and source quality control reports
 - d. Shop drawings
 - e. Samples
 - f. Pull-schedules
 - g. Manufacturer warranty registration for the structured cabling system.
2. During Construction:
 - a. Coordination drawings
 - b. System labeling schedules
 - c. Labeling samples
 - d. Pull-schedules
 - e. Field quality control report/test results
3. Post Construction:
 - a. Record (as-built) drawings
 - b. Cable administration drawings and printouts
 - c. Pull-schedules
 - d. Test results
 - e. Maintenance data
 - f. Manuals
 - g. Warranties and certifications

- C. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- D. Samples: provide product samples for cables, outlets, connectors, labels, patch cords. Samples shall include standard finishes and color options. For large equipment, such as racks and cabinets, provide standard finishes and color options only.
- E. Pull-schedules:
 - 1. For all backbone and horizontal cables to be installed.
 - 2. Horizontal cables pull schedules shall include, at least, the following fields:
 - a. Sequential line number
 - b. Room name and number
 - c. Outlet ID
 - d. Jack ID
 - e. Cable ID
 - f. TR/IDF
 - g. Rack ID
 - h. Patch panel and port ID
 - i. Cable type
 - j. Comments
 - 3. Backbone cables pull schedules shall include, at least, the following fields:
 - a. Sequential line number
 - b. Cable ID
 - c. Strand/pair
 - d. Cable type
 - e. Origination room (TR/IDF)
 - f. Rack ID
 - g. Termination panel and port ID
 - h. Ending room (TR/IDF)
 - i. Rack ID
 - j. Termination panel and port ID
 - k. Cable type
 - l. Comments
- F. Shop Drawings:
 - 1. For communications equipment room fittings.
 - a. Include plans, elevations, sections, details, and attachments to other work.
 - b. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - c. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
 - d. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

2. For backbone and horizontal distribution
 - a. Include plans showing outlet locations
 - b. Show backbone and horizontal pathways and cable routing
 - c. Wiring diagrams to show typical wiring schematics including the following:
 - 1) Cross-connects.
 - 2) Patch panels.
 - 3) Patch cords.
 - d. Cabling pathways and routes to include:
 - 1) Pathways to include cable tray (or other wireway) route to scale, relationship to structural electrical and mechanical elements.
 - 2) Clearances and access above and to the side.
 - 3) Vertical elevations above floor or bottom of ceiling structure.
 - 4) Vertical and horizontal offsets and transitions
 - 5) Load calculations showing compliance with the maximum live and still load rating.
3. Labeling scheme and samples

G. As-Built Drawings:

1. Must document all changes that occurred during the installation.
2. Shall include routes of all backbone pathways, backbone cables and station cable trunks (main routes).
3. The Contractor shall produce, and keep up-to-date, a complete record as-built set of prints (black-line bonds) which shall be corrected, and marked-up to show every change from the original Specifications and Contract Drawings through final acceptance. This set of drawings shall be protected against soiling, tears, and similar damage and defacement. This set shall be kept on the job site and shall be used only as a record set. (This shall not be construed as authorization for the Contractor to make changes in the Work without proper approvals.)
4. Upon completion of the work and before final payment, the Contractor shall produce and submit a final set of record drawings by updating the AutoCAD files of the construction set of drawings (to be provided by the Director's Representative) with the information from the as-built set. The submittal shall include the original record set of black-bonds and the electronic files of the as-built drawings in both AutoCAD format and PDF format.
5. At the conclusion of this project, two sets of black-line bond and two copies of the drawing files on Windows based media, formatted for use by AutoCad 2013 (or later version), of all the drawings specifically prepared for this Contract, shall be provided. The drawings shall be instrument drawn and shall contain all changes shown in the record set. Sepia line drawings on paper are not acceptable.

H. Test Results

1. Test results shall show compliance with the testing requirements for the specific cabling system.
2. Provide test results for 100% of the backbone and station cables installed.
3. Provide test results in the format(s) requested.

I. Warranties

1. Provide a minimum 1 year warranty on the physical installation.
2. Provide and extended (Minimum 20 year) manufacturer warranty for the complete end-to-end structured cabling system for all the systems components, including the horizontal and backbone distribution.
3. Provide warranties within 30 business days after project was completed.

J. Qualifications

1. Installer Qualifications:
 - a. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
 - b. Cabling Installer must have personnel certified by BICSI on staff.
 - c. Cabling installer must be Certified Installer for the cabling system provided.
2. Seismic Qualification Certificates: For equipment frames from manufacturer.
 - a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - b. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
 - c. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

K. Definition of Acceptance

1. The Director's Representative acceptance of the installation will be based upon satisfactory performance during a thirty (30) day period of beneficial use beginning after all of the other acceptance requirements listed below have been satisfied in full by the Director's Representative.
2. Acceptance of the installation will be reasonably and good faith determined by the Director's Representative. Partial use of the installation prior to completion will not be considered as contributing in part or in whole to the thirty day period. Problems discovered during the thirty (30) day period covered under the responsibilities of the Vendor must be fixed at no cost to the State.
3. Acceptance will not be given, and no final payments will be made, until all problems have been fixed to the satisfaction of the Director's Representative. Acceptance does not absolve the Contractor from any of its obligations under warranties and guarantees.
4. The other acceptance criteria are the following:
 - a. All tests have been passed and all required test results have been submitted by the Contractor in appropriate format and have been accepted without dispute by the Director's Representative.
 - b. All required documentation has been submitted by Contractor.
 - c. All required labeling has been completed.

- d. All work has been completed as required by the specifications, including all cable runs and pathways in their permanent places, and all cabinets, racks and cable pathways (i.e. ladder, tray, etc.) secured.
 - e. All Punch List items have been completed.
 - f. The Contractor has obtained the warranty for the installation.
 - g. The Contractor has submitted written notification that the installation is completed and that all specification requirements have been met.
5. Upon satisfactory completion of acceptance requirements by the Contractor, and after satisfactory performance during the thirty (30) day period, and correction of any defects found, the Director's Representative will notify the Contractor in writing of its acceptance of the installation..

1.6 QUALITY ASSURANCE

- A. All products shall be installed new, best of their respective kinds, free from defects, listed by Underwriter's Laboratories for the intended use, and bearing their label.
- B. All products shall be provided as specified, without exception, unless approved in writing prior to the bid.
- C. Non-compliant products installed as a part of this Contract shall be removed and replaced and all costs for removal and replacement shall be borne solely by the Contractor(s).
- D. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of RCDD.
- E. Installation Supervision: Installation shall be under the direct supervision of a Registered Technician or Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
- F. Field Inspector: Currently registered by BICSI as RCDD to perform the on-site inspection.
- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- H. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- I. Grounding: Comply with ANSI-J-STD-607-A.
- J. Seismic Performance Requirements:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation earthquake motions determined according to SEI/ASCE 7.
 - 2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and work above ceilings is complete.
- B. Where required by local code, trade harmony shall be observed by using only approved union based installation workforce. Coordinate with the Director's Representative.

1.8 COORDINATION

- A. Coordinate layout and installation of communications equipment with facilities LAN equipment and telecommunications service suppliers.
- B. Meet jointly with Director's Representative to exchange information and agree on details of equipment arrangements and installation interfaces.
- C. Record agreements reached in meetings and distribute them to other participants.
- D. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.
- E. Coordinate layout and installation of communications pathways with the other trades. Survey the facility to locate conduits, sleeves and other pathways provided by others.
- F. Coordinate furniture mounted components with the furniture vendor.
- G. Coordinate cable routing in the ceiling with the other trades.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and work above ceilings is complete.
- B. Where required by local code, trade harmony shall be observed by using only approved union based installation workforce. Coordinate with the Director's Representative.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.
- C. Telecommunications Main Grounding Bus Bar

1. The TMGB must be a predrilled copper bus bar with holes for use with standard-sized lugs, have a minimum dimensions of 6.3 mm (0.25 in) thick by 101 mm (4 in) wide, and variable length. It must be listed by an NRTL.
2. Hole patterns on the bus bars shall accommodate two-hole lugs per the recommendation of BICSI and ANSI-J-STD-607-A standards.
3. Insulators shall electrically isolate bus bars from the wall, or other mounting surfaces, thereby controlling the current path.
4. Provide required stainless steel hardware to fasten the two-hole ground lugs to the bus bar.
5. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

D. Telecommunications Grounding Bus Bar

1. The TGB must be a predrilled copper bus bar with holes for use with standard-sized lugs, have a minimum dimensions of 6.3 mm (0.25 in) thick by 51 mm (2 in) wide, and variable length. It must be listed by an NRTL.
2. Hole patterns on the bus bars shall accommodate two-hole lugs per the recommendation of BICSI and ANSI-J-STD-607-A standards.
3. Insulators shall electrically isolate bus bars from the wall, or other mounting surfaces, thereby controlling the current path.
4. Provide required stainless steel hardware to fasten the two-hole ground lugs to the bus bar.

E. Bonding Accessories

1. Two Mounting Hole Ground Terminal Block
 - a. Ground terminal block shall be made of electroplated tin aluminum extrusion.
 - b. Ground terminal block shall accept conductors ranging from #14 AWG through 2/0.
 - c. The conductors shall be held in place by two stainless steel set screws.
 - d. Ground terminal block shall have two 1/4" (6.4 mm) holes spaced on 5/8" (15.8 mm) centers to allow secure two-bolt attachment to the rack or cabinet.
 - e. Ground terminal block shall be UL Listed as a wire connector.
2. Compression Lugs
 - a. Compression lugs shall be manufactured from electroplated tinned copper.
 - b. Compression lugs shall have two holes spaced on 5/8" (15.8 mm) or 1" (25.4 mm) centers, as stated below, to allow secure two bolt connections to busbars.
 - c. Compression lugs shall be sized to fit a specific size conductor, sizes #6 to 4/0, as stated below.
 - d. Compression lugs shall be UL Listed as wire connectors.
3. Antioxidant Joint Compound
 - a. Oxide inhibiting joint compound for copper-to-copper, aluminum-to-aluminum or aluminum-to-copper connections.
 - b. Equipment Ground Jumper Kit

- c. Kit includes one 24"L insulated ground jumper with a straight two hole compression lug on one end and an L-shaped two hole compression lug on the other end, two plated installation screws, an abrasive pad and a .5 ounce tube of antioxidant joint compound.
 - d. Ground conductor is an insulated green/yellow stripe #6 AWG wire
 - e. Lugs are made from electroplated tinned copper and have two mounting holes spaced .5" to .625" apart that accept 1/4" screws.
 - f. Jumper will be made with UL Listed components
4. Accessory Products:
- a. Provide any accessory products related to the copper connectors required to provide a complete and functional infrastructure system.

2.2 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

- A. Cable Support: NRTL labeled.
- B. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
- C. Cable hangers and non-continuous supports shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.
- D. Shall have various attachment options for: wall, ceiling, joist, beam, flange, raised floor pedestal and others type of mounting.
- E. Support brackets with cable tie slots for fastening cable ties to brackets.
- F. Lacing bars, spools, J-hooks, and D-rings, straps and other devices.
- G. Cable straps (ties) shall be reusable Velcro-style with hook and loop or d-ring, available in various colors and sizes. Plenum rated straps shall be used in plenum spaces.
- H. Innerduct shall be used to install the optical fiber cables when not in conduit. Shall be flexible non-metallic conduit for use in plenum and riser rated spaces. Can be continuous or split duct. Plenum rated innerduct shall be used in all plenum spaces. Use riser rated in the vertical riser and any other non-plenum spaces. Provide 1" or 1 - 1/4" to fit the cables that need to be installed in it.
- I. Non-continuous supports
 - 1. Erico Caddy Cat Links, CAT16HP, CAT32HP, CAT48HP, CAT64HP
 - 2. Erico Caddy CableCat, CAT12, CAT21, CAT32, CAT64, CAT21SS, CAT32SS, CAT64SS
 - 3. Or approved equivalent
- J. Adjustable non-continuous supports
 - 1. Erico Caddy CableCat, CAT425
 - 2. Or approved equivalent

- K. Multi-tiered non-continuous supports
 - 1. Erico Caddy CableCat, CATHBA
 - 2. Or approved equivalent

- L. Innerduct
 - 1. Carlon, Pyramid
 - 2. Or approved equivalent

2.3 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

- A. Conduits and Backboxes:
 - 1. Provide where indicated on drawings or as required.
 - 2. Conduit and boxes sizes as shown on the communications drawings.
 - 3. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Flexible metal conduit shall not be used unless specifically noted.

2.4 SLEEVE SEALS AND FIRESTOPPING FOR COMMUNICATIONS PATHWAYS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
- B. Comply with requirements in Division 07 Section "Penetration Firestopping".
- C. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- D. Comply with BICSI TDMM, "Firestopping Systems" Article.
- E. Sealing Elements: Interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
- F. Pressure Plates: Stainless steel. Include two for each sealing element.
- G. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.
- H. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - 1. Advance Products & Systems, Inc.
 - 2. Calpico, Inc.
 - 3. Metraflex Co.
 - 4. Pipeline Seal and Insulator, Inc.
 - 5. Hilti
 - 6. Approved equal

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 VIBRATION AND SEISMIC CONTROLS FOR COMMUNICATIONS SYSTEMS

- A. Communications systems components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. The term "withstand" means "the unit will remain in place without separation from any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event".
- C. Communications equipment shall be seismically rated and braced according to IBC 1621.

2.7 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

- A. Comply with requirements of TIA/EIA-606-A and UL969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements of Division 26 Section "Identification for Electrical Systems".
- C. The identification for the communications systems shall meet all the requirements of a Class 3 facility as defined by ANSI/TIA/EIA 606-A, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
- D. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- E. Identify all the components of the communications systems.
- F. For fire-resistant plywood, do not paint over manufacturer's label.
- G. All labels shall be preprinted or computer-printed type.
- H. Type, format, wording, printing, and placement of labels shall be coordinated with facilities' existing administration plan. Items and/or issues not addressed in facilities' established administration plan shall be addressed in accordance with TIA/EIA 606-A Standard (e.g. cable tray, conduits, junction boxes, grounding systems, etc).
- I. Labeling System
 - 1. PC-based software, WINDOWS compatible, capable of supporting alpha numeric characters and Windows True Type Fonts.
 - 2. Compatible with laser printers.
 - 3. Label sizes supported:
 - 4. Minimum: 0.8" W x 0.2" H.

5. Maximum: 3.0" W x 12.0" H

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

- A. Complete work according to the agreed upon schedule. Cooperate in coordinating your activities with other planned and ongoing work at the site in a manner that facilitates meeting the schedule. This includes coordination with the various trades in determining work schedules and in resolving physical installation issues.
- B. All materials, cables, components, and all aspects of the installation must meet all local, state, and federal laws, as well as applicable code and regulatory requirements. They must also meet the requirements of any other entity legally empowered to set standards or codes governing composition and use in this installation, as well as any rules specific to the site. Code and regulatory requirements must prevail if there are any conflicts with requirements stated or implied in this specification and its companion documents. Where there is uncertainty in determining precedence, or what specific code or regulatory requirements apply, an Authority Having Jurisdiction (AHJ) over the issue in question will decide.
- C. The Director's Representative reserves the right to require the Contractor to remove from the project any employee that it deems careless, problematic, or is identified by competent authority as not conforming to required safety codes, regulations, or standards, or is cited for performing or acting in an objectionable manner, thus affecting the safety or productivity of others.
- D. Take all necessary safety and health precautions and warnings required by codes and regulations to protect the project, its workers, the public, and the property of others. Applicable OSHA regulations or AHJ directives must be followed. The Contractor is responsible for ensuring that any subcontractors it uses comply with these requirements.
- E. If subcontractors are used, the Contractor must integrate their performance into the overall project. The Contractor must be responsible for the performance of all subcontractors it uses, ensuring that they meet the objectives of the project.
- F. Accept responsibility for all damages to persons or property that occurs as a result of its fault or negligence, or those of its subcontractors.
- G. Designate a Project Manager to act as the technical and managerial interface between the Contractor and the Client and its representatives.
- H. At the request of the Client or its representatives, the contractor must participate in meetings covering technical, installation, and management issues.
- I. Contractor must perform all work required under this specification in a skillful and professional manner in accordance with standards and practices documented and/or accepted by industry, such as the ANSI/TIA/EIA, NECA standards and codes and the BICSI TDMM manuals. The Contractor's technicians must be familiar with the proper

assembly and installation of all components they are working with, and must follow manufacturer's specific installation requirements.

- J. Maintain its installation and storage areas free from an accumulation of waste material and rubbish, and dispose of them in a manner acceptable to the Client, building management and the General Contractor/Construction Manager.
- K. Contractor must at its sole cost and expense, provide all tools needed to perform its required work. Upon completion of the project, all tools, equipment, and materials not designated as belonging to the Client must be removed by the Contractor. After completion, the work areas must be left in a clean and unobstructed condition.
- L. Contractor must be responsible for the security of all its installation materials, whether purchased by, or supplied to the Contractor, as well as tools and ancillary components and documents.
- M. Order all components in a timely manner so that installation dates are not compromised. Materials must either be on hand, or available on short notice, so that the installation may be expedited if required, or if the opportunity to do so presents itself.
- N. Obtain all necessary permits.
- O. Provide all materials, and the necessary labor and services required to ensure all components of the system are completely installed in accordance with the intent of the Contract Documents.
- P. Ensure that if excess materials are ordered for the project they are kept in their original condition and packaging for restocking.
- Q. Compliance by the contractor with the provisions of this specification does not relieve him of the responsibilities of furnishing materials, equipment and systems of proper design, mechanically and electrically suited to meet operating guarantees at the specified service conditions.
- R. Notify the Director's Representative and design team in writing within 1 business day about the discovery of, but not limited to, the following:
 - 1. Problematic or missing pathways
 - 2. Field conflicts
 - 3. Work by other trades that is impeding the telecommunications installation resulting in a possible schedule, cost or quality impact
 - 4. Unsafe working conditions
 - 5. Materials with problematic lead times
 - 6. Media exceeding length limitations as defined by the governing standards for that media and its application
 - 7. Live systems put at risk by the installations activities
 - 8. Access required to live rooms
- S. All materials shall be installed as per the manufacturers' instructions, unless noted otherwise.

- T. Comply with NECA 1.
- U. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- V. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- W. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- X. Right of Way: Give to piping systems installed at a required slope.
- Y. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- Z. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.2 STAFFING

- A. Craft personnel shall be certified personnel qualified to perform the work and be knowledgeable of the following activities.
 - 1. Color coding of standard American telephone/ data telecommunications cables.
 - 2. Bonding and grounding of shields.
 - 3. Testing conductors for transmission impairments.
 - 4. Testing conductor insulation.
 - 5. Installation and termination of optical fiber cabling.
 - 6. Testing and verification of optical fiber transmission characteristics with a power meter.
 - 7. Telephone and Data Industry Cable Installation Standards and Manufacturer's Instructions will be used for in-process quality control and final acceptance of the work installation.
 - 8. Cable tray and ladder rack installation.
- B. Craft personnel will be required to provide and use the proper tools and test equipment in the performance of each activity. The tools must be in good working order, and the test equipment must have current calibration certificates, as applicable. The Director's Representative reserves the right to review the tool and test equipment lists and maintenance procedures of the contractor.
- C. Use of Site – Refer to the Division 01 Requirements.
- D. Follow manufacturer's instructions for installing, connecting, and adjusting all telecommunications riser and horizontal cabling and associated supporting, termination and splicing equipment, conduits, poke-throughs, and ladder rack. Provide a copy of such instructions at the equipment during any work on the equipment.

- E. Keep all items protected before and after installation. Provide protection for exposed cables roughed onto the floor prior to their installation into the furniture systems. Clean up and remove all debris.
- F. If products and materials are specified herein for a specific item or system, use those products or materials. If products and materials are not listed, use first-class products and materials, subject to acceptance of shop drawings.
- G. Examine and compare the telecommunications cabling drawings and specifications with the drawings and specifications of other trades; report any discrepancies between them to the IT Project Manager; and obtain from him written instructions for changes necessary in the work.
- H. The locations of structural and architectural features, existing sleeves, floor slots, termination and cross connect fields, panels, racks and other equipment indicated on the drawings are approximate. The contractor shall verify the existence, locations, and suitability of all such items, and shall present, with bid response, required modifications to contract documents necessary to complete this work.

3.3 SPECIAL CONDITIONS

- A. Furnish, install, terminate and test all horizontal, riser and outlet cabling for all floors shown in the attached and associated drawings and described below.
 - 1. The contractor shall route all copper and fiber cabling, unless otherwise identified, via hung ceilings, cable tray, ladder rack, conduits, raised floors, poke-throughs, and furniture systems unless otherwise noted. Contractor shall install all overhead station cable in such a manner that the selected route does not in any way compromise ceiling integrity. Cables that are routed in open ceiling areas must be neatly tie wrapped and suspended with the appropriate hangers and shall not be allowed to rest on ducts, pipes and conduits. At no time will cable be supported from hung ceilings or ceiling support wires. All overhead cabling must be neatly bundled and secured as close as possible to the overhead slab to avoid conflict with or EMI from flexible electrical conduits, motors, etc.
 - 2. Core drilling and the installation of aftersets, grommets access slots, sleeves, conduits, fire rated poke-throughs, and raceways required to route copper and fiber optic cabling will be furnished and installed by parties as indicated by contract documents. Where pathways furnished by others are not sufficient for the routing of cabling, this condition shall be brought to the attention of the Construction Manager and the IT Project Manager, in writing, by this contractor.
 - 3. As indicated, cabling shall run to workstation and other outlets through cavities in the drywall and openings in sheet metal or wooden studs within the drywall construction. The sheet metal studs will not be gasketed for this purpose, it shall be the contractor's responsibility to exercise extreme care in snaking cable through these areas to avoid damage to the cable jacketing.
 - 4. Information Outlet faceplates for all boxes will be furnished and installed by this contractor.
 - 5. All cabling shall be installed at least: 12" from high voltage lighting and fluorescent fixtures unless within a metal enclosure 72" from transformers and motors.

3.4 SERVICE CONTINUITY

- A. Maintain continuity of communications services to all functioning portions of the telecommunications systems throughout the installation.
- B. If a temporary outage of a live system is required that outage must be scheduled as far in advance as possible to allow the Director's Representative enough time to prepare and accommodate. Should this notice not be given in advance the Contractor will be required to perform the work outside of standard business hours at their own cost.

3.5 GROUNDING AND BOUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- C. Comply with ANSI-J-STD-607-A.
- D. Locate grounding bus bar to minimize the length of bonding conductors. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.
- E. Bonding to all non-active (non-current carrying) metal support structures, rack, runway etc. within each Telecommunication Room or Space. Coordinate this bonding with the supplier and installer of rack, runway etc.
- F. The TMGB/TGB is to provide a single point ground reference within the room and IS NOT TO BE USED AS AN AC EQUIPMENT GROUND.
- G. All cabling used to bond grounds are to be tagged with labels with the point of origin i.e. going to/coming from, with printed labels.

PATHWAYS INSTALLATION FOR COMMUNICATIONS SYSTEMS (HANGERS AND SUPPORTS, CONDUITS AND BACKBOXES, CABLE TRAYS AND RACEWAYS)

- H. Comply with NECA 1
- I. Cable Trays: Comply with NEMA VE 2, TIA/EIA-569-A and manufacturer's installation procedures.
- J. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- K. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- L. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- M. All metal cable trays, metal cable raceways, or other metallic pathways must be grounded. Joined sections must preserve ground continuity.

- N. Install cable tray systems as shown in construction drawings. The locations shown may need to be adjusted slightly in the field to assure proper placement.
- O. All cable tray sections shall be field cut to length as required with a minimum number of splice points. All field cuts shall be made using the manufacturers recommended equipment.
- P. Cable tray supports must be suited to the cable tray types they are employed with and loads they will carry. Manufacturer's recommendations on support spacing must be followed.
- Q. Cable trays and cable raceways shall be mounted at heights as called for in the construction documents. In areas where a minimum of 300 mm (12 in) access headroom is not available, the contractor shall notify the Director's Representative.
- R. The inside of cable trays shall be free of burrs, sharp edges or projections that can damage cable insulation. Abrasive supports (e.g., threaded rod) installed within the cable fill area shall have that portion within the tray protected with a smooth, non-scratching covering so that cable can be pulled without physical damage.
- S. Care shall be taken to ensure that access to other building components (e.g., air conditioning ducts) is not restricted by cable pathways.
- T. Cable trays shall not be used as walkways, ladders, or equipment supports.
- U. Cable management and support hardware must be UL listed for use in the environments in which they will be employed.
- V. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
- W. Install cable trays to route cables if conduits cannot be located in these positions.
- X. Secure conduits to backboard when entering room from overhead.
- Y. Extend conduits 3 inches above finished floor.
- Z. Provide metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- AA. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- BB. Pathway Installation in Communications Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
 - 2. Install cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard when entering room from overhead.

4. Extend conduits 3 inches (76 mm) above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.6 SLEEVES INSTALLATION FOR COMMUNICATIONS SYSTEMS

- A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 50 mm above finished floor level.
- G. Size pipe sleeves to provide 6.4-mm annular clear space between sleeve and pathway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."
- K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 25-mm annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 25-mm annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

- N. Provide sound proofing of all penetrations as required. Refer to architectural and electrical drawings for details.

3.7 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.8 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."
- B. Refer to Division 07 Section "Fire and Smoke Protection".
- C. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- D. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.9 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

- A. Identify ALL system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems." Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- B. See Evaluations for discussion of TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 3 level of administration including optional identification requirements of this standard.
- C. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- D. All permanent labels must be durable and legible and suited for long term use in the environments in which they will be located. Labels shall be preprinted or computer-printed type. Handwritten labels are unacceptable unless approved by the Director's Representative.
- E. Label all racks and cabinets as detailed in the construction drawings. Cabinet and rack labels must be large enough to be viewed from 15' away from the rack or cabinet. Cabinets and racks shall be labeled with professionally made signage.

F. Grounding and Bonding

1. All system components shall be labeled complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems".
2. Labels shall be located on conductors as close as practicable to their point of termination in a readable position. Labels shall be nonmetallic and include the information "IF THIS CONNECTOR OR CABLE IS LOOSE OR MUST BE REMOVED, PLEASE CALL THE BUILDING TELECOMMUNICATIONS MANAGER
3. Provide nonmetallic pre-printed labels, white background with black printing that can be permanently mounted to the busbar.
4. The bonding conductors for telecommunications, TBB conductor, and each grounding equalizer shall be green or marked with a distinctive green color.

G. Labeling scheme for all communications systems is subject to prior approval by the Director's Representative.

END OF SECTION

SECTION 270800

COMMISSIONING OF COMMUNICATIONS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Copper cable test device
 - 2. Optical fiber cable test device
 - 3. Cable Test Results
 - 4. As-built drawings
- B. Alternates: Not Applicable.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Sections include the following:
 - 1. 271500 – Communications Horizontal Cabling
 - 2. 271600 – Communications Connecting Cords, Devices and Adapters

1.3 SUMMARY

- A. Provides specifications for a certification tester used for end to end testing, certification, and documentation of all test results to confirm the installed connectivity system complies with industry standards and specific category and performance ratings.

1.4 RELATED DOCUMENTS

- A. Architectural, mechanical, electrical, and all technology drawings.

1.5 REFERENCES

- A. Codes and Regulations: (Note: Reference Division 01 for specific code versions governing the work in addition to the information noted below).
 - 1. Refer to Section 270500 – Common Work Results for Communications

PART 2 - PRODUCTS

2.1 COPPER CABLE TEST DEVICE

A. Manufacturer List:

1. Fluke Networks

B. Product Options: Select analyzer to comprehensively certify each category rated connection and record results verifying compliance with TIA/EIA performance specifications to meet the category rating of the system.

1. DTX Cable Analyzer, Model No. DTX-1800

C. Description:

1. Must meet or exceed TIA Level IV compliant network cable-testing device certification by an independent laboratory, such as Intertek, for verification of high speed, TIA/EIA T568 compliant cables.
2. Copper test equipment must be capable of certifying Category-3, Category-5e, and Category-6 UTP/ScTP links or channels independent of termination hardware configuration (RJ45 port or 110-style) for each level of performance.
3. Provide full 2-way Autotest of Category-3, 5e, and 6 twisted pair links.
4. All test equipment shall be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.

D. Accessory Products:

1. Interface Adapters
 - a. TIA Category-3, 5e and 6: 100 ohm
 - b. Category/Class E permanent link adapters for TIA Cat 3, 5e and 6 unshielded and shielded cables.

2.2 OPTICAL FIBER CABLE TEST DEVICE

A. Manufacturer List:

1. Fluke Networks

B. Product Options:

1. Select analyzer to comprehensively certify each optical fiber connection and record results verifying compliance with TIA/EIA performance standards and manufacturer specifications.
 - a. DTX Cable Analyzer, Model No. DTX-1800

C. Description:

1. The optical fiber source shall permit full end to end testing of Multimode, Single-mode and LOMMF optical fiber cabling fully compliant with industry standards and manufacturer recommendations.
 2. Available source types and wavelengths shall be as follows:
 - a. Multimode - 850nm LED and 1300nm LED.
 - b. Single-mode – 1310nm FP Laser and 1550nm FP Laser.
 - c. LOMMF – 850nm VCSEL and 1310nm FP Laser.
 3. The power meter shall be calibrated to read 850, 1300, 1310 and 1550nm wavelengths.
- D. Accessory Products:
1. Interface Adapters
 - a. DTX Fiber Module for Multimode cable @ 850 and 1300 nm – Model No. DTX-MFM2
 - b. DTX Fiber Module for Gigabit LOMMF cable @ 850 and 1310 nm – Model No. DTX-GFM2
 - c. DTX Fiber Module for Singlemode cable @ 1310 and 1500 nm – Model No. DTX-SFM2
 - d. Optical Fiber Mandrels.
 2. Fiber Microscope
 - a. Magnification of 200X or 400X for endface inspection
 - b. Optional requirements
 - i. Video camera systems are preferred.
 - ii. Camera probe tips that permit inspection through adapters are preferred.
 - iii. It is preferable to use test equipment capable of saving and reporting the endface image.
 - c. FiberInspector Mini Video Microscope – Model No. FT500.

PART 3 - EXECUTION

3.1 EXAMINATIONS

- A. Check actual site conditions prior to start of any work. Ensure all preceding trade work associated with the telecommunications system is accurate and complete before proceeding with installation or use of products specified in this section.
- B. Verify telecommunications cabling is installed and supported, terminated, mounted in an appropriate housing or terminated on the applicable component and labeled prior to certification testing and documentation.
- C. Verify certification tester universal interface adapters and manufacturer patch cords that enable permanent link verification are in new condition not indicating any twisting or kinking resulting from incorrect storage of the tester interface adapters.
- D. Optical fiber patch cords shall be inspected to ensure connector surfaces are clean and free of defects that may affect testing results.

3.2 COPPER CABLE TESTING GENERAL REQUIREMENTS

A. Process:

1. Certification test 100% of the installed cabling plant including all backbone and horizontal four (4) pair UTP/ or F/UTP copper connections.
2. Follow manufacturers' instructions and recommended industry standards and guidelines to complete all TIA/EIA testing procedures to verify performance levels.
3. Follow manufacturer requirements for self-calibration procedures.
4. Perform all tests required by local authorities in addition to tests specified herein.
5. Update tester software to show specific project information including but not limited to:
 - a. Date and time of testing
 - b. Project name
 - c. Field technicians name
 - d. Cable identification number
 - e. Cable manufacturer, type and part number

3.3 CATEGORY 6 COPPER CABLE TESTING REQUIREMENTS

A. General Requirements

1. Every cabling link in the installation shall be tested for:
 - a. Wire Map
 - b. Length
 - c. Insertion Loss
 - d. NEXT Loss
 - e. PS NEXT Loss
 - f. ACR-F Loss
 - g. PS ACR-F Loss
 - h. Return Loss
 - i. Propagation Delay
 - j. Delay Skew

in accordance with the field test specifications defined in ANSI/TIA-568-C.2 "Commercial Balanced Twisted-Pair Telecommunications Cabling and Components Standard". This document will be referred to as the "TIA Cat 6 Standard."

2. The installed twisted-pair horizontal links shall be tested from the IDF in the telecommunications room to the telecommunication wall outlet in the work area for compliance with the "*Permanent Link*" performance specification as defined in the Category 6 Standard.
3. One hundred percent of the installed cabling links must pass the requirements of the Category 6 Standard mentioned in A.1 above and as further detailed in Section B. Any failing link must be diagnosed and corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links

shall be provided in the test results documentation in accordance with Section C below.

4. Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. Appropriate training programs include but are not limited to installation certification programs provided by BICSI or the ACP (Association of Cabling Professionals).
5. The test equipment (tester) shall comply with the accuracy requirements for level III field testers as defined in ANSI/TIA-1152. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy *plus* adapter contribution) are specified in Table 3 of ANSI/TIA-1152 (Table 3 in this TIA document also specifies the accuracy requirements for the Channel configuration).
6. The RJ45 test plug shall fall within the values specified in ANSI/TIA-568-C Annex C for NEXT, FEXT and Return Loss.
7. The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.
8. The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy, preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. The contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.
9. The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests (detailed in Section 4.2.2 of ANSI/TIA-1152). Any Fail or Fail* result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass or Pass*.
10. A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks. To which extent '*' results shall determine approval or disapproval of the element under test shall be defined in the relevant detail specification, or agreed on as a part of a contractual specification.
11. A representative of the end-user shall be invited to witness field testing. The representative shall be notified of the start date of the testing phase five business days before testing commences.
12. A representative of the end-user has the right (at their discretion) to select a random sample of 5% of the installed links. The representative (or his authorized delegate) shall test these randomly selected links and the results are to be stored in accordance with the prescriptions in Section C.1. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the end-user representative shall repeat 100% testing and the cost shall be borne by the installation contractor.

B. Performance Test Parameters

The test parameters for Cat 6 are defined in the TIA Cat 6 standard. The test of each link shall contain all of the following parameters as detailed below. In order to pass the test, all measurements (at each frequency in the range from 1 MHz through 250 MHz) must meet or exceed the limit value determined in the above-mentioned standard.

1. Wire Map - Shall report “Pass” if the wiring of each wire-pair from end to end is determined to be correct. The Wire Map results shall include the continuity of the shield connection if present.
2. Length - The field tester shall be capable of measuring length of all pairs of a basic link or channel based on the propagation delay measurement and the average value for NVP⁽¹⁾. The physical length of the link shall be calculated using the pair with the shortest electrical delay. This length figure shall be reported and shall be used for making the Pass/Fail decision. The Pass/Fail criteria are based on the maximum length allowed for the Permanent Link configuration (90 meters – 295 feet) plus 10% to allow for the variation and uncertainty of NVP.
3. Insertion Loss (Attenuation) - Insertion Loss is a measure of signal loss in the permanent link or channel. The term “Attenuation” has been used to designate “Insertion Loss”. Insertion Loss shall be tested from 1 MHz through 250 MHz in maximum step size of 1 MHz. It is preferred to measure insertion loss at the same frequency intervals as NEXT Loss in order to provide a more accurate calculation of the Attenuation-to-Crosstalk ratio (ACR) parameter. Minimum test results documentation (summary results): Identify the worst wire pair (1 of 4 possible). The test results for the worst wire pair must show the highest attenuation value measured (worst case), the frequency at which this worst case value occurs, and the test limit value at this frequency.
4. NEXT Loss - Pair-to-pair near-end crosstalk loss (abbreviated as NEXT Loss) shall be tested for each wire pair combination from each end of the link (a total of 12 pair combinations). This parameter is to be measured from 1 through 250 MHz. NEXT Loss measures the crosstalk disturbance on a wire pair at the end from which the disturbance signal is transmitted (near-end) on the disturbing pair. The maximum step size for NEXT Loss measurements shall not exceed the maximum step size defined in the standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst case NEXT margin⁽²⁾ and the wire pair combination that exhibits the worst value of NEXT (worst case). NEXT is to be measured from each end of the link-under-test. These wire pair combinations must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.

Table 1 -- Maximum frequency step size as defined in ANSI/TIA-1152

Frequency Range (MHz)	Maximum Step size (MHz)
1 – 31.25	0.15
31.26 – 100	0.25
100 – 250	0.50

5. PS NEXT Loss - Power Sum NEXT Loss shall be evaluated and reported for each wire pair from both ends of the link under-test (a total of eight results). PS NEXT Loss captures the combined near-end crosstalk effect (statistical) on a wire pair when all other pairs actively transmit signals. Like NEXT this test parameter must be evaluated from 1 through 250 MHz and the step size may not exceed the maximum step size defined in the standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for PS NEXT. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
6. ACR-F, pair-to-pair - Attenuation Crosstalk Ratio Far-end is calculated from the pair-to-pair FEXT Loss. It shall be measured for each wire-pair combination from both ends of the link under-test. FEXT Loss measures the crosstalk disturbance on a wire pair at the opposite end (far-end) from which the transmitter emits the disturbing signal on the disturbing pair. FEXT is measured to compute ACR-F Loss that must be evaluated and reported in the test results. ACR-F measures the relative strength of the far-end crosstalk disturbance relative to the attenuated signal that arrives at the end of the link. This test yields 24 wire pair combinations. ACR-F is to be measured from 1 through 250 MHz and the maximum step size for FEXT Loss measurements shall not exceed the maximum step size defined in the standard as in Table 1. Minimum test results documentation (summary results): Identify the wire pair combination that exhibits the worst-case margin and the wire pair combination that exhibits the worst value for ACR-F. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
7. PS ACR-F Loss - Power Sum Attenuation Crosstalk Ratio Far-end is a calculated parameter that combines the effect of the FEXT disturbance from three wire pairs on the fourth one. This test yields eight wire-pair combinations. Each wire-pair is evaluated from 1 through 250 MHz in frequency increments that do not exceed the maximum step size defined in the standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst pair combinations must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
8. Return Loss - Return Loss (RL) measures the total energy reflected on each wire pair. Return Loss is to be measured from both ends of the link-under-test for each wire pair. This parameter is also to be measured from 1 through 250 MHz in frequency increments that do not exceed the maximum step size defined in the standard as shown in Table 1. Minimum test results documentation (summary results): Identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for Return Loss. These wire pairs must be identified for the tests performed from each end. Each reported case should include the frequency at which it occurs as well as the test limit value at this frequency.
9. Propagation Delay - Propagation delay is the time required for the signal to travel from one of the link to the other. This measurement is to be performed for each of the four wire pairs. Minimum test results documentation (summary results): Identify the wire pair with the worst-case propagation delay. The report shall include the propagation delay value measured as well as the test limit value.

10. Delay Skew (as defined in the TIA Cat 6 Standard; Section 6.2.19) - This parameter shows the difference in propagation delay between the four wire pairs. The pair with the shortest propagation delay is the reference pair with a delay skew value of zero. Minimum test results documentation (summary results): Identify the wire pair with the worst-case propagation delay (the longest propagation delay). The report shall include the delay skew value measured as well as the test limit value.

C. Test Result Documentation

1. The test results/measurements shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered, i.e., “as saved in the tester” at the end of each test and that these results cannot be modified at a later time.
2. The database for the completed job shall be stored and delivered on CD-ROM or DVD including the software tools required to view, inspect, and print any selection of test reports.
3. A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information
 - a. The identification of the link in accordance with the naming convention defined in the overall system documentation
 - b. The overall Pass/Fail evaluation of the link-under-test including the NEXT Headroom (overall worst case) number
 - c. The date and time the test results were saved in the memory of the tester.
4. General Information to be provided in the electronic database with the test results information for each link:
 - a. The identification of the customer site as specified by the end-user
 - b. The identification of the link in accordance with the naming convention defined in the overall system documentation
 - c. The overall Pass/Fail evaluation of the link-under-test
 - d. The name of the test limit selected to execute the stored test results
 - e. The cable type and the value of NVP used for length calculations
 - f. The date and time the test results were saved in the memory of the tester
 - g. The brand name, model and serial number of the tester
 - h. The identification of the tester interface
 - i. The revision of the tester software and the revision of the test standards database in the tester
 - j. The test results information must contain information on each of the required test parameters that are listed in Section B and as further detailed below under paragraph C5.
5. The detailed test results data to be provided in the electronic database for must contain the following information:

For each of the frequency-dependent test parameters, the value measured at every frequency during the test is stored. The PC-resident database program must be able to process the stored results to display and print a color graph of the measured parameters. The PC-resident software must also provide a summary numeric format in which some

critical information is provided numerically as defined by the summary results (minimum numeric test results documentation) as outlined above for each of the test parameters.

- a. Length: Identify the wire-pair with the shortest electrical length, the value of the length rounded to the nearest 0.1 m (1) and the test limit value
- b. Propagation delay: Identify the pair with the shortest propagation delay, the value measured in nanoseconds (ns) and the test limit value
- c. Delay Skew: Identify the pair with the largest value for delay skew, the value calculated in nanoseconds (ns) and the test limit value
- d. Insertion Loss (Attenuation): Minimum test results documentation as explained in Section B for the worst pair
- e. Return Loss: Minimum test results documentation as explained in Section B for the worst pair as measured from each end of the link
- f. NEXT, ACR-F: Minimum test results documentation as explained in Section B for the worst pair combination as measured from each end of the link
- g. PS NEXT and PS ACR-F: Minimum test results documentation as explained in Section B for the worst pair as measured from each end of the link

⁽¹⁾: Nominal Velocity of Propagation (NVP) expresses the speed of the electrical signals along the cabling link in relation to the speed of light in vacuum (3×10^8 m/second). Insulation characteristics and twist rate of the wire pair influence NVP in minor ways. Typically, an 'average' value for NVP is published for all four wire-pairs in a data cable.

⁽²⁾: 'Margin' designates the difference between the measured value and the corresponding test limit value. For passing links, 'worst case margin' identifies the smallest margin over the entire frequency range; the point at which the measured performance is "closest" to the test limit.

3.4 FIBER OPTIC CABLE TESTING REQUIREMENTS

A. GENERAL

1. All tests performed on optical fiber cabling that use a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.
2. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work.

B. OPTICAL FIBER CABLE TESTING

1. Field-test instruments shall have the latest software and firmware installed.
2. Link and channel test results from the OLTs shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.
3. Fiber endfaces shall be inspected at 200X or 400X magnification. 200X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers. Scratched, pitted or dirty connectors shall be diagnosed and corrected.
 - a. It is preferable that the endface images be recorded in the memory of the test instrument for subsequent uploading to a PC and reporting.

4. Testing shall be performed on each cabling segment (connector to connector).
5. Testing shall be performed on each cabling channel (equipment to equipment) that is planned for use per the Director's Representative instructions.
6. Testing of the cabling shall be performed using high-quality test cords of the same fiber type as the cabling under test. The test cords for OLTS testing shall be between 1 m and 5 m in length.
7. Optical loss testing
 - a. Backbone link
 - iv. Multimode backbone links shall be tested at 850 nm and 1300 nm in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper or the equivalent method.
 - v. Singlemode backbone links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1, One Reference Jumper or the equivalent method.
 - vi. Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.
 - vii. Use the One Reference Jumper Method specified by ANSI/TIA/EIA-526-14A, Method B and ANSI/TIA/EIA-526-7, Method A.1 or the equivalent method. The user shall follow the procedures established by these standards or application notes to accurately conduct performance testing.
8. Magnified Endface Inspection
 - a. Fibers shall be inspected at 250X or 400X magnification. 250X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers.
9. Length Measurement
 - a. The length of each fiber shall be recorded.
 - b. It is preferable that the optical length be measured using an OLTS.
10. Polarity Testing
 - a. Paired duplex fibers in multi-fiber cables shall be tested to verify polarity in accordance with Clause E.5.3 of ANSI/TIA 568 C.0. The polarity of the paired duplex fibers shall be verified using an OLTS.

C. ADMINISTRATION

1. Test results documentation
 - a. Test results saved within the field-test instrument shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of the test records. These test records shall be uploaded to the PC unaltered, i.e., "as saved in the field-test instrument". The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.
 - b. The test results documentation shall be available for inspection by the Director's Representative during the installation period and shall be passed to the Director's Representative within 5 working days of completion of

- tests on cabling served by a telecommunications room or of backbone cabling. The installer shall retain a copy to aid preparation of as built information.
- c. The database for the complete project, including twisted-pair copper cabling links, if applicable, shall be stored and delivered on CD-ROM prior to the Director's Representative acceptance of the building. This CD-ROM shall include the software tools required to view, inspect, and print any selection of the test reports.
 - d. Circuit IDs reported by the test instrument should match the specified label ID.
 - e. The detailed test results documentation data is to be provided in an electronic database for each tested optical fiber and shall contain the following information
 - viii. The identification of the customer site as specified by the end-user
 - ix. The name of the test limit selected to execute the stored test results
 - x. The name of the personnel performing the test
 - xi. The date and time the test results were saved in the memory of the tester
 - xii. The manufacturer, model and serial number of the field-test instrument
 - xiii. The version of the test software and the version of the test limit database held within the test instrument
 - xiv. The fiber identification number
 - xv. The length for each optical fiber (Optionally the index of refraction used for length calculation when using a length capable OLTS)
 - xvi. Test results to include OLTS attenuation link and channel measurements at the appropriate wavelength(s) and the margin (difference between the measured attenuation and the test limit value).
 - xvii. The overall Pass/Fail evaluation of the link-under-test for OLTS measurements
 - xviii. A picture or image of each fiber end-face and a pass/fail status of the end-face based upon visual inspection.

3.5 ACCEPTANCE OF TEST RESULTS

- A. Unless otherwise specified by the Director's Representative, each cabling link shall be in compliance with the following test limits:
 - 1. Optical loss testing
 - a. Multimode and Singlemode links
 - xix. The link attenuation shall be calculated by the following formulas as specified in ANSI/TIA-568-C.0.
 - a) $\text{Link_Attn (dB)} = \text{Cable_Attn (dB)} + \text{Connector_Attn (dB)} + \text{Splice_Attn (dB)}$
 - b) $\text{Cable_Attn (dB)} = \text{Attenuation_Coefficient (dB/km)} * \text{Length (Km)}$
 - c) $\text{Connector_Attn (dB)} = \text{number_of_connector_pairs} * \text{connector_loss (dB)}$
 - d) $\text{Maximum allowable connector_loss} = 0.75 \text{ dB}$

- e) $\text{Splice_Attn (dB)} = \text{number_of_splices} * \text{splice_loss (dB)}$
- f) Maximum allowable splice_loss = 0.3 dB
- g) The values for the Attenuation_Coefficient (dB/km) are listed in the table below:

Type of Optical Fiber	Wavelength (nm)	Attenuation coefficient (dB/km)	Wavelength (nm)	Attenuation coefficient (dB/km)
Multimode 62.5/125 μm	850	3.5	1300	1.5
Multimode 50/125 μm	850	3.5	1300	1.5
Single-mode (Inside plant)	1310	1.0	1550	1.0
Single-mode (Outside plant)	1310	0.5	1550	0.5

2. Magnified endface inspection

- a. Fiber connections shall be visually inspected for endface quality.
 - b. Scratched, pitted or dirty connectors shall be diagnosed and corrected.
- B. All installed cabling links and channels shall be field-tested and pass the test requirements and analysis as described in Section 3.4. Any link or channel that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link or channel meets performance requirements. The final and passing result of the tests for all links and channels shall be provided in the test results documentation in accordance with Section 3.4.
- C. Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with Contract Documents and to the satisfaction of the Director's Representative.

Note: High Bandwidth applications such as 1000BASE-SX, 10GBASE-S, and FC1200 impose stringent channel loss limits. Where practical, certification should consider loss length limits that meet maximum channel (transmitter to receiver) loss.

Performance specification for MM fiber at 850 nm

Fiber Type		Bandwidth	1000BASE-SX		10GBASE-SR		FibreChannel 1200-MX-SN-I	
	μm	(MHz• Km)	Length (m)	Loss (dB)	Length (m)	Loss (dB)	Length (m)	Loss (dB)
OM1	62.5	200	275	2.38	33	2.5	33	2.4
OM2	50	500	550	3.56	82	2.3	82	2.2
OM3	50	2000	1000	3.56	300	2.6	300	2.6

3.6 REPAIR

- A. Any connections failing to meet referenced standards or more stringent performance requirements stated above, must be removed and replaced with connections that prove, in additional testing, to meet or exceed the performance standards set forth.

3.7 RE-INSTALLATION

- A. No additional burden to the state regarding costs, network down-time and/or end user interruption shall result from the re-installation of specified components. Scheduling for re-installation work shall be coordinated, in writing, with the Director's Representative prior to beginning the work.

3.8 CLOSEOUT ACTIVITIES

- A. Contractor to submit all test results and any test documentation required prior to acceptance by the Director's Representative.
- B. Record copy and as-built drawings
- C. Provide record copy drawings periodically through out the project as requested by the Director's Representative, and at end of the project on CD-ROM. Record copy drawings at the end of the project shall be in CAD format and include notations reflecting the as built conditions of any additions to or variation from the drawings provided such as, but not limited to cable paths and termination point. CAD drawings are to incorporate test data imported from the test instruments.
- D. The as-built drawings shall include, but are not limited to block diagrams, frame and cable labeling, cable termination points, equipment room layouts and frame installation details. The as-builts shall include all field changes made up to construction completion:
 - 1. Field directed changes to pull schedule.
 - 2. Field directed changes to cross connect and patching schedule.
 - 3. Horizontal cable routing changes.
 - 4. Backbone cable routing or location changes.
 - 5. Associated detail drawings.

END OF SECTION

SECTION 271100

COMMUNICATIONS EQUIPMENT ROOMS FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes the components that shall comprise the Communications Equipment Room Fittings and practices to be used when installing them.
- B. Section Includes:
 - 1. Communications cabinets, racks and enclosures.
 - 2. Cable management for rack and wall mounted equipment.
 - 3. Cable tray/Ladder rack.
 - 4. Backboards.
 - 5. Entrance Facilities.
 - 6. Grounding.
 - 7. Installation (rack and stack) of network equipment furnished by others.

1.2 RELATED DOCUMENTS

- A. Division 00 "Procurement & Contracting Requirements Group"
- B. Division 01 "General Requirements"
- C. Division 07 Section "Fire and Smoke Protection"
- D. Division 26 Section "Cable Trays for Electrical Systems"
- E. Division 26 Section "Identification for Electrical Systems"
- F. Division 26 Section "Grounding and Bonding for Electrical Systems"
- G. Division 26 Section "Hangers and Supports for Electrical Systems"
- H. Division 26 Section "Vibration and Seismic Controls for Electrical Systems"
- I. Division 26 Section "Overcurrent Protective Device Coordination Study"
- J. Division 27 Section "Common Work Results For Communications"
- K. Division 27 Section "Communications Horizontal Cabling"
- L. Division 27 Section "Communications Connecting Cords, Devices and Adapters"
- M. Division 27 Section "Commissioning of Communications"

1.3 DEFINITIONS

- A. Refer to Division 27 Section "Common Work Results for Communications".

1.4 SUBMITTALS

- A. Refer to Division 27 section "Common Work Results for Communications".

1.5 QUALITY ASSURANCE

- A. Refer to Division 27 section "Common Work Results for Communications".

1.6 PROJECT CONDITIONS

- A. Refer to Division 27 section "Common Work Results for Communications".

1.7 COORDINATION

- A. Refer to Division 27 section "Common Work Results for Communications".

PART 2 - PRODUCTS

2.1 CABLE TRAY

- A. All pathways for communications systems shall comply with TIA/EIA-569-A, BICSI Telecom Distribution Manual.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
- C. Comply with the requirements of Division 26 Sections "Cable Trays for Electrical Systems.
- D. Shall be identified as defined in NFPA 70 and marked for intended location and application.
- E. Source Limitations: Obtain cable trays and components from single manufacturer.
- F. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:
 - 1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
 - 2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
 - 3. Load and Safety Factors: Applicable to both side rails and rung capacities.
- G. Telco style cable runway
 - 1. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards.
 - 2. Straight sections shall be furnished in standard 10 foot long sections.
 - 3. Provide all fittings and accessories required to protect, support and install the cable tray system. Provided appropriate grounding equipment. Provide appropriate fittings and cable drop outs to maintain proper bend radius for cables in the cable tray and when leaving the tray.
 - 4. Cable tray sizes as shown on the floor plans.
 - 5. Chatsworth 11252-7XX, or approved equal.

2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm).
- B. A-C, exterior grade.
- C. Contractor shall cut plywood sheets as required to fit specific room dimensions.
- D. Comply with requirements for plywood backing panels specified in Division 06 Section "Carpentry."

2.3 EQUIPMENT RACKS AND CABINETS

- A. Cabinets
 - 1. Freestanding, modular steel or aluminum, 19-inch (480-mm) panel mounting adjustable rail with square holes.
 - 2. Dimensions: 30" W x 42" D x 84" H
 - 3. Vented front and rear doors. Split rear doors.
 - 4. Provide all required mounting hardware and accessories, including
 - 5. Vertical cable managers, two per cabinet
 - 6. PDU mounting frames, four per cabinet
 - 7. Vertically mounted PDU, two per cabinet. Exact input and output receptacles to be coordinated with electrical and Director's Representative at the time of installation.
 - 8. Provide cabinets for the IT Room, as shown on drawings.
 - 9. Provide APC AR3150.
 - 10. Provide sides at both the ends of the cabinet rows.
 - 11. Provide vertical cable managers, two per cabinet, APC AR7572.
- 12. Grounding:
 - a. Telecommunications equipment bonding conductors and hardware
 - 1) Make to length using #6 AWG copper conductor and two-hole conductor, long barrel with window lug, or pre-terminated kits.
 - 2) Provide one per rack and cabinet.
 - b. Rack/cabinet grounding kit with horizontal grounding strip to provide a common grounding point within the rack or cabinet
 - 1) Provide one per rack/cabinet
 - c. Equipment jumper
 - 1) Make to length or pre-terminated kit
 - 2) Provide one per rack/cabinet
 - d. Provide required stainless steel hardware to fasten the two-hole ground lugs to the bus bar.
 - e. Comply with ANSI-J-STD-607-A
 - f. Seismically rated and braced according to IBC 1621.
 - g. Provide and install all mounting components and accessories to securely fix frame to floor slab.

- h. Provide and install all mounting hardware and accessories necessary, including, but not limited to:
 - 1) Mounting brackets as required.
 - 2) Panel mounting screws and nuts.
 - 3) Comply with ANSI-J-STD-607-A.

B. Power Distribution Unit

- 1. Power distribution units (PDUs). Furnish and install PDUs per equipment rack/cabinet. Exact model to be coordinated with the Director's Representative at the time of installation.
- 2. All equipment racks in the Telecom Room shall include two (2) metered-by-outlet, switched and Ethernet-monitored/networked 6' H, vertical power strips as follows:
- 3. Corded input plug; minimum length of 15 feet
- 4. (21) C13 and (3) C19 receptacles.
- 5. Local power monitoring LED display.
- 6. Power and environmental monitoring via IP.
- 7. Surge protection integral to strip.
- 8. All vertical power strips shall be provided with rear facing stand-off (equipment racks) mounting brackets that are both offset one inch (1") to the side of the mounting rails so as not to interfere with the equipment mounted within the rack and provided with sufficient depth to allow access to the vertical and horizontal wire managers.
- 9. APC metered rack PDU, Part No. AP8965, or approved equivalent.

C. Cable Management

- 1. Cable ties used to support station cable bundles in the cable tray or other pathways above hung ceiling and to tie the cables entering the equipment racks.
 - a. Shall be Velcro type
- 2. Distribution Rings:
 - a. Split Ring style
 - b. Molded, fire-retardant material
 - c. Wall mounted
 - d. Nominal 2"D x 2 ½"W

2.4 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Refer to Section 270500 "Common Work Results for Communications".
- C. Telecommunications Main Grounding Bus Bar
 - 1. The TMGB must be a predrilled copper bus bar with holes for use with standard- sized lugs, have a minimum dimensions of 6.3 mm (0.25 in) thick by 101 mm (4 in) wide, and variable length. It must be listed by an NRTL.

2. Hole patterns on the bus bars shall accommodate two-hole lugs per the recommendation of BICSI and ANSI-J-STD-607-A standards.
3. Insulators shall electrically isolate bus bars from the wall, or other mounting surfaces, thereby controlling the current path.
4. Provide required stainless steel hardware to fasten the two-hole ground lugs to the bus bar.
5. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

D. Telecommunications Grounding Bus Bars:

1. The Telecommunications Grounding Bus Bars (TGBs) must be a predrilled copper busbar with holes for use with standard- sized lugs, have a minimum dimensions of 6.3 mm (0.25 in) thick by 51 mm (2 in) wide, and variable length. It must be listed by an NRTL
2. Hole patterns on the bus bars shall accommodate two-hole lugs per the recommendation of BICSI and ANSI-J-STD-607-A standards.

E. Insulators shall electrically isolate bus bars from the wall, or other mounting surfaces, thereby controlling the current path.

F. Provide required stainless steel hardware to fasten the two-hole ground lugs to the bus bar.

G. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

H. Comply with ANSI-J-STD-607-A.

2.5 LABELING

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Refer to Section 270500 "Common Work Results for Communications".

PART 3 - EXECUTION

3.1 INSTALLATION PRACTICES

A. All materials shall be installed as per the manufacturers' instructions, unless noted otherwise.

B. Comply with NECA 1.

C. Comply with BICSI TDMM for layout and installation of communications equipment rooms.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment with the facilities' telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Director's Representative to exchange information and agree on details of equipment arrangements and installation interfaces.
 2. Record agreements reached in meetings and distribute them to other participants.
 3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
 4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.
- F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.2 PATHWAYS/SUPPORTS

- A. Install cable tray systems as shown in construction drawings. The locations shown may need to be adjusted slightly in the field to assure proper placement.
- B. All cable tray sections shall be field cut to length as required with a minimum number of splice points. All field cuts shall be made using the manufacturers recommended equipment.
- C. Cable tray supports must be suited to the cable tray types they are employed with and loads they will carry. Manufacturer's recommendations on support spacing must be followed.
- D. Cable trays and cable raceways shall be mounted at heights as called for in the construction documents. In areas where a minimum of 300 mm (12 in) access headroom is not available, the contractor shall notify the Director's Representative.
- E. The inside of cable trays shall be free of burrs, sharp edges or projections that can damage cable insulation. Abrasive supports (e.g., threaded rod) installed within the cable fill area shall have that portion within the tray protected with a smooth, non-scratching covering so that cable can be pulled without physical damage.
- F. Care shall be taken to ensure that access to other building components (e.g., air conditioning ducts) is not restricted by cable pathways.
- G. Cable trays shall not be used as walkways, ladders, or equipment supports.
- H. Cable management and support hardware must be UL listed for use in the environments in which they will be employed.
- I. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
- J. Install cable trays to route cables if conduits cannot be located in these positions.
- K. Secure conduits to backboard when entering room from overhead.
- L. Extend conduits 3 inches above finished floor.
- M. Provide metal conduits with grounding bushings and connect with grounding conductor to grounding system.

- N. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.3 TELECOMMUNICATIONS BACKBOARDS

- A. Telecommunications backboards to be AC-rated plywood that is fire-retardant treated and 3/4 inches thick.
- B. Furnish and install telecommunication backboards on wall of communication equipment rooms as indicated in construction documents. Unless otherwise specified or field coordinated, the bottom of the backboards shall be placed approximately six inches above finished floor (AFF), and must extend to a minimum height of eight feet.
- C. Mount backboards such that the fire rating stamp is visible. If the plywood is painted, the fire rating stamp must not be covered.

3.4 RACKS AND CABINETS

- A. Racks shall be securely fastened in four corners to the MDF/IDF room's floor.
- B. Racks and cabinets shall be positioned according to drawings. The contractor shall field verify the dimensions of the room prior to installation of equipment and report any discrepancies to the Director's Representative.

3.5 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Refer to Section 270500 "Common Work Results for Communications".
- C. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- D. Comply with ANSI-J-STD-607-A.
- E. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar.
- F. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 FIRESTOPPING

- A. Refer to section 270500 "Common Work Results for Communications".
- B. Refer to Division 07 Section "Fire and Smoke Protection".
- C. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- D. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.7 IDENTIFICATION

- A. Refer to section 270500 "Common Work Results for Communications"
- B. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems." Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- C. See Division 27 Section "Common Work Results for Communications Systems" for additional identification requirements. See Evaluations for discussion of TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 3 level of administration including optional identification requirements of this standard.
- D. All permanent labels must be durable and legible and suited for long term use in the environments in which they will be located. Labels shall be preprinted or computer-printed type. Handwritten labels are unacceptable unless approved by the Director's Representative.
- E. Label all racks and cabinets as detailed in the construction drawings. Cabinet and rack labels must be large enough to be viewed from 15' away from the rack or cabinet. Cabinets and racks shall be labeled with professionally made signage. Signage is subject to prior approval by the Director's Representative.

END OF SECTION

SECTION 271500

COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes the components and practices to be used when installing horizontal cabling.
- B. Section Includes:
 - 1. Pathways for horizontal cables
 - 2. Horizontal copper cables
 - 3. Cable connecting hardware: connectors, patch panels, outlets
 - 4. Cabling identification products

1.2 RELATED DOCUMENTS

- A. Division 00 "Procurement & Contracting Requirements Group"
- B. Division 01 "General Requirements"
- C. Division 07 Section "Fire and Smoke Protection"
- D. Division 26 Section "Cable Trays for Electrical Systems"
- E. Division 26 Section "Identification for Electrical Systems"
- F. Division 26 Section "Grounding and Bonding for Electrical Systems"
- G. Division 26 Section "Hangers and Supports for Electrical Systems"
- H. Division 26 Section "Vibration and Seismic Controls for Electrical Systems"
- I. Division 26 Section "Overcurrent Protective Device Coordination Study"
- J. Division 26 Section "Raceway and Boxes for Electrical Systems"
- K. Division 27 Section "Common Work Results for Communications"
- L. Division 27 Section "Communication Rooms Fittings"
- M. Division 27 Section "Communications Connecting Cords, Devices and Adapters"
- N. Division 27 Section "Commissioning of Communications"

1.3 DEFINITIONS

- A. Refer to Division 27 Section "Common Work Results for Communications".

1.4 QUALITY ASSURANCE

- A. Refer to Division 27 section “Common Work Results for Communications”.

1.5 PROJECT CONDITIONS

- A. Refer to Division 27 section “Common Work Results for Communications”.

1.6 COORDINATION

- A. Refer to Division 27 section “Common Work Results for Communications”.

1.7 SUBMITTALS

- A. General Procedures
 - 1. All submittals shall comply with the requirements of Division 01.
- B. Refer to Division 27 Section “Common Work Results for Communications” for a submittals list and details.
- C. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles.
- D. Shop Drawings:
 - 1. Cabling administration drawings and printouts.
 - 2. System labeling schedules
 - 3. Pull-schedules
 - 4. Wiring diagrams to show typical wiring schematics including the following:
 - a. Cross-connects.
 - b. Patch panels.
 - c. Patch cords.
 - 5. Cross-connects and patch panels detail mounting assemblies; show elevations and physical relationship between the installed components.
 - 6. Cable tray (or other pathway) layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
 - a. Vertical and horizontal offsets and transitions.
 - b. Clearances for access above and to side of cable trays.
 - c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
 - d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.
- E. Qualifications
 - 1. Installer Qualifications:
 - e. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
 - f. Cabling Installer must have personnel certified by BICSI on staff.

- g. Cabling installer must be certified installer for the cabling system provided.
- F. Samples: For workstation outlets, jacks, jack assemblies, and faceplates for color selection and evaluation of technical features.
- G. Source quality-control reports.
- H. Field quality-control reports.
- I. Maintenance data.

1.8 QUALITY ASSURANCE

- A. Refer to Division 27 section "Common Work Results for Communications".

1.9 PROJECT CONDITIONS

- A. Refer to Division 27 section "Common Work Results for Communications".

1.10 COORDINATION

- A. Refer to Division 27 section "Common Work Results for Communications".

PART 2 - PRODUCTS

2.1 UNSHIELDED TWISTED PAIR (UTP) CABLE

- A. Manufacturer List:
 - 1. Siemon
- B. Product Options:
 - 1. The manufacturers noted above shall be the only manufacturers acceptable to the Director's Representative and A/E.
- C. Category 6, 100-ohm, 4-pair UTP cable, blue jacket.
- D. Mechanical and transmission shall meet or exceed:
 - 1. ICEA S-90-661 for mechanical properties.
 - 2. TIA/EIA-568-B.2 for performance specifications.
- E. Topology shall comply with the requirements of TIA/EIA-568-C.1
- F. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 - 1. Plenum Rated, Conductive: Type CMP complying with NFPA 262 for cable runs in plenum spaces.
 - 2. Siemon System 6 UTP cable.

2.2 UTP TERMINATION HARDWARE

- A. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- B. Coordinate colors with Director's Representative before ordering.
- C. Mechanical and transmission shall meet or exceed:
 - 1. ICEA S-90-661 for mechanical properties.
 - 2. TIA/EIA-568-B.2 for performance specifications.
- D. Connectors:
 - 1. 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular, Category 6. Color to match the faceplate.
 - a. Siemon angled module MX6-(XX), where XX represents color. Provide for all water proof/wash/down outlet locations.
 - b. Siemon MX6-F(XX), where XX represents color. Provide for all outlet locations that are not waterproof/wash/down.
- E. Patch Panel:
 - 1. 48-port high density angled patch panels, Category 6.
 - c. Siemon HD6-48A
- F. Color Coded Icons
 - 1. Voice, data and blank marking
 - 2. Coordinate colors and markings with Director's Representative before ordering.

2.3 WORK AREA OUTLETS

- A. Connectors:
 - 1. Category 6 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular.
 - 2. Mechanical and transmission shall meet or exceed:
 - a. ICEA S-90-661 for mechanical properties.
 - b. TIA/EIA-568-B.2 for performance specifications.
 - c. IP66/IP67 seal for the ruggedized connectors
 - 3. Part Numbers
 - d. Siemon MX6-F(XX) for MAX connectors, where XX represents color.
 - e. Siemon X6 for ruggedized connectors.
 - f. Provide ruggedized connectors in all wash-down spaces
- B. Faceplates
 - 1. Wall phone, two and four-port faceplates, furniture bezels and surface boxes for use with snap-in jacks accommodating any combination of UTP work area cords. Refer to detail drawings for configurations.

2. Metal Faceplate: Stainless steel, complying with requirements in Division 26 Section "Wiring Devices."

- a. Steel faceplate with phone studs, Leviton 4108W, or approved equal.

3. Plastic faceplate: High-impact plastic. Coordinate colors Architect and with Division 26 Section "Wiring Devices."

- b. Siemon MAX modular faceplates.

- c. For waterproof/wash-down outlet locations, the faceplate shall be mounted on back-box with hinged cover. Coordinated exact faceplate with electrical.

C. Blank Inserts

1. Provide blank inserts for all unused faceplate openings.

D. Color Coded Icons

1. Voice, data and blank marking
 2. Coordinate colors and markings with Director's Representative before ordering.

E. Factory labeled by silk-screening or engraving for stainless steel faceplates.

F. Machine printed, in the field, using adhesive-tape label.

G. Snap-in, clear-label covers and machine-printed paper inserts.

2.4 PATHWAYS

- A. Refer to Section 270500 "Common Work results for Communications".

2.5 GROUNDING AND BONDING

- A. Refer to Section 270500 "Common Work results for Communications".

2.6 IDENTIFICATION

- A. Refer to Section 270500 "Common Work results for Communications".

PART 3 - EXECUTION

3.1 GENERAL

- A. All materials shall be installed as per the manufacturers' instructions, unless noted otherwise.
- B. Comply with NECA 1.
- C. Comply with BICSI TDMM for installation and testing of communications horizontal cabling.
- D. All work shall be performed in a professional manner.

- E. Install cable after interior of building has been physically protected from the weather and as much mechanical work that is likely to damage cabling as possible has been completed without impacting the overall schedule.
- F. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters.
- G. Conceal raceways and cables except in unfinished spaces.
- H. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- I. Terminate conductors; no cable shall contain un-terminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
- J. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
- K. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
- L. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
- M. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
- N. In the communications equipment room, install a 10-foot- (3-m-) long service loop neatly coiled.
- O. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- P. All UTP cables, links, and their termination hardware must comply with the applicable specifications included in the most current versions of the ANSI/TIA 568-C.0, 568-C.1 and 568-B.2 standards and its relevant addenda (including 568-B.2-1 and 568-B.2-10), as well as their referenced and associated documents unless otherwise noted in this specification. Termination practices must follow manufacturers' guidelines and the requirements of these standards. Any discrepancies must be brought to the attention of the Director's Representative prior to termination for resolution.
- Q. Unless otherwise noted, optical fiber cables, links, and components must comply with ANSI/TIA 568-C.0, ANSI/TIA 568-C.1, and ANSI/TIA 568-C.3 requirements.
- R. Surface mounted communications outlet boxes must be securely fastened so that they will not come loose over time. Use of double backed adhesive tape or Velcro is not acceptable.

- S. All exposed cabling entering or exiting modular furniture and tables shall be protected with spiral wrap, flexible conduit or similar.
- T. All metallic communications cables must be listed and marked as per Article 800 of the NEC (NFPA 70, edition recognized by AHJ). All fiber optic cables must be listed and marked as per Article 770 of the NEC (NFPA 70, edition recognized by AHJ). Listings of cables employed on the project (e.g. CMP, CMR, OFNP, OFNR, etc.) must be in accordance with the requirements of this specification and its associated documents.
- U. In situations where there is a high density of cabling in racks, the Contractor must utilize techniques, and if necessary, provide additional support structures in addition to the specified racks and cable trays, to be sure that cable support, routing, and termination are properly performed
- V. Any cable damaged or exceeding recommended installation parameters during installation or testing shall be replaced by the contractor prior to final acceptance at no cost to the State.

3.2 HORIZONTAL CABLING INSTALLATION

- A. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-B.1.
 - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 - 3. Terminate all conductors; no cable shall contain un-terminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, racks, frames, and terminals.
 - 5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
 - 7. Install service loop on each end of cable, as required. Provide minimum 10-foot loop at the telecom room end and 10-foot loop at the outlet end (coiled in the ceiling above outlet location), unless cables exceed maximum length.
 - 8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- B. UTP Cable Installation
 - 1. Comply with TIA/EIA-568-B.2.
 - 2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.
 - 3. Cables shall be dressed and terminated in accordance with manufacturer's recommendations and best industry practices, such as those in the BICSI TDMM manuals and the NECA/BICSI 568-2006 standard.
 - 4. All 4 pair cables shall be terminated on the jack and patch panels using T568-B wiring scheme.
 - 5. For Category rated 4-pair UTP cables (i.e. recognized under the TIA 568-standards), pair untwist at the termination shall not exceed 12 mm (0.5 inch).

6. For Category rated 4-pair UTP cables (i.e. recognized under the TIA 568-standards), the cable jacket shall be maintained as close as possible to the termination point. Not more than 1.0" of cable jacket shall be removed.
7. Cables shall be neatly bundled and dressed to their respective patch panels or wiring blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame. Cable bundles must be neat, but should not be perfectly groomed to avoid potential "alien crosstalk" problems.
8. When terminating to patch panels, 4-pair cables must be routed from both sides of racks and cabinets to their termination points on a given patch panel, rather than being run to the panel from a single direction.
9. Cable minimum bend radius limit and maximum pulling tension limit shall not be violated. Bend radius limit for 4-pair UTP = 4 X Cable OD. Pulling tension on 4-pair UTP cables shall not exceed 25-lbf.
10. In office environments, UTP cable runs must provide for ten feet of slack above the ceiling at the telecom outlet end and fifteen feet in the Telecom Room unless otherwise specified or unless the total cable length exceeds 295 feet. Slack must be stored neatly and safely as appropriate to the location. Wherever practical, slack must be in an extended loop or in a figure eight shape rather than in a circular loop, and attention to bend radius must be taken into account.
11. Where possible, fiber cables and copper cables running in the same cable tray must be kept separated. In situations where they have to run together, or where they must cross each other, the fiber cables must be on top.
12. Suitable coverings must protect station jacks and faceplates until work is completed in the areas they are situated in. Locations with terminated jacks prior to installation in faceplates must have the jacks protected in a suitable covering and stored in a manner that minimizes the possibility of damage to the jacks as well as to the cables terminated on them.
13. Cables shall be dressed and terminated in accordance with manufacturer's recommendations and best industry practices, such as those in the BICSI TDMM manuals and the NECA/BICSI 568-2006 standard.
14. All 4 pair cables shall be terminated on the jack and patch panels using T568-B wiring scheme.
15. Cables shall be neatly bundled and dressed to their respective patch panels or wiring blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame. Cable bundles must be neat, but should not be perfectly groomed to avoid potential "alien crosstalk" problems.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Provide the following minimum separation distances between pathways for copper communications cables and power wiring.

- a. For branch circuits of 5 kVA or less, a minimum physical separation of (2.5 in) between the communications cabling and power cabling is required. When power or communications cable, or both, are in enclosed grounded metal pathway (i.e. conduit), if it is not possible to keep the minimum separation distance for certain segments of the pathways, then the separation for those segments may be less if approved by the Director's Representative prior to installation.
- b. Minimum separation from possible sources of electromagnetic interference exceeding 5kVA shall be as follows:

Condition	Minimum Separation
Unshielded power lines or electrical equipment in proximity to open or non-metal communications cabling pathways	24"
Unshielded power lines or electrical equipment in proximity to a grounded fully enclosed metal communications cabling pathway	12"
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded fully enclosed metal communications cabling pathway.	6"
Electrical motors or transformers	47"

3. A minimum clearance of 5" from fluorescent fixtures must be maintained.

3.3 OPTICAL FIBER CABLE INSTALLATION

- A. Install fiber optic cable so as not to violate cable minimum bend radius limits specified by the manufacturer under no load and under pulling tension. Where manufacturer limits are unknown, then the bend radius limit must be at least 10 times the cable outside diameter under no load and at least 20 times under pulling tensions up to the maximum specified in ANSI/TIA 568-C.0 for the cable type. The only exception will be for fiber cables with fewer than 4-strands intended for a "Cabling Subsystem 1" configuration per ANSI/TIA 568-C.0 and ANSI/TIA 568-C.3, where the no load radius must not be less than 1" and the radius under pulling tension must not be less than 2" up to the maximum tension specified. For non-circular cables, the minor axis of the cable must be used in determining the limit.
- B. At telecommunications outlets and at fiber patch panels, where individual fiber strands are broken out, manufacturer specified strand bend radius limits must not be violated. Where manufacturer limits are unknown, the bend radius shall not be less than one inch.
- C. Care must be exercised when handling fiber optic cable. Pulling tension must not exceed the limits specified by the manufacturer.
- D. There shall be no splicing of Horizontal fiber optic cable.
- E. Fiber links must employ "consecutive fiber positioning" termination at patch panels as per 568-C.0 Annex B.
- F. Fiber cable and strand identification must be according to the ANSI/TIA 598-C standard (as required by both ANSI/TIA 568-C.0 and ANSI/TIA 568-C.3)

- G. Metal armored fiber cable must be bonded to ground per the NEC (NFPA 70) and ANSI-J-STD-607-A.
- H. Fiber connectors must be installed per manufacturer's guidelines for the connector type employed using best industry practice.
- I. Non-connected terminated fiber optic cables and patch cords, as well as unused fiber adapter (coupler) ports must be protected with appropriate caps.

3.4 PATHWAYS AND SUPPORT INSTALLATION

- A. Refer to Section 270500 "Common Work results for Communications".
- B. Certain cable pathways might be provided by others. It is the responsibility of the vendor to notify the project team in writing of any pathway that is not provided.
- C. Before installing cabling inspect all pathways installed by others including but not limited to conduit, cable trays and innerduct and promptly report any problems to the Director's Representative.
- D. Cable support hardware and its placement, tie wrapping practices, etc. must not degrade the physical, electrical, or optical characteristic of any of the installed cable types. Plenum spaces require plenum rated cable ties.
- E. Velcro cable ties may be used in lieu of plastic cable ties.
- F. Provide abrasion protection for any cable or wire bundles which pass through holes or across edges of sheet metal or punched metal studs.
- G. Suspended cable runs (e.g. ceiling) must be supported at least every five (5) feet. Cable bundle size and weight must be well within the support manufacturer's specifications, and the support must be suited to the type of cable it is being used with. Suspended cable bundles must be tie wrapped at least every four (4) feet, but the ties must not be so tight as to crimp or deform the cable sheath. The distances between supports, between ties, or between supports and ties need not be exactly uniform, but for UTP copper cables, must exhibit some randomness to avoid potential electrical problems that can arise from a periodic cable deformation.
- H. Where possible, route cables in overhead cable trays and inside wire management systems attached to the equipment cabinets and racks. Use Velcro ties or ducts to restrain cabling installed outside of wire management systems on racks or in cabinets.
- I. Cable pathways shall not be filled greater than the maximum fill for the particular raceway or cable tray type as per relevant sections of the applicable version of the National Electrical Code (NFPA-70) and the TIA-569-B standard.
- J. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit, where none exists and where it is practical to do so.
- K. Cable, cable trays and support shall be installed above fire-sprinkler systems and shall not be attached to the sprinkler system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.

- L. Cables must not be laid on top of, or fastened to, such items as lighting fixtures, electrical machinery, ceiling grid, ceiling tiles, HVAC ducts, removable ceiling supports, conduits, sprinkler pipes, or other distribution pipes, but must be properly and independently supported above the ceiling as required by codes, standards, and good industry practice. The contractor shall install appropriate carriers to support the cabling. Steel, masonry, independent rods, independent support wires or other structural parts of the building shall be used for cable support attachment points up to the total weight for which the fastener is approved. Rods or wires that are employed for other functions (e.g. suspended ceiling grid support) shall not be utilized as attachment points.
- M. UTP copper cables must be kept away from lighting fixtures, parallel runs of electrical cables and electrical conduits, and other potential sources of interference.
- N. Cables run in the ceiling must be as high up as practical to avoid other services, but in no event lower than 3" above the ceiling grid, and in no case must they interfere with other services or the ability to lift, remove, or replace ceiling tiles.
- O. All cables must follow prescribed pathways.
- P. In areas with raised floors, cables must be supported and kept off the under floor.
- Q. Any cables that penetrate raised floor must be protected with split loom tubing or bushings.
- R. Cables routed from floor or column in-feeds to system furniture raceway shall be protected with spiral wrap, flexible plastic innerduct or similar means.
- S. Clearance from sprinklers must be in accordance with applicable codes and/or AHJ requirements.

3.5 GROUNDING AND BONDING INSTALLATION

- A. Refer to Section 270500 "Common Work results for Communications".

3.6 FIRESTOPPING INSTALLATION

- A. Refer to Section 270500 "Common Work results for Communications".

3.7 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

- A. Refer to Section 270500 "Common Work results for Communications".
- B. All horizontal cables shall be labeled at both ends prior to termination. The labels should be typed or produced with a labeling making device and not hand written. Labels shall be installed between 6" and 12" from the cable termination point and placed in a visible location. In the telecom rooms, labels shall be placed between the cable bundle and the termination hardware. Cable IDs shall be visible and readable after cable installation is completed. If the cable is re-terminated resulting in the above condition not being met, a new label shall be generated and installed.
- C. When the cable terminates within an enclosed housing, e.g. in a fiber patch cabinet, the cable must be labeled within 6"-12" of entering the termination housing.

- D. All permanent labels must be durable and legible and suited for long term use in the environments in which they will be located. Labels must be machine created. Handwritten labels are unacceptable unless approved in writing by the Director's Representative.
- E. All cables, patch panels, punch down blocks, and other items specifically identified by the Director's Representative must be fully labeled. The Director's Representative will supply a document describing labeling requirements for most of these items. If the Vendor prefers, some variations from the specifics of these requirements may be allowed after consultation with, and written approval of the Director's Representative. The requirements of the ANSI/TIA/EIA-606-A standard, subject to the Director's Representative approval, must be followed for items required to be labeled that are not addressed in detail by this specification or other documents provided by the Director's Representative.
- F. Cabling must be labeled within 12 inches of entry/exit of wall or floor penetrations or entry/exit into conduits that penetrate walls or floors. Depending on the length of the run, intermediate cable labels may be needed on open pathway cabling as well as on raceways and cable trays. Refer to construction documents for detail on labeling placement.
- G. Ensure all labeling is included in the same manner as it was shown in the construction drawings and is accurate.
- H. Labeling scheme for all communications systems is subject to prior approval by the Director's Representative.

3.8 SOURCE QUALITY CONTROL

- A. Upon receipt of the cable shipment at the project site, the Contractor shall be responsible for inspecting and testing the cables on the reels to verify and validate the manufacturer's factory testing certifications.
- B. Factory test copper cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory test optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3
- E. Cable will be considered defective if it does not pass tests and inspections.
- F. Prepare and submit test and inspection reports.
- G. The Contractor shall accept all cables meeting the manufacturer's factory testing certifications and be held responsible for their performance thereafter.

3.9 FIELD QUALITY CONTROL

- A. All testing of all equipment and cables shall be performed by a testing crew and foreman not previously involved in any way or form in this project.
- B. Cable tests shall be performed utilizing the procedures documented herein on 100% of all installed cabling.

- C. All testing procedures shall be performed in accordance with the manufacturers' recommended testing guidelines and the procedures specified herein. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.
- D. The Director's Representative shall have the right to inspect and monitor any or all of the field tests. The Contractor must give the Director's Representative a minimum of two day notice before testing commences.
- E. The Director's representative, shall have the right to request the Contractor's testing crew to perform a 10% random testing to confirm and verify all testing results submitted.
- F. This 10% testing will be performed in the presence of the Director's Representative. This request will be given to the with two days prior notice and shall be performed at no additional cost to the State.
- G. The Director's Representative reserves the right to refuse payment for testing services if the 10% random test does not meet the criteria of a 95% match to the original test results. The Director's Representative shall reserve the right to hire a third party testing crew.
- H. At its sole discretion, the Director's Representative may choose to have all or part of the cabling installation re-tested by a suitably qualified third party (or parties) using test instruments and methods adhering to the same standards and limits that the Contractor must adhere to. Links failing these tests must be re-tested and any discrepancies resolved or repaired at Contractor's sole cost. This will not apply to links where both the original and re-tested measured values fall within the standards allowed measurement uncertainty range of the test instruments.
- I. Tests and Inspections:
 - 1. Visually inspect cable jacket materials for NRTL certification markings. Inspect cabling terminations in the Telecommunications room for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
 - 2. Visually confirm cable performance/category, marking of outlets, cover plates, outlet/connectors, and patch panels.
 - 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 4. Test all UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - 5. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - 6. Perform Category 6 Permanent Link Test for all cables. In addition, test all the interconnect cables between the LAN switches and the interconnect field patch panels.
- J. Procedures:
 - 1. Test results and remediation will be required prior to move-in and may be requested prior to Telecom Room ready or customer patching. The following testing schedule should be

completed by the contractor and submitted to the General Contractor and the Director's Representative at project commencement.

Infrastructure Type	Date
Backbone Cabling	No later than 3 weeks before move-in
Horizontal Cabling (not including modular furniture)	No later than 2 weeks before move-in
Horizontal Cabling (only modular furniture)	No later than 1.5 weeks before move-in

2. No asterisk (*) test results will be accepted. These results shall be retested and submitted after a PASS is received. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B.2 and 568-C.0. Any defect in the cabling system installation including but not limited to cable, connectors, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
3. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.
4. Cables, jacks, connecting blocks, and patch panels shall be tested when in their final locations.
5. Labeling must be completed prior to testing to ensure that mislabeled outlets are identified during the testing process.
6. The Director's Representative reserves the right to observe testing.
7. All tests must be performed by technicians with training in the methods that will be employed. The technicians must have field experience with the instruments that will be used for testing.
8. Test equipment must be in good working order and must have been calibrated within the time period specified by the manufacturer and to specified accuracy.
9. Where applicable, the testing instrument must utilize an appropriate test head.
10. The Contractor must identify the manufacturer and model of all test equipment to be used, and supply specifications if requested to do so by the Director's Representative. The Director's Representative reserves the right to reject the use of any equipment it deems inadequate.
11. Adapter cables and other accessories associated with test equipment must be of high quality and must not be degraded from use or improper storage.
12. Pass/Fail criteria for all UTP and optical fiber link tests must be based upon the limits contained in this specification, or if not stated, then upon the applicable portions of the ANSI/TIA 568-C and 568B.2 (and relevant addenda) group of standards cited in this specification covering the measured parameters for Cat 6A, CAT 6, CAT 5e, CAT 3 and optical fiber cables.
13. Links failing any test must be fixed and fully re-tested.

K. Optical Fiber Cable Tests:

1. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
2. Link End-to-End Attenuation Tests:

- a. Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm for multimode and 1310 and 1550 for single-mode fiber, in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
 - b. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.
3. Testing procedures and limits shall be in accordance with the following unless otherwise noted:
 - a. ANSI/TIA-568-C.0
 - b. ANSI/TIA-568-C.0 Annex E
 - c. ANSI/TIA-568-C.3
4. All multimode fiber optic links must be 100% tested end to end in both directions at both 850 nm and at 1300 nm for attenuation via an Optical Loss Test Set (OLTS) using LED sources. Attenuation testing must be compliant with the ANSI/TIA-568-C.0 standard, and as required by it, compliant with the ANSI/TIA/EIA-526-14A standard utilizing Method B, One Reference Jumper Method. The light source used for the measurement must meet the launch requirements of the ANSI/TIA/EIA-455-78B standard whether within the test instrument, or by utilizing a Category 1 light source with an external mandrel wrap per section 6.4.2.1 of the ANSI/TIA 568-C.0 standard. Guidelines of ANSI/TIA-568-C.0 Annex E must be followed in performing this test.
5. The general formula for the attenuation limit to which a multimode fiber link must be tested against is:
 - a. At 850 nm or 1300 nm: Max. Attenuation (dB) = [Measured link length (km) x Fiber cable attenuation (dB/km) at the specified wavelength] + [Allowed mated connector loss (db) x # of mated connector pairs] + [Allowed splice loss (db) x # of fusion or mechanically spliced connectors]
 - b. Unless otherwise noted, the following values must be used in the link loss formula:
 - 1) At 850 nm: Max. Attenuation (dB) = [Measured link length (km) x 3.5 dB/km] + [0.75 dB x # of mated connector pairs] + [0.15 db x # of spliced connectors]
 - 2) At 1300 nm: Max. Attenuation (dB) = [Measured link length (km) x 1.5 dB/km] + [0.75 dB x # of mated connector pairs] + [0.15 db x # of spliced connectors]
 - 3) NOTE: Some specified values may be tighter than those in published standards.
6. The length of the fiber link must be measured and recorded. This may be via a test set or via markings on the cable jacket.
7. Proper adapter polarity, which will be specified elsewhere, must be verified.

L. Unshielded Twisted Pair cable (4-pair) testing

1. Horizontal cabling shall be tested using an instrument certified compliant to ANSI/TIA/EIA-568-B.2-10 Level IIIe for Cat 6A; ANSI/TIA/EIA-568-B.2-1 Level III for Cat 6; and ANSI/TIA/EIA-568-B.2 Level IIe for Cat 5e and Cat 3.
2. UTP link parameters must be tested against their respective "Permanent Link" specification limits defined in the most current versions of the ANSI/TIA-568-C.0 and ANSI/TIA/EIA-568-B.2 standards and their relevant addenda including 568-B.2-1 and 568-B.2-10.
3. The following parameters must be included for all cable Categories:

- a. Wire Map (continuity, shorts, reversed pairs, split pairs, transposed pairs)
 - b. Insertion Loss (each pair)
 - c. Length (each pair)
 - d. Propagation Delay (each pair)
 - e. Delay Skew (worst case)
 - f. NEXT (pair to pair) from each end of the link
4. Additionally, the following parameters must be included for Cat 5e, Cat 6 and Cat 6A testing:
 - a. PSNEXT (each pair) from each end of the link
 - b. ACRF (pair to pair) from each end of the link
 - c. ACRN (pair to pair) from each end of the link
 - d. PSACRF (pair to all other pairs) from each end of the link
 - e. PSACRN (pair to all other pairs) from each end of the link
 - f. Return Loss (each pair) from each end of the link
 5. Category 6 and Category 6A links might be required to be tested for alien crosstalk parameters. If so, the conditions of test (e.g. the percentage of installed cables to test, which will be the victim and which the disturber cables) will be specified elsewhere, and the following parameters will have to be included:
 6. PSANEXT from each end of the link
 7. PSAACRF from each end of the link
 8. The test instrument must be set for the correct Nominal Velocity of Propagation (NVP) of the specific Cat 6A, Cat 6, Cat 5e or Cat 3 cable being tested and not for a generic cable of the respective category.
 9. Any failed test results that cannot be remedied through re-termination must be reported in writing to the Director's Representative immediately, along with a copy of the test results.

M. Test Results

1. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
2. Test results must be recorded in the memory of the field test instrument (except for fiber length if this is derived from cable jacket markers) and then be transferred unaltered to a Windows PC using the recommended software from the manufacturer to output the test results into the formats detailed below.
3. Test results must be returned to the Director's Representative in the following formats.

For Fluke testers	.flw and .pdf
For Agilent testers	.sdf or .mdb and .pdf
Printed copies	Two binders containing full test results for each cable

4. For UTP Permanent Links, all the parameters listed in this specification under the "Unshielded Twisted Pair cable (4-pair) testing" section must be included in the test results database and in the printed copy. The Nominal Velocity of Propagation (NVP) set in the test instrument for these measurements must be included as well.
5. Fiber optic links must show the measured attenuation values, as well as the limits against which they have been tested, and the link length in the database and in the printed copy.
6. As part of the testing documentation package the following information must also be included: date(s) of test, name(s) of test personnel, identification of field test instrument

used including manufacturer, model and serial number, and date of most recent calibration of the test instrument.

7. Required UTP and fiber test results must be sent to the manufacturer in a timely manner so that they can validate the results and issue an extended warranty/guaranty certificate for the installation.

N. Close-Out Documentation

1. Provide the following (10) business days after the project has been handed over to the customer.
2. As-Built Drawings
 - a. These drawings must document all changes from the construction drawings
 - b. These drawings must add the routes of all backbone cables, backbone cable pathways and station cable trunks
3. Test Results as required in Section 2.09 "Reporting Test Results"
4. Copy of form submitted to Leviton/Berk-tek to obtain warranties for the horizontal and backbone systems.
5. The contractor must provide the following (30) business days after the project has been handed over to the Client.

END OF SECTION

SECTION 280500

COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - a. Grounding and bonding for Electronic Safety and Security (ESS).
 - b. Pathways for ESS.
 - c. Lightning and Surge Protection for ESS.
 - d. Vibration and Seismic Controls for ESS.
 - e. Equipment Enclosures for ESS.
 - f. Electronic Components for ESS.
 - g. Exposed Components.
 - h. Cables for ESS.
 - i. Identification for ESS.
 - j. Electronic Safety and Security (ESS) equipment coordination and installation.
2. Provide labor, materials and equipment necessary to complete the work of the Electronic Safety and Security (ESS) Systems, including but not limited to the following:
 - a. Access Control and Facility Monitoring System (ACFMS)
 - b. Video Surveillance (CCTV) System (VSS)
 - c. Associated cabling, enclosures and uninterruptible power supplies.

1.2 RELATED DOCUMENTS

- A. Division 00 "Procurement & Contracting Requirements Group"
- B. Division 01 "General Requirements"
- C. Division 07 Section "Fire and Smoke Protection"
- D. Division 08 Section "Door Hardware"
- E. Division 26 Section "Cable Trays for Electrical Systems"
- F. Division 26 Section "Identification for Electrical Systems"
- G. Division 26 Section "Grounding and Bonding for Electrical Systems"
- H. Division 26 Section "Hangers and Supports for Electrical Systems"
- I. Division 26 Section "Vibration and Seismic Controls for Electrical Systems"
- J. Division 26 Section "Overcurrent Protective Device Coordination Study"
- K. Division 26 Section "Raceway and Boxes for Electrical Systems"
- L. Division 27 Section "Communications Backbone Cabling"
- M. Division 27 Section "Communications Equipment Room Fittings"
- N. Division 28 Section "Access Control/Facility Monitoring System"
- O. Division 28 Section "Video Surveillance System"

1.3 ABBREVIATIONS AND DEFINITIONS

A. Abbreviations

ACFMS	Access Control and Facility Monitoring System
ACP	Access Control Panel
AFF	Above Finished Floor
ANSI	American National Standards Institute
AWG	American Wire Gauge
CPU	Central Processing Unit
CR	Card Reader
CRT	Computer Terminal with Keyboard
CCTV	Close Circuit Television
EIA	Electronic Industries Alliance
ESS	Electronic Safety and Security
FCC	Federal Communications Commission
Fps	frames per second
GUI	Graphical User Interface
ISC	Intelligent System Controller
iSCSI	Internet Small Computer Systems Interface
IP	Internet Protocol
LAN	Local Area Network
LPS	Lock Power Supply
Mbps	Megabits per second
MC	Magnetic Contact
MHz	Megahertz
NIC	Network Interface Card
NVR	Network Video Recorder
RMS	Rack Mount Space (1.75")
RU	Rack Unit (1.75")
RAID	Redundant Array of Independent Disks
RAID0	Block Level Striping without Parity or Mirroring
RAID5	Block Level Striping with Distributed Parity
SCP	Security Control Panel
SCS	Structured Cabling System
SDK	Software Development Kit
SSA	Software Support Agreement
SMS	Security Management System
TB	Terra Bytes
TCP/IP	Transmission Control Protocol / Internet Protocol
UL	Underwriters Laboratories
UPS	Uninterrupted Power Supply

UTP	Unshielded Twisted Pair
VSS	Video Surveillance System
WAN	Wide Area Network

B. Definitions

1. "Provide" shall mean furnish and install.
2. "Work" shall mean all labor, materials, equipment, apparatus, controls, accessories, and all other items required for a proper and complete installation.
3. "Concealed" shall mean hidden from sight in chases, furred spaces, shafts, embedded in construction or in crawl space.
4. "Exposed" shall mean not installed underground or concealed as defined above.
5. "Furnished by others" shall mean materials or equipment purchased and set in place under other sections of the general contract and connected to the systems covered by this section of the specifications by this trade contractor.
6. "Coordinate" shall mean all work provided under this section of the specification shall be in compliance with work of other trades.
7. "Demonstration" shall mean the verification by operation, movement or adjustment of an item or system and the comparison of the item or system performance against a qualitative standard or standards as set forth in the specific requirements of the cited paragraph.
8. "Test" implies the systematic exercising of an item or system under all specified conditions with quantitative measurement of specified parameters and comparison of performance against the quantitative standards set forth. The Security Contractor shall pre-test/pre-commission the installed system before the Director's Representatives shall test the system. Provide sign-off sheets to the Director's Representatives certifying that the system is ready for testing and commissioning.
9. Base Design/System: The intent of this phrase(s) is to describe the security systems specified herein, without regard or reference to the alternates appended to this document. The base design and base system present minimum acceptable performance levels and the Director's Representative desire to provide priority consideration to the most economic security system that meets these performance levels.
10. Contractor: This term designates the company which conducts the Work and is responsible to ensure that others provide specified Work as described in the Specifications for security systems. This term specifically refers to a company that is qualified to perform the Work specified herein related to the integration of all electronic security access control systems and components and the fabrication and installation of all security equipment.
11. Electrical work: shall include furnishing and installing all security system interconnecting conduits, junction boxes, outlet boxes, electrical troughs, cable ladders, plywood backboard and other associates mounting hardware. Interconnecting security conduits shall be installed with a nylon pull string inside the conduits for installation of interconnecting conductors. In addition, the It shall include installation of the electrical power for the security system. Refer to the electrical drawings and electrical specifications for installation requirements.
12. Door Hardware Supplier: The Company engaged to provide materials and services for all door hardware, door frames, and mechanical locking hardware.
13. Door/Frame Security Hardware Package: This term signifies the security hardware package associated with a security access controlled and/or alarm

monitored door. Security door hardware includes an electrified lock, electric strike, electrified panic hardware, electric power transfers or electrified hinges, magnetic door contacts, lock power supplies, termination cabinets, and final connection of wiring to door security devices and to the appropriate screw terminals on the screw-type termination strips located in the termination box.

1.4 STANDARDS AND CODES

- A. Ensure that the design and fabrication of the equipment is in accordance with applicable engineering codes and standards. When specific requirements are stated in this Section that exceed and/or overlap those requirements of the codes and standards referenced here, this Section shall govern.
- B. Ensure compliance with all applicable prevailing codes and laws within the jurisdiction of the site as applicable to the extent of this section.
- C. Provide a complete fully operational turnkey security system as specified within these documents.
- D. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The most current version of the following standards shall be referenced.
 - 1. American National Standards Institute (ANSI) Publications:
 - a. National Electrical Safety Code
 - 2. American Society for Testing and Materials (ASTM) Publications:
 - a. Standard Practice for Security Engineering Symbols
 - 3. National Fire Protection Association (NFPA) Publications:
 - a. National Electrical Code
 - 4. National Electrical Manufacturers Association (NEMA) Publications:
 - a. Industrial Control Devices and Assemblies.
 - b. Enclosures for Industrial Controls and Systems
 - c. Enclosures for Industrial Controls and Systems
 - d. Enclosures for Electrical Equipment
 - 5. Underwriters Laboratories, Inc., Standard for Safety:
 - a. UL 5 Surface Metal Raceways and Fittings
 - b. UL 6 Rigid Metal Conduit
 - c. UL 50 Cabinets and Boxes
 - d. UL 65 Electric Wired Cabinets
 - e. UL 83 Thermoplastic-Insulated Wires
 - f. UL 96 Lightning Protection Components
 - g. UL 193 Fuses
 - h. UL 294 Access Control System Units
 - i. UL 437 Key Locks
 - j. UL 444 Communication Cables
 - k. UL 486A/B Wire Connectors and Soldering Lugs
 - l. UL 493 Thermoplastic-Insulated Underground Feeder and Branch Circuit Cables
 - m. UL 497B - Protectors for Data Communication and Fire Alarm Circuits

- n. UL 512 Fuse Holders
 - o. UL 514B Boxes, Fittings for Conduit and Outlets
 - p. UL 603 Power Supplies For Use With Burglar-Alarm Systems
 - q. UL 609 Local Burglar Alarm Units and Systems
 - r. UL 611 Central-Station Burglar-Alarm Systems
 - s. UL 632 Electrically Actuated Transmitters
 - t. UL 634 Connectors and Switches For Use With Burglar Alarms Systems
 - u. UL 639 Intrusion Detection Units
 - v. UL 651 Conduit, Schedule 40' and 80' Rigid PVC
 - w. UL 796 Electrical Printed Wiring Boards
 - x. UL 797 Electrical Metallic Tubing
 - y. UL 827 Central Stations For Watchman, Fire-Alarm, and Supervisory Services
 - z. UL 1037 Anti-theft Alarms and Devices
 - aa. UL 1076 Proprietary Burglar Alarm Units and Systems
 - bb. UL 1773 Boxes, Termination
- 6. Applicable Federal, state and local laws, regulations, ordinances and codes.
 - 7. Nothing in this Section, including revocation of certain specific codes, standards or specifications, shall relieve the Security Contractor of the responsibility for compliance with the codes, standards or specifications which are generally recognized to be applicable to the Work specified herein.

1.5 SUBMITTALS

A. General Procedures

- 1. All submittals shall comply with the requirements of Division 01.

B. List of Submittals:

- 1. Pre-Construction Submittals:
 - a. Quality Assurance (QA) Plan
 - b. Qualifications and Certificates
 - c. Materials and Equipment List
 - d. Product Data for every product installed
 - e. Manufacturer Quality Assurance Tests and Source Quality Control Reports
 - f. Shop drawings
 - g. Samples
- 2. During Construction:
 - a. Coordination Drawings
 - b. System Labeling
- 3. Post Construction:
 - a. Test Plan and Procedures
 - b. Field Quality Control Reports/Test Results
 - c. Record (as-built) Drawings
 - d. Spare Parts List
 - e. Manuals
 - f. Maintenance Support
 - g. Warranties

- C. Quality Assurance Plan: submit a QA plan and reporting program containing a project schedule with anticipated milestone dates for all project related tasks (i.e. shop drawing submittal, various construction milestones, testing, acceptance, etc.).
- D. Qualifications and Certificates
 - 1. Installer Qualifications:
 - a. Qualification Data: The work specified herein shall be performed by a qualified installer, as defined and described herein.
 - b. Installer shall be certified installer for the specific manufacturers and systems provided.
 - 2. Seismic Qualification Certificates: For equipment frames from manufacturer.
 - a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - b. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
 - c. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Materials and Equipment List:
 - 1. Complete list of all materials, equipment and accessories proposed for his Work. This list shall include manufacturers, complete catalog identification numbers and model or system designator, quantities, options, product data as described below, basic system architectural block diagrams, and CPU software operating features.
 - 2. The submittal shall be in sufficient detail so that the equipment and materials proposed can be readily identified.
 - 3. Submittal of partial lists is not acceptable.
- F. Product Data:
 - 1. For each type of product indicated.
 - 2. Shall be ordered by specifications section. Each product data shall reference the appropriate section and subsection.
 - 3. Collect Product Data into a single submittal for each element of construction or system.
 - 4. Include construction details, material descriptions, dimensions of individual components and profiles, and standard colors and finishes. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Is shall also include roughing-in diagrams and templates, standard wiring diagrams, controls and performance curves. Where Product Data must be specially prepared or modified because standard printed data is not suitable for use, submit as "Shop Drawings".
 - 5. Clearly mark each copy to identify pertinent products, models, and accessories. Show performance characteristics and capacities. Show dimensions and clearances required. Include the following information:
 - a. Reference to appropriate specification section and subsection.
 - b. Compliance with recognized trade association standards.

- c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 - g. Manufacturer's printed recommendations.
- G. Samples: Along with project data and shop drawings, submit one (1) sample for each exposed security devices and security devices with color and finish options, for review by the Architect. The Director's Representative/Architect shall retain these devices as record of the approved equipment for the length of the project.
- H. Shop Drawings:
1. The shop drawing submittals shall include highly detailed, to-scale, drawings describing the products (systems, equipment, devices and materials) and services as to precise locations, mounting and installation methods, details and dimensions, schedules, conduit sizing, conduit routing, riser diagrams, point-to-point interconnect diagrams, equipment schedules, zoning schedule, door schedules, VSS camera schedules, system interface schedules or diagrams, power requirement schedules, stand-by/emergency power schedule, cost reports, and such other diagrammatic or written descriptions which shall allow a thorough and accurate understanding of the security systems and equipment that are being furnished, how they are intended to function, how they will be installed, and all other necessary information of similar intent.
 2. No work shall commence nor shall any equipment be ordered until the submittals have been approved in writing. All work shall be in accordance with approved submittals. A detailed completion schedule shall be submitted with all submittals.
 3. Indicate, among other requirements noted herein, the accurate locations of all conduit, raceway, junction and utility boxes, termination panels, transformers (if any), power supplies, panels, and all other equipment noted.
 4. Clearly illustrate all mounting locations and methods, with particular detail for the installation of intrusion sensors, locking hardware, and request-to-exit devices at doors, sensors located at windows and the mounting of interior and exterior VSS cameras. While some drawing details may be "typical," the shop drawings shall illustrate the installation detail of each unique application.
 5. Include plans, elevations, sections, details, and attachments to other work.
 6. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 7. Equipment schedules and details shall provide the following information, as appropriate in each case: door number; door type; door position switch; request-to-exit type; request-to-exit location; auxiliary request-to-exit device, if any; lock type; power requirements; emergency power; access control type; special installation requirements; timed-shunt times; shunt type; precise, to-scale mounting location; zone or point designation; remote control of lock by specific and designated control console; VSS camera number activated by sensor or switch closure; input/output programming schedules; CPU output reports structure.
 8. Camera schedules and details shall provide the following information: camera number; camera type; monitor number for each camera (if any); sequencing [if any]; camera model number; camera features, such as auto-iris; lens

specification; power requirements; type of power input; cable type; length of cable run; camera mounts; camera housing; camera housing features, such as heater, etc.; camera drives; switcher position; switcher type; monitor type; cameras displayed on each monitor, especially linked displays; DVR positions; alarm queuing; special installation or carpentry requirements; camera and/or lens controls; alarm homing; termination method; lightning, ground loop, etc. protection.

9. Clearly illustrate the fields of view of each camera, as well as “park” positions for panning and zooming cameras (if any). If the camera is capable of wide-angle and telephoto viewing, both fields of view shall be indicated. The installer's “aiming point” shall be indicated. The submittal shall clearly identify outdoor cameras mounting details and maintenance access concepts and design.
 10. System interface schedules or diagrams shall clearly identify: sensors and switches which queue cameras, as well as the number of camera activated; DVR activation logic; VSS monitor switching logic; interfaces, if any, between the access control system; distributed processing capabilities and functions; sensors and switches exclusively used as request-to-exit devices.
 11. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
 12. Exposed equipment: Submit one (1) sample for each exposed security devices and security devices with color and finish options, for review by the Engineer and Architect. The Engineer/Architect shall retain these devices as record of the approved equipment for the length of the project.
 13. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.
- I. System labeling: submit labeling scheme and samples.
- J. All post construction submittals must be presented and approved prior to final acceptance.
- K. Formal Test Plan and Procedures: 30 days prior to acceptance testing and final inspection, submit a formal test plan and test procedures.
- L. Spare Parts and Components List: At the conclusion of the work, submit a complete list of manufacturers' recommended spare parts and components required in order to satisfactorily maintain and service the systems for a minimum of two years.
- M. Manuals:
1. Prior to final acceptance, complete sets of Operation, Maintenance and Service Manuals shall be submitted for systems and equipment provided under this contract.
 2. The manuals shall be compiled, assembled and indexed, in an easily identifiable hard cover form. Three (3) sets of the manuals shall be submitted prior to final acceptance testing.
 3. The manuals shall include the following:
 - a. Complete operating instructions.
 - b. Complete maintenance instructions, wiring diagrams, troubleshooting instructions.
 - c. System service instructions for work which manufacturers recommend user service.

- d. Complete parts lists for each major item of equipment and/or for each system.
- e. Complete collection of manufacturers' product and catalog literature for equipment and systems installed under this contract.
- f. Manufacturers' warranties.
- g. Operating characteristics, performance data, ratings, and manufacturers' specifications for each item of equipment or system.
- h. Where practical, internal wiring diagrams and schematics.
- i. Name, address, and telephone number for service for each item of equipment or system.
- j. Software User Documentation: Manual shall include operating instructions, programming instructions, technical documentation and maintenance procedures to permit making changes to system configuration.

N. Record Drawings

- 1. Produce and keep up-to-date, a complete record as-built set of prints (black-line bonds) which shall be corrected, and marked-up to show every change from the original Specifications and Contract Drawings through final acceptance. This set of drawings shall be protected against soiling, tears, and similar damage and defacement. This set shall be kept on the job site and shall be used only as a record set. (This shall not be construed as authorization to make changes in the Work without proper approvals.)
- 2. The as-built drawings will be kept up-to-date and will be checked monthly as a requirement for approval of monthly progress payments.
- 3. Upon completion of the work and before final payment, produce and submit a final set of record drawings by updating the AutoCAD files of the construction set of drawings (to be provided by the Director's Representative) with the information from the as-built set. The submittal shall include the original record set of black-bonds and the electronic files of the as-built drawings in both AutoCAD format and PDF format.
- 4. At the conclusion of this project, two sets of black-line bond and two copies of the drawing files on Windows based media, formatted for use by AutoCad 2009 (or later version), of all the security drawings specifically prepared for this Contract, shall be provided. The drawings shall be instrument drawn and shall contain all changes shown in the record set. Sepia line drawings on paper are not acceptable.

O. Service/Maintenance

- 1. Maintenance and repair of the system (parts and labor) shall be provided free of charge during the warranty period, including repair of workmanship defects.
- 2. Correct any system defect within six (6) hours of receipt of call from Director's Representative.
- 3. Contractor shall offer extended service/maintenance agreements up to four (4) years after the warranty expires. The agreements shall be renewable monthly, quarterly or yearly.
- 4. Free software upgrades during the warranty period.

P. Warranties

- 1. As a condition precedent to the final payment, execute a written guarantee (warranty) to the Director's Representative certifying that all the contract

requirements have been completed in accordance to the final Specifications and Contract Drawings and warranting all materials and equipment furnished by him under this contract to remain in satisfactory operating condition (ordinary wear and tear, abuse and causes beyond his control for this Work excepted) for a period of one (1) year from the date of final acceptance or beneficial use, whichever is later.

2. All defects or damages due to faulty materials or workmanship shall be repaired or replaced without delay to the Director's Representative satisfaction at no cost to the State.
3. Provide four (4) periodic inspections at no cost to the State during the warranty period.
4. When equipment and labor covered by the installer's warranty or by a manufacturer's warranty have been replaced or restored because of his failure during the period of that warranty, the warranty period for the replaced or repaired equipment or restored work shall be reinstated for a period of time equal to the original warranty period, and commencing with the date of completion of the replacement or restoration work. In the event that any manufacturer customarily provides a warranty period greater than one (1) year, the Security Contractor's warranty shall be for the greater period of time.
5. In no case shall the integrated system/security equipment warranties be voided where user-programmable programming changes are performed by the trained facility appointed system programming representative, to include redefining system input/output points, operation characteristics, time delays, and report formats to the Director's Representative site-particular requirements.

Q. Definition of Acceptance

1. The acceptance of the installation will be based upon satisfactory performance during a thirty (30) day period of beneficial use beginning after all of the other acceptance requirements listed below have been satisfied in full by the Director's Representative.
2. Acceptance of the installation will be reasonably and good faith determined by the Director's Representative. Partial use of the installation prior to completion will not be considered as contributing in part or in whole to the thirty day period. Problems discovered during the thirty (30) day period covered under the responsibilities of the Vendor must be fixed at no cost to the State.
3. Acceptance will not be given, and no final payments will be made, until all problems have been fixed to the Director's Representative full satisfaction. Acceptance does not absolve the installer from any of its obligations under warranties and guarantees. The other acceptance criteria are the following:
 - a. All tests have been passed and all required test results have been submitted in appropriate format and have been accepted without dispute by the Director's Representative.
 - b. All required documentation has been submitted.
 - c. All required labeling has been completed.
 - d. All work has been completed as required by the specifications, including all cable runs and pathways in their permanent places, and all cabinets, racks and cable pathways (i.e. ladder, tray, etc.) secured.
 - e. All Punch List items have been completed.
 - f. All warranties for the installation have been obtained by installer.

- g. Written notification has been submitted that the installation is completed and that all specification requirements have been met.
- 4. Upon satisfactory completion of acceptance requirements and after satisfactory performance during the thirty (30) day period, and correction of any defects found, the Director's Representative will notify the contractor in writing of its acceptance of the installation.

1.6 QUALITY ASSURANCE

- A. Unless otherwise specifically noted, all equipment, material and articles to be installed shall be new, best of their respective kinds, free from defects, listed by Underwriter's Laboratories for the intended use, bearing their label and of the most suitable grade for the purpose intended.
- B. Non-compliant products installed as a part of this scope shall be removed and replaced at no additional cost to the State.
- C. Unless otherwise specifically noted, reference to any equipment, material, article or patented process, by trade name, make or catalog number shall be regarded as establishing a standard of performance and quality. Provide the name of the manufacturer, the model number and other identifying data and information respecting the performance, capacity, nature and rating of the electrical, mechanical and other equipment to be incorporated in the work.
- D. When so directed, samples shall be submitted for approval at no cost to the State. Equipment, material and articles procured, installed, or used without required approval shall be at the risk of subsequent rejection. Warranties for all installed products shall be in accordance with the Contract General Provisions and as cited herein.
- E. The services of a qualified manufacturer's technical representative, thoroughly experienced in the installation and operation of the type of system being provided shall be obtained at no cost to the State, to consult on equipment selection, installation, and testing of the specified systems if and as requested by the Director's Representative.
- F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Grounding: Comply with ANSI-J-STD-607-A.
- H. Modularity: Provide components designed for modular increase or decrease of system capability by installation or removal of plug-in modules. System components shall be designed to facilitate modular subassembly and part replacement.
- I. Reliability: Provide only new, unused components free from flaws or imperfections, which are in current manufacturing production. Components shall be manufactured to meet all the requirements specified herein and shall be free from characteristics or defects which affect the appearance or which might affect the serviceability or render the equipment unsuitable for the intended purpose. The workmanship shall be of superior quality. The MTBF for any sensor component shall not be less than five-thousand (5000) hours. Provide components designed for continuous operation. Electronic components of the system shall be of the solid-state type, mounted on printed circuit boards conforming to UL seven-hundred-ninety-six (UL-796). Boards shall be plug-in, quick-disconnect type. Circuitry shall not be so densely placed as to impede maintenance. Power-dissipating components shall incorporate safety margins

of not less than twenty-five (25) percent with respect to dissipation ratings, maximum voltages, and current-carrying capacity. Light duty relays and similar switching devices shall be solid-state type or hermetically sealed electro-mechanical type.

- J. Maintainability: The components shall be capable of being maintained using commercially available standard tools and equipment. Components shall be so arranged and assembled that they are readily accessible to maintenance personnel without compromising the defeat resistance of the various ESS subsystems.
- K. Availability: Provide products and services available within the project schedule established for this scope of work.

1.7 QUALIFICATIONS

- A. Manufactures: The ESS security provided shall each be standard products of one manufacturer and the manufacturer shall have been in business manufacturing similar products for at least five (5) years.
- B. Post-Installation Support: Contractor shall be a factory-authorized and trained dealer of the systems provided and shall be certified to maintain/repair the systems after systems acceptance.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Comply with the requirements of the Construction Indoor Air Quality Management Plan and the Construction Waste Management Plan.
- B. Deliver materials in original packaging, bearing brand name and identification of manufacturer or supplier.
- C. Store materials to keep them dry and protected from soiling, dirt or damage. Neatly stack gypsum boards flat to prevent sagging.
- D. Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect trim accessories from being bent or damaged.

1.9 COORDINATION

- A. Coordinate layout and installation of security equipment in the telecommunications rooms, copper and/or fiber backbone and LAN requirements with the Director's Representative and the Structured Cabling System (SCS) installer.
- B. Meet jointly with Director's Representative to exchange information and agree on details of equipment arrangements and installation interfaces.
- C. Record agreements reached in meetings and distribute them to other participants.
- D. Coordinate location of power raceways and receptacles with locations of security equipment requiring electrical power to operate.
- E. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.

4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- F. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- G. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed.
- H. Coordinate sleeve selection and application with selection and application of firestopping specified in the Electrical Section.
- I. Coordinate routing of the security cables.
- J. Coordinate the installation of the door/frame security package with the door hardware supplier. Security door hardware includes an electrified lock, electric strike, electrified panic hardware, electric power transfers or electrified hinges, magnetic door contacts, lock power supplies, termination cabinets, and final connection of wiring to door security devices and to the appropriate screw terminals on the screw-type termination strips located in the termination box. Responsibility for furnishing and installing a typical Door/Frame Security Package is divided as follows:
 1. Door Hardware supplier responsibilities:
 - a. Shall furnish and install factory-prepared door frame fitted with factory prepared cut-outs and appropriate pre-welded outlet boxes to accept the door security devices.
 - b. Shall furnish and install all non-security mechanical hardware. This shall include but not limited to mechanical hardware, hinges, door closers, door stops, etc.
 - c. Shall furnish all electronic locksets, power transfer hinges, door monitoring contacts, request-to-exit devices for the new doors.
 2. Security supplier responsibilities:
 - a. Shall install all door monitoring contacts, electromagnetic locks, shear locks, and request to exit devices for the existing doors. Devices shall be retrofitted to the existing doors, as specified on the drawings.
 - b. Shall install all magnetic contacts and electronic locksets and power transfer hinges, provided by the door hardware supplier, as specified on the drawings.
 - c. Shall furnish and install termination cabinet furnished with screw-type termination block(s). The termination block(s) shall include additional screw terminals to accept the wiring interconnect inputs from the card reader(s), request-to-exit passive infrared detectors and/or the request-to-exit push button switch, and shunt switch, as required, which are not part of the door/frame security hardware package.
 - d. Shall coordinate with the electrical work all hi-voltage power to security equipment a required, including but not limited to, the types and sizes of interconnecting wiring, outlet box sizes, electrical contacts needed and screw terminal sizes.
 - e. Shall coordinate with the SCS installer who will be providing data connections for the cameras, control panels, servers, workstations and any other security equipment that requires data or telephone connectivity.
 3. Electrical supplier responsibilities:

- a. Shall furnish, install and final connect all security door conduits and interconnect wires from door power supply and termination cabinet and/or junction box to all security devices associated with a door/frame security door location.
- b. Shall furnish and install all other security system interconnecting conduits, junction boxes, outlet boxes, electrical troughs, and other associated mounting hardware. Interconnecting security conduits shall be installed with a nylon pull string inside the conduits for installation of interconnecting conductors.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING FOR SECURITY SYSTEMS

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.

2.2 PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY

- A. Hangers and Supports
 - 1. Cable Support: NRTL labeled.
 - 2. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
 - 3. Cable hangers and non-continuous supports shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.
 - 4. Shall have various attachment options for: wall, ceiling, joist, beam, flange, raised floor pedestal and others type of mounting.
 - 5. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 6. Lacing bars, spools, J-hooks, and D-rings, straps and other devices.
 - 7. Cable straps (ties) shall be reusable Velcro-style with hook and loop or d-ring, available in various colors and sizes. Plenum rated straps shall be used in plenum spaces.
- B. Conduits and Back Boxes:
 - 1. Provide where indicated on drawings or as required.
 - 2. Conduit and boxes sizes as shown on the communications drawings.
 - 3. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."
 - 4. Flexible metal conduit shall not be used unless specifically noted.
- C. Sleeves
 - 1. Refer to Division 26 "Electrical".
- D. Sleeve Seals and Firestopping
 - 1. Install to seal exterior wall penetrations.
 - 2. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway

- or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal
3. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

E. Grout

1. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.3 LIGHTING AND SURGE PROTECTION

- A. Intrusion detection, access monitoring and control, video circuitry, and communication circuits that connect to outdoor mounted equipment shall be protected at both ends against excessive voltages.
- B. This requirement shall apply for circuits that are routed both in underground conduits and overhead runs. As a minimum, both primary detection devices, such as three (3) electrode gas-type surge arrestor, and secondary protectors shall be installed to reduce dangerous voltages to levels that will cause no damage. Fuses shall not be permitted as lightning and power surge protection devices.
- C. Provide fail-safe gas tube type surge arrestors on all exposed security data circuits. Breakdown voltage for the unit shall be three-hundred to five-hundred (300-500) VDC. The unit shall have equal performance for bi-polar operation with an automatic reset feature, and a minimum life of one thousand (1000) surges with ten (10) times one-thousand (1000) microsecond wave-form at one-thousand (1000) amperes.

2.4 VIBRATION AND SEISMIC CONTROLS FOR ESS

- A. Security systems components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. The term “withstand” means “the unit will remain in place without separation from any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event”.
- C. Equipment shall be seismically rated and braced according to IBC 1621.

2.5 IDENTIFICATION FOR SECURITY ESS

- A. Comply with requirements of Division 26 Section "Identification for Electrical Systems".
- B. The identification for the communications systems shall meet all the requirements of a Class 3 facility as defined by ANSI/TIA/EIA 606-A, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
- C. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- D. Identify all the components of the security systems.
- E. For fire-resistant plywood, do not paint over manufacturer's label.
- F. All labels shall be preprinted or computer-printed type.

- G. Type, format, wording, printing, and placement of labels shall be coordinated with facility's existing administration plan
- H. Labeling System
 - 1. PC-based software, WINDOWS compatible, capable of supporting alpha numeric characters and Windows True Type Fonts.
 - 2. Compatible with laser printers.
 - 3. Label sizes supported:
 - 4. Minimum: 0.8" W x 0.2" H.
 - 5. Maximum: 3.0" W x 12.0" H.

2.6 EQUIPMENT ENCLOSURES FOR ESS

- A. Cabinets or housings, power supply enclosures, terminal cabinets, multiplexer, data gathering panels, wiring gutters, and other component housings, collectively referred to as enclosures, shall be so formed and assembled as to be sturdy and rigid.
- B. Thickness of metal in cast and sheet metal enclosures of all types shall not be less than those in Tables I and II, UL six-hundred-eleven (UL-611). Sheet steel used in fabrication of enclosures shall be not less than fourteen (14) gauge. Doors and covers shall be flanged. Where doors are mounted on hinges with exposed pins, the hinges shall be of the tight pin type or the ends of hinge pins shall be tack welded to prevent ready removal. Doors having a latch edge length of less than twenty-four (24) inches shall be provided with a single lock. Where the latch edge of a hinged door is twenty-four (24) inches or more in length, the door shall be provided with a three (3)-point latching device with lock; or alternatively with two (2) locks, one (1) located near each end.
- C. Any ventilator openings in enclosures and cabinets shall conform to the requirements of UL six-hundred-eleven (UL-611).
- D. Unless otherwise indicated, sheet metal enclosures, excluding control console enclosures, shall be designed for wall mounting with top holes slotted. Mounting holes shall be in positions which remain accessible when all major operating components are in place and the door is open, but shall be inaccessible when the door is closed. Covers of pull and junction boxes provided to facilitate initial installation of the system shall be held in place by tack welding, brazing, or one-way screws. Zinc labels shall be affixed to such boxes indicating they contain no connections. These labels shall not indicate that the box is part of the security system.
- E. Excluding the cabinets and other enclosures located in Security or Telecommunications Rooms, all enclosures, cabinets, housings, boxes, raceways, and fittings of every description having hinged doors or removable cover plates which contain circuits of the security system and its power supplies, shall be provided with cover-operated corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door is moved as little as one quarter (1/4) inch from its normally closed position.

2.7 EXPOSED COMPONENTS

- A. Components exposed and accessible to the public shall be of a design and construction typical and suitable for such use. All device fasteners shall be an approved security type. All components and materials shall be resistant to vandalism and waterproof.

2.8 ELECTRONIC COMPONENTS FOR ESS

- A. All electronic components of the system shall be of the solid-state type, mounted on printed circuit boards conforming to UL seven-hundred-ninety-six (UL 796). Boards shall be plug-in, quick-disconnect type. Circuitry shall not be so densely placed as to impede maintenance. All power dissipating components shall incorporate safety margins of not less than twenty-five (25) percent with respect to dissipation ratings, maximum voltages, and current-carrying capacity. All electronic printed circuit boards furnished and installed shall be provided with a mildew/fungus-resistant and moisture inhibiting coating.

2.9 CABLES FOR ESS

- A. PVC-Jacketed, RS-232 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, and individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage; PVC jacket. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
 - 1. NFPA 70, Type CM.
 - 2. Flame Resistance: UL 1581 Vertical Tray.
 - 3. Plenum-Type, RS-232 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, and individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage; plastic jacket. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
 - 4. NFPA 70, Type CMP.
 - 5. Flame Resistance: NFPA 262 Flame Test.
- B. PVC-Jacketed, RS-485 Cable: Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, PVC insulation, unshielded, PVC jacket, and NFPA 70, Type CMG. RS-485 communications require 2 twisted pairs, with a distance limitation of 4000 feet.
 - 1. Plenum-Type, RS-485 Cable: Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and fluorinated-ethylene-propylene jacket.
 - 2. NFPA 70, Type CMP.
 - 3. Flame Resistance: NFPA 262 Flame Test.
- C. Multiconductor, PVC Readers and Wiegand Keypads Cables: No. 22 AWG, paired and twisted multiple conductors, stranded (7x30) tinned copper conductors, semirigid PVC insulation, overall aluminum foil-polyester tape shield with 100 percent shield coverage, plus tinned copper braid shield with 65 percent shield coverage, and PVC jacket.
 - 1. NFPA 70, Type CMG.
 - 2. Flame Resistance: UL 1581 Vertical Tray.
 - 3. For TIA/EIA-RS-232 applications.
- D. Paired PVC Readers and Wiegand Keypads Cables: Paired, 3 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, individual aluminum foil-polyester tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
 - 1. NFPA 70, Type CM.
 - 2. Flame Resistance: UL 1581 Vertical Tray.

- E. Paired PVC Readers and Wiegand Keypads Cable: Paired, 3 pairs, twisted, No. 20 AWG, stranded (7x28) tinned copper conductors, polyethylene (polyolefin) insulation, individual aluminum foil-polyester tape shielded pairs each with No. 22 AWG, stranded (19x34) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
 - 1. NFPA 70, Type CM.
 - 2. Flame Resistance: UL 1581 Vertical Tray.
- F. Plenum-Type, Paired, Readers and Wiegand Keypads Cable: Paired, 3 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum foil-polypropylene tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene-propylene jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- G. Plenum-Type, Multiconductor, Readers and Wiegand Keypads Cable: 6 conductors, No. 20 AWG, stranded (7x28) tinned copper conductors, fluorinated-ethylene-propylene insulation, overall aluminum foil-polyester tape shield with 100 percent shield coverage plus tinned copper braid shield with 85 percent shield coverage, and fluorinated-ethylene-propylene jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- H. Paired Lock Cable: 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
 - 1. NFPA 70, Type CMG.
 - 2. Flame Resistance: UL 1581 Vertical Tray.
- I. Plenum-Type, Paired Lock Cable: 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- J. Paired Lock Cable: 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
 - 1. NFPA 70, Type CMG.
 - 2. Flame Resistance: UL 1581 Vertical Tray.
- K. Plenum-Type, Paired Lock Cable: 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and plastic jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- L. Paired Input Cable: 1 pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, overall aluminum foil-polyester tape shield with No. 22 AWG, stranded (7x30) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
 - 1. NFPA 70, Type CMR.
 - 2. Flame Resistance: UL 1666 Riser Flame Test.

- M. Plenum-Type, Paired Input Cable: 1 pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, aluminum foil-polyester tape shield (foil side out), with No. 22 AWG drain wire, 100 percent shield coverage, and plastic jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- N. Paired AC Transformer Cable: 1 pair, twisted, No. 18 AWG, stranded (7x26) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
 - 1. NFPA 70, Type CMG.
- O. Plenum-Type, Paired AC Transformer Cable: 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and plastic jacket.
 - 1. NFPA 70, Type CMP.
 - 2. Flame Resistance: NFPA 262 Flame Test.
- P. LAN Cabling: Comply with Division 28 Section "Conductors and Cables for Electronic Safety and Security."
 - 1. NFPA 262.
- Q. Composite Cable:
 - 1. Element 1 (Lock Power): 18 AWG, 4 Conductor Shielded Plenum
 - 2. Element 2 (Card Reader): 18 AWG, 3 Pair/6 Conductor Shielded Plenum
 - 3. Element 3 (Door Position Switch): 22 AWG, 2 Conductor Shielded Plenum
 - 4. Element 4 (Request to Exit Device): 18 AWG, 4 Conductor Shielded Plenum

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR SECURITY SYSTEMS INSTALLATION

- A. All materials shall be installed as per the manufacturers' instructions, unless noted otherwise.
- B. Comply with NECA 1.
- C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- F. Right of Way: Give to piping systems installed at a required slope.
- G. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

- H. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.
- I. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- J. Thoroughly clean areas and spaces where work is performed or used as access to work. Remove completely, paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore all surfaces to their original condition.
- K. All wall-mounted equipment shall be mounted square and plumb.
- L. Complete work according to the agreed upon schedule. Cooperate in coordinating your activities with other planned and ongoing work at the site in a manner that facilitates meeting the schedule. This includes coordination with the various trades in determining work schedules and in resolving physical installation issues.
- M. All materials, cables, components, and all aspects of the installation must meet all local, state, and federal laws, as well as applicable code and regulatory requirements. They must also meet the requirements of any other entity legally empowered to set standards or codes governing composition and use in this installation, as well as any rules specific to the site. Code and regulatory requirements must prevail if there are any conflicts with requirements stated or implied in this specification and its companion documents. Where there is uncertainty in determining precedence, or what specific code or regulatory requirements apply, an Authority Having Jurisdiction (AHJ) over the issue in question will decide.
- N. The Director's Representative reserves the right to require the removal from the project of any staff that it deems careless, problematic, or is identified by competent authority as not conforming to required safety codes, regulations, or standards, or is cited for performing or acting in an objectionable manner, thus affecting the safety or productivity of others.
- O. Take all necessary safety and health precautions and warnings required by codes and regulations to protect the project, its workers, the public, and the property of others. Applicable OSHA regulations or AHJ directives must be followed.
- P. Accept responsibility for all damages to persons or property that occurs as a result of its fault or negligence.
- Q. Designate a Project Manager to act as the technical and managerial interface with the Client and or its representatives.
- R. Participate in meetings covering technical, installation, and coordination and management issues.
- S. Perform all work required under this specification in a skillful and professional manner in accordance with standards and practices documented and/or accepted by industry, such as the ANSI/TIA/EIA, NECA standards and codes. Technicians must be familiar with the proper assembly and installation of all components they are working with, and must follow manufacturer's specific installation requirements.
- T. Maintain its installation and storage areas free from an accumulation of waste material and rubbish, and dispose of them in a manner acceptable to the Director's Representative.

- U. Provide all tools needed to perform its required work. Upon completion of the project, all tools, equipment, and materials not designated as belonging to the Client must be removed. After completion, the work areas must be left in a clean and unobstructed condition.
- V. Contractor must be responsible for the security of all its installation materials, whether purchased by, or supplied to the Security Contractor, as well as tools and ancillary components and documents.
- W. Order all components in a timely manner so that installation dates are not compromised. Materials must either be on hand, or available on short notice, so that the installation may be expedited if required, or if the opportunity to do so presents itself.
- X. Obtain all necessary permits.
- Y. Ensure that any excess materials are ordered for the project they are kept in their original condition and packaging for restocking.
- Z. Where required by local code, trade harmony shall be observed by using only approved union based installation workforce.

3.2 INSTALLATION

- A. Installation of all equipment and materials shall be in accordance with the current recommendations of the manufacturer
- B. The work shall also be in accordance with:
 - 1. Installation criteria defined in these specifications and construction documents.
 - 2. Approved submittals
 - 3. Applicable requirements of the referenced standard.

3.3 SUPERVISION

- A. Provide the following services as part of the scope:
 - 1. Supervision of sub-contractors
 - 2. Coordination with other trades for system related work (electric contractor, finish hardware contractor, door contractor, architect and general contractor)
 - 3. Attend construction meetings
 - 4. Keep updated drawings on site
 - 5. Meet construction deadlines per schedule

3.4 ENCLOSURES FOR ESS

- A. All enclosures that are not installed in a secured space, such as Security Room/Closet or IT/Telecommunications Rooms, shall have tamper provisions:
- B. Tamper switches shall be mechanically mounted to maximize the defeat time when enclosure covers are opened and removed. The minimum amount of time required to depress or defeat the tamper switch after opening or removing the cover shall be greater than one (1) second.
- C. Enclosure and tamper switch shall function in such a manner as to not allow direct line of sight to any internal components or the tampering of the switch or circuit wiring. Tamper switches shall be inaccessible until the switch is activated; have mounting hardware concealed so that location of the switch cannot be observed from the exterior of the enclosure; be under electrical supervision at all times, irrespective of the

protection mode in which the circuit is operating; shall be spring-loaded and held in the closed position by the door protected; and shall be wired so that they break the circuit when the door is disturbed.

- D. Tamper switches on doors which must be opened to make normal maintenance adjustments to the system and to service the power supplies shall be of the push/pull set, automatic-reset type. Covers of pull and junction boxes provided to facilitate initial installation of the system need not be provided with tamper switches.

3.5 ALARM ANNUNCIATION

- A. Alarm annunciation shall include intrusion detection, tamper, fail safe, line fault, and power loss.
- B. Intrusion Detection: Intrusion detection alarms shall include the full range of interior point protection sensors, volumetric space, access control protection sensors, and duress alarms. Duress alarms shall be annunciated to clearly distinguish them from other intrusion detection alarms.
- C. Tamper: Enclosures, cabinets, housings, boxes, raceways, and fittings having hinged doors or removable covers and which contain circuits for the security system and its power supplies, shall be provided with cover operated, corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door or cover is moved as little as one quarter (1/4) inch from the normally closed position. Tamper switches shall be mechanically mounted to maximize the defeat time when enclosure covers are opened or removed. The minimum amount of time required to depress or defeat the tamper switch after opening or removing the cover shall be one (1) second. Enclosure and tamper switch shall prevent direct line of sight to any internal components and prevent switch or circuit tampering. Tamper switches shall be inaccessible until the switch is activated; conceal mounting hardware so that location of the switch cannot be observed from the exterior of the enclosure; be under electrical supervision at all times, irrespective of the protection mode in which the circuit is operating; shall be spring-loaded and held in the closed position by the door or cover protected; and shall be wired to break the circuit when the door or cover is disturbed. Tamper switches on doors which must be opened to make normal maintenance adjustments to the system and to service the power supplies shall be of the push/pull set, automatic reset type. Tamper alarms shall be annunciated to be clearly distinguishable from intrusion detection alarms.
- D. Fail-Safe Alarms: Provide a fail-safe capability in all critical elements of the system. Fail-safe is defined as the capability to monitor for proper system functions and to report an alarm when a failure is detected in any critical system function. This shall include, but not be limited to, the capability to monitor communication link integrity and to provide self-test. When diminished functional capabilities are detected, the system shall provide annunciation of the fault. Fail-safe alarms shall be annunciated to clearly distinguish them from other types of alarms.
- E. Fail-Safe Locking: All locking shall be fail-safe to the extent that such locking is permitted by appropriate and pertinent life-safety and building codes. Fail-safe locking shall be understood to mean that upon failure, locks shall fail in the “unlocked” and “unsecured” position. All locking shall be interconnected into the building's fire alarm system and, upon activation of the fire alarm system, shall immediately “unlock” to permit emergency egress from the building. The Security Contractor shall coordinate all interface requirements with the fire alarm system installer. The Security Contractor

shall furnish and install the necessary interface relays and interconnecting wiring, conduits, and mounting hardware, etc. to effect this operation.

- F. Line Fault: As a minimum, fault isolation at the systems level shall have the same geographic resolution as provided for intrusion detection. The communication links of the security system shall have an active mode for line fault detection. Active mode is defined as that in which some type of signal is continuously sent across the link, resulting in simple link breaks being readily detected. The system shall be either a static system or a dynamic system. In a static system, the "no-alarm" condition shall always be represented by the same signal, which shall be different than the signal originally transmitted. The dynamic system shall represent "no-alarm" with a signal which continually changes with time.
- G. Power Loss: Provide the capability to detect when any critical component of the system experiences loss of primary power and/or is switched over to either emergency power or uninterruptible power and to declare an alarm. The alarm shall clearly annunciate the identity of the component experiencing the power loss.

3.6 GROUNDING AND BONDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.
- C. All cabling used to bond grounds are to be tagged with labels with the point of origin i.e. going to/coming from, with printed labels.

3.7 PATHWAYS INSTALLATION FOR SECURITY SYSTEMS

- A. Comply with NECA 1.
- B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- C. All wiring shall be concealed where possible. All exposed wiring shall be installed in conduit.
- D. All conduits shall be electrical metallic tubing (EMT), except where otherwise noted. Exceptions shall be requested in writing as appropriate, such as for different conduit types for various classes of construction, such as for cast-in-place concrete, and placement in cable ducts. Minimum size of conduit shall be three quarter (3/4) inch. Connections shall be threadless type fittings or couplings. Fastenings and supports for conduit shall be in accordance with the national and local codes.
- E. Security Contractor shall submit conduit and wire layout drawings showing circuit numbers, wiring and conduit routings for approval by the Engineer prior to the initiation of Work. Shop drawings of the security systems conduit routing shall be coordinated by Security Contractor with fire wall construction, mechanical duct work, structural components, fire protection, and plumbing.
- F. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- G. Care shall be taken to ensure that access to other building components (e.g., air conditioning ducts) is not restricted by cable pathways.
- H. Cable management and support hardware must be UL listed for use in the environments in which they will be employed.

- I. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
- J. Secure conduits to backboard when entering room from overhead.
- K. Extend conduits 3 inches above finished floor.
- L. Provide metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- M. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- N. Pathways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. Changes in direction of runs shall be made with symmetrical bends or cast metal fittings.
- O. All conduits shall be affixed or supported at intervals and using prescribed methods and devices in accordance with governing codes. No run of conduit between outlets or fittings shall contain more than four quarter bends (360 degrees). Bends shall be made such that the conduit will not be injured and that the interval diameter will be effectively reduced.
- P. All conduit connections shall be tight so as not to create intermittent loss of ground protection. All cut ends entering into fittings shall be reamed smooth or have a bushing inserted to prevent damage to wire insulation.
- Q. Conduit, raceways and other pathways shall be kept at least six inches from uninsulated flues, steam pipes or any pipe containing a hot gas or liquid. So far as practical, avoid traps and dips in conduit runs, which might collect moisture.
- R. Strict attention shall be given to all conduits containing fiber optic cabling to ensure that manufacturer's recommended conduit bend radii limitations/restrictions are followed.
- S. Where conduits connect to sheet steel enclosures, they shall be fastened with two (2) locknuts where insulating bushings are used. Bushings shall be installed on ends of all conduits where they terminate in pull boxes, outlet boxes, cabinets, etc. and shall be of the insulating type and shall be securely fastened with locknuts on each side. Crushed or deformed conduits shall not be installed. Bushings shall not be used as locknuts. Open ends shall be sealed around security conductors to be liquid tight using an approved air-drying sealer after capping ends with insulated bushings.
- T. Conduits crossing expansion joints in concrete slabs shall be provided with suitable expansion fittings, or other suitable means, to compensate for building expansion and contraction. Conduits traversing hazardous areas shall use the penetrations and fittings shown on the drawings and provided under other sections of the contract. Seal the fittings subsequent to verifying the integrity of the contained conductors.
- U. Pathways shall not block ceiling or equipment access doors. Where conduit or raceway is passed through walls, floors, ceilings or roofs, annular space shall be sealed or patched. Openings in firewalls and all corridor walls shall be sealed with mineral wool or an approved silicone sealant.
- V. No pathways shall be fastened to other pipe or conduit or installed so as to prevent the ready removal of other pipe or conduit for repairs.

- W. Conduit, panels, devices and boxes shall be secured by means of shields in concrete, machine screws on metal surfaces and wood screws on wood construction material. Threaded studs driven in my power charge and provided with either lock-washers and nuts or nail type nylon anchors are not acceptable in lieu of machine screws. Wood plugs shall not be used as expansion shields. Unless conditions or Drawings dictate otherwise, panels shall be located between 3'-6" and 6'-0" above floor level.

3.8 SLEEVES INSTALLATION FOR SECURITY SYSTEMS

- A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Cut sleeves to length for mounting flush with both surfaces of walls.
- E. Extend sleeves installed in floors 50 mm above finished floor level.
- F. Size pipe sleeves to provide 6.4-mm annular clear space between sleeve and pathway or cable, unless indicated otherwise.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry
1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants."
- I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."
- J. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 25-mm annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- L. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 25-mm annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.9 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Specification Section "Penetration Firestopping".

- B. Cable/wire runs and conduit shall be installed in accordance with applicable electrical Work standards, national and local codes as well as manufacturers' specifications of installed equipment.
- C. Where required by local code, trade harmony shall be observed by using only approved union based installation workforce.

3.10 CABLE/WIRES INSTALLATION

- A. Cable/wire runs and conduit shall be installed in accordance with applicable electrical Work standards, national and local codes as well as manufacturers' specifications of installed equipment.
- B. All ESS conductors shall be separated from 240V primary power lines. ESS conductors shall not share any conduit in which primary power conductors are run. Junction and receptacle boxes carrying 240V, or higher voltage, shall not in any way be attached to or carry security systems conductors.
- C. Conductors shall be copper, and shall not have a diameter less than eighteen (18) AWG unless otherwise indicated. Exceptions will be made for vendor-provided leads and internal equipment wiring. If required, modify equipment wiring fittings which will not accept eighteen (18) AWG minimum conductors. Conductors for intercom systems and for multiplexer data communications shall be a minimum of twenty-two (22) AWG. Other exceptions may be granted for use of smaller gauge conductors upon approval by the Director's Representative.
- D. Conductors interconnected to equipment subject to movement shall be stranded or shall be of a type manufactured specifically for such interconnections.
- E. Wire fill, conductors, and conduit shall be sized in compliance with the National Electrical Code. The number of conductors required may vary on the basis of the manufacturers of the selected equipment. In no event, shall conduit fill exceed 40%.
- F. In the event that ESS conductors must share conduit with other low voltage conductors, prior approval is required. All system conductors shall be run concealed wherever practical, and shall be placed in conduit.
- G. All conductors shall be run continuously between sensors, processors, junction boxes, terminal strips or panels, and other approved devices. Splices between such locations are not to be permitted. Necessary junctions shall be made using screw-type terminal blocks, or in accordance with manufacturer's requirements for equipment connections.
- H. Line supervision requirements shall be observed
- I. All conductors shall be color coded and tagged consistently. Coordination with the Director's Representative regarding the exact wire coding and tagging is mandatory. Transposing or changing color coding of conductors shall not be permitted. Conductor identification shall be provided within each enclosure where a tap, splice or termination is made, and at the equipment terminal of each conductor. Terminal and conductor identification shall match that shown on approved shop drawings. Hand lettering or marking will not be accepted. Marking shall be an approved permanent type utilizing an approved method. Tagging devices shall be approved and shall be permanent, not subject to inadvertent separation. All conductors at control consoles shall be bundled, neatly fanned out, and tagged. Cables and wires shall be tagged to clearly indicate their electrical characteristics, circuit number and panel designation. Tagging shall be such

that several conductors may be disconnected and reconnected without the use of drawings.

- J. If required by manufacturers' specifications, shielding requirements shall be observed.
- K. Only approved pulling compounds shall be used. Pull strengths shall not exceed standards established by the National Electrical Code.
- L. Submit conduit and wire layout drawings showing circuit numbers, wiring and conduit routings for approval by the Engineer prior to the initiation of Work. Shop drawings of the security systems conduit routing shall be coordinated by Security Contractor with fire wall construction, mechanical duct work, structural components, fire protection, and plumbing.

3.11 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.12 IDENTIFICATION FOR SECURITY SYSTEMS

- A. Identify ALL system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems." Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- B. See evaluations for discussion of TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 3 level of administration including optional identification requirements of this standard.
- C. All permanent labels must be durable and legible and suited for long term use in the environments in which they will be located. Labels shall be preprinted or computer-printed type. Handwritten labels are unacceptable unless approved by the Director's Representative.
- D. Label all equipment, enclosures, cables, terminations and any other components using unique identifiers.
- E. Labeling scheme for all communications systems is subject to prior approval by the Director's Representative.
- F. All cables shall be color coded and tagged consistently. Transposing or changing color coding of conductors shall not be permitted. Conductor identification shall be provided within each enclosure where a tap, splice or termination is made, and at the equipment terminal of each conductor. Terminal and conductor identification shall match that shown on approved shop drawings. Hand lettering or marking will not be accepted. Marking shall be an approved permanent type utilizing an approved method. Tagging devices shall be approved and shall be permanent, not subject to inadvertent separation. All conductors at control consoles shall be bundled, neatly fanned out, and tagged. Cables and wires shall be tagged to clearly indicate their electrical characteristics,

circuit number and panel designation. Tagging shall be such that several conductors may be disconnected and reconnected without the use of drawings.

3.13 CLEAN, SQUARE INSTALLATION

- A. All equipment shall be clean and free of paint and other defacing materials. All installations shall be square and plumb. Take care that other trades do not deface equipment and do not move equipment out of square and plumb.

3.14 ELECTRICAL POWER

- A. High Voltage Power:
 - 1. Furnish and install wiring, conductors, conduit, and termination for the supply of power to security system components as part of the electrical work. Except for the interconnection into the door hardware furnished devices, it shall be the responsibility of the security supplier to furnish and install all low-voltage conductors and to make all final connections of same. complete information regarding high voltage power requirements for the security equipment.
- B. Low Voltage Power:
 - 1. Low voltage power shall be provided through the use of two-winding isolation-type transformers and rectifier circuits and shall supply DC voltages, where and as required. Voltage levels shall be as rated for the various systems' operational requirements. All low voltage power supplies shall be fully regulated, float type, with battery back-up, capable of supporting the operation of all equipment for a minimum of four hours. Low voltage power supplies shall be required to provide central lock power, camera power, advanced processor controller power and sensor devices power.
- C. Batteries:
 - 1. Provide backup power by dedicated batteries in remotely located system elements such as remote access control panel units. Batteries shall be sized to provide continuous stand-by operation for a minimum of four (4) hours without recharge or replacement.

3.15 TESTING

- A. General: Verify that all requirements of this specification are met. Verification shall be through a combination of analyses, inspections, demonstrations and tests, as described below.
- B. Verification by Inspection: Verification by inspection includes examination of an item and the comparison of pertinent characteristics against the qualitative or quantitative standard set forth in the cited paragraph. Inspection may require moving or partially disassembling the item to accomplish the verification. Inspection shall be made of all equipment installations, proper functioning of all locking hardware and lock controls, mounting and wiring of electrical and signal distribution cabinets and components, and mounting and placement of sensors, VSS cameras, etc. to ensure compliance to the specifications and that the overall installation is accomplished in a professional and workmanlike manner. The Director's Representative shall have full opportunity to witness the required Security Contractor inspections or to conduct his own inspections of the installation.

- C. Verification by Test and Demonstration: Verify by formal demonstrations or tests that the requirements of this Specification have been met.
- D. Test Verification Requirements: Paragraphs 1-3 below list specific requirements which shall be verified by formal demonstration/test. The Director's Representative shall be afforded a fourteen (14) day advance notice of all subsystem demonstrations/tests. The Director's Representative reserve the right to witness any and/or all of the tests described below.
 - 1. Preliminary Tests: Following installation, individually test each sensor and other components and verify the proper functioning of each component within a particular subsystem. Each subsystem shall be similarly tested until all detection zones, alarm assessment components, alarm reporting and display and access control functions have been verified. Any deficiency pertaining to these requirements shall be corrected prior to final functional and operational tests of the system. When subsystem verification is complete, the entire system shall be tested to assure that all elements are compatible and function properly as a complete system.
 - 2. System Operation Test: Following completion of the preliminary tests and the security system and component formal demonstrations, conduct a formal test, to be known as the "System Operation Test", in which all components and subsystems of the security system are demonstrated to operate together as an integrated system. This test shall be performed over a continuous seventy-two (72) hour period. A testing plan and test procedures for each portion of the test shall be prepared and submitted 45 days prior to the start of any testing for approval in accordance with this Specification. Approval of the test procedures must be obtained prior to notification of testing to Director's Representative. Demonstrate that the security system components and subsystems meet specification requirements in the "as-installed" operating environment during the "System Operation Test". While no formal environmental testing is required, measure and record temperature, humidity, and other environmental parameters, and shall include this data in the test report to document the environmental parameters and the environment conditions which were encountered during the "System Operation Test".
 - 3. Tests Upon Completion of Work: Upon completion of the Work, the system shall be subjected to complete functional and operational tests. When all required corrections have been accomplished, the system shall be re tested. The Director's Representative shall be notified in writing fourteen days in advance of the proposed final acceptance testing and inspection date. The advance notice shall include certification that the installation is complete and operable and has satisfactorily performed the final tests specified herein. The acceptance testing and final inspection will be accomplished in the company of the Director's Representative. Prior to the test date, prepare and submit for approval a complete and detailed final acceptance test check off list ("punch list"). The list shall be a complete representation of all specified functions and conditions, including contingency, priority, and abnormal modes of operation. The arrangement of the list shall be such as to provide an orderly method of tabulating checks of system features, response and operation. The tests shall be structured so that all sensors and controls are stimulated directly in their installed and finally adjusted positions and all audible and visual displays, signals, alarms and other responses are observed and printed. At the time of final acceptance testing all required tests shall be repeated and all defects will be corrected until

the system is found to be acceptable to the Director's Representative. A log of all test activities and results shall be maintained by the Security Contractor. Typed copies of this log shall be submitted within seven days of the testing. Final tests shall include, but not limited to the following:

- a. Test of all central CPU's, peripherals, and all panel control functions.
 - b. Test all graphic control and annunciation panel functions and displays.
 - c. Test electrical supervision of all input/output sensor and data communication bus circuits.
 - d. Test of all alarm initiating devices.
 - e. Test of remote battery and battery chargers.
 - f. Test of the UPS system including a battery discharge test
 - g. Test of access control system to include tie-in to fire alarm system.
 - h. Complete operation tests under emergency power.
 - i. Test of fiber optics signal transmission system.
 - j. Visual inspection of all wiring;
 - k. Verification that all required submittals have been provided and have been accepted;
 - l. Demonstrate software and programming/reprogramming functions of all micro-processor systems.
 - m. Verification of systems response time.
 - n. Carefully plan and coordinate the final acceptance tests so that all tests can be satisfactorily completed during one continuous testing period. Provide all necessary instruments, labor and materials required for tests, the equipment manufacturer's technical representative, and qualified technicians in sufficient numbers to perform the tests within the time limits imposed by this Specification.
 - o. Although successful completion of the final acceptance test has been completed, the security system shall not be considered accepted until it is determined that the complete security system is continuously trouble-free and operational, in a manner satisfactory to the Director's Representative, for at least a seven-day period following final acceptance testing. A print-out of the system's activity log will be accepted as proof of compliance with this requirement. In the event that the system fails this operational test, make the necessary adjustments and the seven-day period will restart from the beginning. If the system fails to complete this operational test for four (4) consecutive seven-day restarted test periods, the system shall be considered inoperable and unacceptable. Make all necessary repairs, adjustments, and/or replacements, at his cost. When all adjustments have been completed and after proper notice has been given, the complete acceptance test will be re-performed and witnessed from the beginning. Contractor shall be liable for all expenses for witnessing the retest as specified above. Repeated unsatisfactory operation and chronic system failures shall be considered cause for the complete system removal and replacement by the Director's Representative. In this event, the Security Contractor shall be liable for all expenses and damages incurred, including legal fees and court costs.
4. Reliability/Maintainability Data: Record hours of component, subsystem and system operation, together with failure and repair data. This information shall be incorporated into the System Test Report to be submitted.

3.16 MAINTENANCE AND OPERATING INSTRUCTIONS

- A. Prior to completion of the work, provide field operating instructions with respect to operation functions and maintenance procedures for the equipment and systems installed. Organize operating and maintenance data into suitable sets of manageable size.
- B. All equipment provided under this Section of the Specifications shall be placed in operation and shall function continuously in an operation test for a period of one week, without shut down due to mechanical failure.
- C. Prior to scheduling the project final inspection and after completion of the entire installation period, provide all work required to adjust all controls, and all maintenance to place the systems in operation to meet the requirements of this Section of the Specifications and Contract Documents.
- D. Provide operating, service, maintenance instruction manuals containing replacement data for the equipment which will require operating, maintenance or replacement and one copy of this literature shall be available during the instruction of the operating personnel while the others are checked for completeness.
- E. Sufficient advance notice shall be given to the Director's Representative for the specific instruction period. Upon completion of instruction, obtain from the representative(s) written verification that the above mentioned instruction has been performed. Such verification shall be forwarded to the Director's Representative.
- F. Each copy of the approved operating and maintenance manual shall contain copies of approved shop drawings, equipment literature, cuts, bulletins performance charts, pump curves, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed and bound in a hard back three ring binder. Fly sheets shall be placed before instructions covering each section. The instruction sheets shall be in 8 1/2 inches by 11 inches with large sheets of drawings folded in neatly. Each manual shall have the following minimum contents:
 - 1. Table of Contents
 - 2. Maintenance
 - a. Maintenance and Lubricating Instructions
 - b. Replacement Charts
 - c. Preventive Maintenance Recommendations
 - d. Trouble-shooting Charts for Equipment Components
 - e. Testing Instructions for each Typical Component
 - f. System Draining and Filling Instructions
 - g. Two typed sets of charts indicating equipment tag number, location of equipment, specific equipment service, greasing and lubricating requirements as recommended, lubricant type and intervals of lubrication.
 - h. Two types sets of instructions for ordering spare parts. Each set shall include name, telephone number and address of where they may be obtained.
 - 3. Manufacturer's Literature
 - a. The equipment for which shop drawings have been submitted and approved.
 - b. Wiring Diagrams

- c. Installation Drawings
- d. Manufacturer's Representative and Contract Information
- e. Guarantees

3.17 CLEANING AND ADJUSTING

- A. Subsequent to installation, clean each system component of dust, dirt, grease or oil incurred or accrued from other project activities, and prepare for system activation by manufacturer's recommended procedures for adjustment, alignment or synchronization.
- B. Each component shall be prepared in accordance with the appropriate provisions of the component's installation, operations and maintenance manuals.
- C. Any damage caused to parts of the building, its finish, or furnishings, shall be repaired at no cost to the State.
- D. All items of equipment shall be thoroughly inspected and any items dented, scratched or otherwise damaged, in any manner, shall be replaced or repaired and painted to match the original finish. All items so repaired and refinished shall be brought to the attention of the Director's Representative for inspection and approval.

3.18 SPECIAL TOOLS

- A. Provide any and all special tools, recommended by the manufacturer of items furnished, noted as not being commonly available.

3.19 CERTIFICATES OF APPROVAL

- A. Upon completion of the work, furnish to the Director's Representative in duplicate, certificates of inspection and/or approval from state and local inspection authorities having jurisdiction indicating the installed systems compliance to their requirements.

END OF SECTION

SECTION 283105

MODIFICATIONS TO FIRE ALARM SYSTEM

PART 1 GENERAL

1.01 REFERENCES

- A. Underwriters Laboratories Inc.
- B. National Fire Protection Association Standard 72.

1.02 DEFINITIONS

- A. Initiating Device Circuit: A circuit to which automatic or manual initiating devices are connected where the signal received does not identify the individual device operated. Example:
 - 1. Circuits from PPSSs and ICUs to non-addressable signal initiating devices.
- B. Notification Appliance Circuit: A circuit or path directly connected to a notification appliance. Example:
 - 1. Circuits from PPSSs and ICUs to notification appliances.
- C. Signaling Line Circuit: A circuit or path between any combination of circuit interfaces, control units, or transmitters over which multiple system input signals or output signals, or both are carried. Examples:
 - 1. Circuits from PSS to building PPSSs and ICUs.
 - 2. Circuits from PPSSs and ICUs to addressable devices.
- D. Operating Mode:
 - 1. Private Mode:
 - a. Audible and visible signaling only to those persons directly concerned with the implementation and direction of emergency action initiation and procedure in the area protected by the fire alarm system, and;
 - b. Audible and visible signaling only to those persons within special designated areas where private mode operation is specified to be applicable.
 - 2. Public Mode: Audible and visible signaling to occupants or inhabitants of the area protected by the fire alarm system.

1.03 DESCRIPTION OF EXISTING SYSTEM

- A. The existing Simplex Time Recorder Co. System operates as an integrated multiplexed protected premises and proprietary fire alarm, monitoring and control system. Changes in the status of monitored points are detected by the micro-processor based proprietary supervising station (PSS) and protected premises subsidiary stations (PPSSs) and remote control units (RCUs) located in buildings throughout the facility.

1. Smoke detectors and smoke sensors operate in conjunction with the systems' alarm verification program.
 - a. The alarm verification operation is selectable by zone for smoke detectors and by individual devices for smoke sensors.
 - b. The activation of any smoke detector within its zone initiates the alarm verification program.
2. Smoke sensors act as intelligent and addressable devices. The smoke sensor converts the condition of its smoke sensing chamber to an analog value. This analog value is digitized and transmitted to the FACP(s).
 - a. Actual smoke density and temperature measurements are referenced from average sample measurements and are compared to programmable values of threshold sensitivity.
 - b. Sensor "dirty" and "excessively dirty" trouble conditions are reported automatically through a maintenance advisory and alert program procedure.
3. System individually identifies each addressable initiating device and other addressable monitor functions using multiplexing techniques.
4. System is capable of individually operating each alarm notification appliance, and other control functions, using multiplexing techniques.
5. Alarms are processed by the system at 3 levels of priority:
 - a. Fire alarms have the highest priority.
 - b. Other alarms that require interaction by the attendant have the second level of priority.
 - c. Monitored points which do not require interaction by the attendant are the third level of priority.
6. Access to the system functions are controlled thru at least 3 levels of access security to prevent program modifications or use by unauthorized personnel.
7. Alarms, supervisory signals, and trouble signals are distinctively and descriptively annunciated.
8. Switches for silencing audible trouble and supervisory signals transfers the audible signal to a lamp or other visible indicator adjacent to the switches.
9. All system visual and audible trouble signals and visible indication of their restoration is indicated at the PSS.
 - a. Each building's visual and audible trouble signals and visible indication of their restoration is indicated at its PPSS.
10. Monitoring of ground fault conditions indicate a ground fault trouble condition at the PSS.
11. Summary reports are displayed and printed at the PSS upon appropriate keyboard or function command.
12. Life safety control-by-event functions are retained in a non-volatile programmable memory and are not alterable through normal operation of the system.
 - a. The life safety control-by-event control points may be manually operated at any time by authorized personnel thru appropriate system commands.
 - b. Dedicated switches in the remote annunciator/control centers (RA/CCs) allow personnel to manually operate specific pre-programmed life safety control-by-event control points.

- c. Life safety control-by-event functions are printed and displayed at the PSS.
- 13. User programmable control-by-event functions may be programmed thru appropriate system commands to automatically activate any user programmable control point upon a status change from any programmable monitor point.
 - a. The user programmable control-by-event control points may be manually operated at any time by the authorized personnel thru appropriate system commands.
 - b. Dedicated switches in the RA/CCs allows personnel to manually operate each pre-programmed user programmable control-by-event control point.
 - c. Assigned messages, date and time are printed and displayed at the PSS for the control points activated by the user programmable control-by-event function.
- 14. User programmable parameters for automatic time-initiated functions (start/stop, on/off, secure/access, etc.) may be added, omitted and altered thru appropriate system commands.
 - a. The time-initiated user programmable control points may be manually operated at any time by authorized personnel thru appropriate system commands.
 - b. Dedicated switches in the RA/CCs allows personnel to manually operate each pre-programmed user programmable time-initiated control point.
 - c. Assigned messages, date and time are printed and displayed at the PSS for the control points activated by the time-initiated control point.
- B. The PSS activates immediately and performs its alarm functions upon receipt of system alarm condition thru actuation of automatic or manual initiating devices:
 - 1. The PSS sounds its audible alarm and illuminates its system alarm lamp or flashing display.
 - a. The PSS displays the point and type of alarm condition.
 - b. The PSS prints the assigned message with date and time on the printer for the point in alarm.
 - 2. The fire department is automatically called.
 - 3. An authorized person at the PSS presses the acknowledge button which silences its audible alarm and causes a print-out and CRT display of the assigned message for the point in alarm with date, time and an acknowledge prefix.
- C. Life Safety Control-By-Event Functions: The PSS, PPSSs and ICUs immediately perform life safety control-by-event functions upon system alarm condition:
 - 1. Audible alarm signal sounds:
 - a. An authorized person may silence any alarm signal in progress through a silence command, but subsequent actuation of non-addressable initiating devices in other zones cause the system to resound and record the alarm. Subsequent actuation of another addressable initiating device also causes the system to resound and record the alarm.

- b. An authorized person may activate the alarm notification appliances on selected floors, and all floors, each building, and all areas of the facility.
 - 1) Visual indicators in the RA/CC at the PSS indicate on/off status of the alarm notification appliances.
 - c. Alarm signal does not sound in stairwells or elevators.
 - d. Actuation of smoke detecting devices in stairwells, or elevator shafts do not sound the alarm signal, but activates all other system alarm functions.
 - 2. Visual alarm notification appliances illuminate and flash a fire warning signal.
 - 3. Fail safe door lock mechanisms release so that associated doors may be opened.
 - 4. Selected HVAC equipment (fans, air handling units) shut down.
 - 5. Selected fans pressurize stairwells, and elevator hoistway.
 - 6. Fire dampers and smoke dampers close.
 - 7. Phase I automatic elevator recall for fire fighter's service operates upon actuation of an elevator lobby smoke detecting device (excluding the designated floor lobby smoke detecting device) or actuation of an associated hoistway or machine room smoke detecting device. All elevators that service that lobby return non-stop to the designated floor. (If the smoke detecting device at the designated floor is activated, the elevators that serve that level return non-stop to the alternate floor).
 - a. The elevator automatic (smoke detecting devices) and manual (two and three position key switches) Phase I Emergency Recall Operation and the Phase II Emergency In-Car Operation operate in accordance with the applicable ANSI/ASME A17.1 Rules 211.3 thru 211.8 and NFPA 72 3-9.3.
- D. Personnel at remotely located emergency fire telephones may communicate with the attendant at the PSS via private line emergency fire telephone system.
 - 1. Supervision of emergency telephone circuit wiring and wiring for audible and visual signal indicator indicates trouble conditions at the master telephone and PSS.
- E. An authorized person manually resets system at conclusion of alarm condition. When an alarm condition is corrected, a print-out and display occurs at the PSS stating the assigned reset message for the point in alarm with the date, time and reset suffix.
- F. Primary and Secondary Power Supplies:
 - 1. Failure of primary power supplies automatically transfers the affected portions of the system to the secondary power supplies.
 - 2. Utilizing the secondary battery power supplies, the system operates under maximum normal load conditions for 24 hours and then is capable of operating all alarm notification appliances used for evacuation for 15 minutes.
 - 3. Upon restoration of primary power supply, the system reverts to normal operation without loss, attendant intervention, or manual re-start procedures.
- G. Monitoring Integrity of Installation Conductors and Other Signaling Channels:

1. Performance of Signaling Line Circuits:
 - a. Circuits from PSS to PPMCU's: NFPA 72, Class A, Style 7. A print-out and display occurs to identify trouble conditions.
 - b. Circuits from PPMCU's and ICUs to Addressable Devices: NFPA 72, Class B, Style 4. A print-out and display occurs to identify trouble conditions.
 2. Performance of Initiating Device Circuits:
 - a. Circuits from PPMCU's and ICUs to Initiating Devices (Fire Alarm): NFPA 72, Class B, Style C. A print-out and display occurs to identify trouble conditions.
 3. Performance of Notification Appliance Circuits:
 - a. Circuits from PPMCU's and ICUs to Notification Appliances: NFPA 72, Class B, Style Y. A print-out and display occurs to identify trouble conditions.
 4. Monitoring Integrity of Power Supplies:
 - a. An audible and visual alarm, display and print-out indicates failure of the primary (main) power supplies, within the system, at the PSS.
 - b. The system also monitors the secondary (battery) power supplies for battery trouble conditions (low voltage/no batteries, high current and charging current).
- H. Interconnection of Fire Safety Control Functions:
1. Monitoring of wiring to the protected premises fire safety function relays and appliances causes a print-out and display to occur at the PSS to identify trouble conditions.
- I. Sprinkler System Alarm and Supervision:
1. Flow of water through a waterflow fire alarm switch causes a system alarm.
 2. Supervision of sprinkler system signal attachments (sprinkler valve supervisory switches, pressure switches, etc.) indicates circuit trouble and supervisory signal conditions at the PSS.
 3. Control valves in the sprinkler system are supervised.
- J. Supervision of Pressure Sources Associated with Fire Suppression Systems:
1. Pressure sources are supervised to initiate two separate and distinct signals, one indicating that the required pressure has been increased or decreased, and the other indicating restoration of the pressure to its required value.
- K. Supervision of All Fire Suppression Systems for Tampering:
1. In addition to the specific supervision functions of each fire suppression system, each system indicates trouble condition at the PSS whenever components of the system are tampered with, opened or removed.

1.05 MODIFICATIONS TO EXISTING SYSTEM

- A. Provide additional smoke detectors.

- B. Provide ICU, signal initiating devices, notification appliances, etc. as shown on the drawings so that system within building operates in same manner as existing.

1.06 DESCRIPTION OF COMPLETED SYSTEM

- A. The completed system shall operate as outlined in DESCRIPTION OF EXISTING SYSTEM, with the following exceptions:
 - 1. Actuation of sprinkler pressure switch does not sound the alarm signal, but indicates supervisory signal conditions for each circuit at the PSS.
 - 2. Control valves in the sprinkler system are supervised to initiate 2 separate and distinct signals indicating movement of the valve from its normal position.
 - a. The off-normal signal is initiated during the first 2 revolutions of a hand wheel or during 1/5 of the travel distance of the valve control apparatus from its normal position.
 - b. The second signal indicates restoration of the valve to its normal position. (The off-normal signal remains until the valve is restored to its normal position).

1.07 SUBMITTALS

- A. Waiver of Submittals: The “Waiver of Certain Submittal Requirements” in Section 013300 does not apply to this Section.
- B. Preliminary Submittal: Existing system test report.
- C. Submittals Package: Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package.
 - 1. Company Field Advisor Letter: With the submittals package include a letter from the Company Field Advisor stating that he/she has reviewed the Submittals Package for accuracy and completeness, and approves all materials and installation methods included in the Submittals Package.
- D. Shop Drawings:
 - 1. Composite wiring and/or schematic diagrams of the modifications as proposed to be installed (standard diagrams will not be acceptable).
 - a. Indicate circuits which are power-limited if power-limited wiring is proposed for use.
 - b. For 2-hour fire rated cable assemblies show proposed routes and installation details (include UL classification data, listing and system number).
 - c. Include transient surge and lightning protection grounding details for signaling line circuits, initiating device circuits, and ac power conductors entering and leaving each fire alarm control panel.
- E. Product Data:
 - 1. Catalog sheets, specifications and installation instructions.
 - 2. Bill of materials.
 - 3. Detailed description of completed system operation. Format similar to DESCRIPTION OF COMPLETED SYSTEM.

4. Include for each system component which utilizes batteries the battery ampere-hour capacity recommended for each component by the Company producing the system, for the specified duration.
5. Statement from the Company producing the system, for each size and type of single conductor and multiconductor cable proposed for use, indicating that the electrical characteristics meet the requirements of the Company.
6. Data from the Company furnishing the products, proving that detection devices that receive their power from the initiating device circuit or a signaling line circuit of a fire alarm control unit are UL listed for use with the control unit.
 - a. Submit data proving that the software and firmware is listed for use with the control panel.
 - b. Submit data proving that the initiating devices are listed for the intended application. Also for specific applications, such as:
 - 1) Smoke door release accomplished directly from the smoke detecting device, show listing for release service.
 - 2) Air duct smoke detecting devices, showing listing indicating complete range of air velocities, temperature and humidity expected at the device when the air handling system is operated.
 - 3) Smoke detecting devices installed in supply air duct downstream of the fan and filters, show detector listed for the air velocity present.
 - 4) For smoke detecting devices installed in return air system, show listing for the air velocity present where the air leaves each smoke compartment, or in the duct system before the air enters the return air system common to more than one smoke compartment.
 - c. Submit data proving that relays and appliances connected to the fire alarm system which are used to initiate control of fire safety functions are listed for the purpose.
 - d. Submit data proving that the method of monitoring the connection between the fire alarm system and controlled electrical and mechanical systems for integrity is listed for the purpose.
7. Detailed description of procedure proposed to test individual initiating devices.
 - a. Include product information pertaining to the test equipment that will be used to perform the tests.
 - b. Include certified statement that the proposed test method meets the test requirements of NFPA 72 and UL 268 (cite reference to the applicable NFPA and UL paragraphs. Format for the certification shall be the inspection and testing form shown in Figure 10.6.2.3 in NFPA 72, 2007 Edition.
8. Response time index comparison between the elevator hoistway and machine room heat detecting devices and sprinkler heads proving that the heat detecting devices will respond and will cause elevator power shutdown prior to sprinkler operation.

F. Quality Control Submittals:

1. Copy of license required by New York State General Business Law Article 6-D for installing Fire Alarm Systems.
 - a. Also include copy of identification card issued by the Licensee for each person who will be performing the Work.
 2. Company Field Advisor Data: Include:
 - a. Name, business address and telephone number of Company Field Advisor secured for the required services.
 - b. Certified statement from the Company listing the qualifications of the Company Field Advisor.
 - c. Copy of NICET Letter of Approval indicating Level III or higher Fire Alarm Systems certification.
 - d. Services and each product for which authorization is given by the Company, listed specifically for this project.
- G. Contract Closeout Submittals:
1. System acceptance test report.
 2. Certificates:
 - a. Affidavit, signed by the Company Field Advisor and notarized, certifying that the system meets the contract requirements and is operating properly.
 - b. NFPA Record of Completion (NFPA 72, 2007, Figure 4.5.2.1) for the modifications.
 3. Operation and Maintenance Data:
 - a. Deliver 2 copies, covering the installed products, to the Director's Representative. Include:
 - 1) Operation and maintenance data for each product.
 - 2) Complete point to point wiring diagrams of the modifications as installed. Identify all conductors and show all terminations and splices. (Identification shall correspond to markers installed on each conductor.)
 4. As-Built:
 - a. Fire alarm vendor shall prepare and provide an "as-built" fire alarm riser diagram drawing to comply with FDNY requirements and include:
 - 1) All fire alarm devices installed (interface relays and their function included).
 - 2) All associated wiring and interconnections with building existing fire alarm control panel (indicate no. of wires and wires size).
 - 3) Fire alarm matrix.
 - 4) Fire alarm sequence of operation.
 - 5) Fire alarm symbols.
 - 6) Point # next to each fire alarm initiating device.
 - 7) Points list.
 - 8) Circuit number (a or b) next to each fire alarm speaker and strobe light as applicable.
 - 9) Functionality statement.
 - b. As-built fire alarm riser diagram drawing shall be labeled as "as-built."
 - c. Fire alarm vendor shall submit the "as-built" fire alarm riser diagram drawing corresponding ACAD file to engineer in order

- for the engineer to prepare the signed and sealed as-built fire alarm riser as the engineer of record.
- d. The electrical contractor shall sign and seal the engineer drawing for the functionality statement part of the as-built requirements. Engineer will sign and seal for the engineer of record.

1.08 QUALITY ASSURANCE

- A. UL Listing: The system products for the modifications shall be listed in the UL Fire Protection Equipment Directory under product category “Control Units System (UOJZ)”.
- B. Company Field Advisor: Company Field Advisor shall be National Institute for Certification in Engineering Technologies (NICET) certified as Level III or higher Fire Alarm Protection/Fire Alarm Systems Engineering Technician.
 - 1. Secure the services of a Company Field Advisor from the Company of the existing system for a minimum of 24 working hours at the contract site for the following:
 - a. Render advice and witness test of existing system.
 - b. Render advice regarding modifications to the system.
 - c. Assist in reprogramming the system.
 - d. Witness final system test and then certify with an affidavit that the modifications were installed in accordance with the contract documents and are operating properly.

1.09 MAINTENANCE

- A. Spare Parts:
 - 1. 10 percent spare of each type initiating device.
 - 2. 10 percent spare of each type notification appliance.
 - 3. 10 percent spare of each type protective device.

PART 2 PRODUCTS

2.01 PEER-TO-PEER NETWORK

- A. Network: Equip the fire alarm control panels and other network devices with network interface modules able to function with the existing network communication bus signaling line circuit.

2.02 REMOTE FIRE SERVICE DEVICES

- A. Fire Warden Remote Floor Communication Station Telephones: Simplex’s 2084 Series, with:
 - 1. Flush mounted cabinet.
 - 2. Non-lockable door.
 - 3. Buzzer and visual indicator (red LED) to indicate call from existing master telephone.
 - 4. Front of door labeled “Fire Warden Station”.

5. Permanently imprinted instructions for use and operation of the telephone. Include warning to call 911 or pull nearest manual fire alarm station in event that emergency call is not answered.
- B. Fire Service Jacks and Telephones:
1. Remote Telephone Jack Stations: Simplex's 2084-9001.
 2. Telephone Handsets: Simplex's 2084-9014.
 3. Storage Racks/Cabinets: Simplex's 2084-9015 (rack) and 8589 (cabinet).

2.03 INITIATING DEVICES

- A. General:
1. Fire detection devices that receive their power from the initiating device circuit or a signaling line circuit of a fire alarm control unit shall be listed for use with the control unit.
 2. Where individually identifiable (addressable) devices are required, but not available from the Company producing the system, either:
 - a. Use non-addressable devices and individually wire each device to the FACP's as separate monitor points, making each non-addressable device individually identifiable, or:
 - b. Employ remote addressable network modules to make each non-addressable device individually addressable.
- B. Ceiling Mounted Detectors (Non-Addressable, Non-Intelligent):
1. General:
 - a. Heat detectors and photoelectric type smoke detectors shall have common mounting base which accommodates interchanging of the different type detectors.
 - b. Space smoke detectors shall be photoelectric type matching the standard building system.
 - c. Provide photoelectric type smoke detectors for elevator lobbies and elevator machine rooms.
 2. Smoke Detectors:
 - a. Photoelectric Type.
 - 1) With 135 degrees F Thermal Device and LED: Simplex's 2098-9202.
 - 2) With LED: Simplex's 2098-9201.
 - 3) Photoelectric type smoke detectors shall have sensitivity level of 3.2.
 - c. Remote Alarm Indicator For Use with Smoke Detectors: LED type indicator mounted on single gang stainless steel faceplate.
 3. Smoke Sensors:
 - a. Photoelectric Type: Simplex's 4098-9714/9792.
 - 1) Photoelectric type smoke sensor shall have initial sensitivity level of 3.2.
- C. Air Duct Smoke Detectors (Non-Addressable):
1. Photoelectric Type: Simplex's 2098-9649/9201.
 - a. Listed for the air velocity present at each air duct detector's location.

- b. Sampling tube to suit installation.
 - c. Local relay (for fire safety control functions from duct detector when applicable):
 - 1) Form C contact(s) rated minimum 1A @ 28V dc power-limited, 1/2A @ 120V ac nonpower-limited.
 - 2) 24V dc auxiliary power circuit(s) as required to suit relay operation and function.
 - d. Local indicator and key-operated test switch.
 - 2. Remote Alarm Indicator for Use with Air Duct Smoke Detectors: LED type indicator mounted on single gang stainless steel faceplate.
 - 3. Remote Alarm Indicator and Test Switch for Use with Air Duct Smoke Detector's: LED type indicator and key operated switch mounted on single gang stainless steel faceplate.
- D. Air Duct Smoke Sensors (Intelligent, Addressable, Analog):
 - 1. Photoelectric Type: Simplex's 4098-9756 with 4098-9714.
 - a. Listed for the air velocity present at each air duct smoke sensor's location.
 - b. Sampling tube to suit installation.
 - c. Local relay (for fire safety control functions from duct detector when applicable):
 - 1) Relay operation programmable from FACP.
 - 2) Form C contact(s) rated minimum 1A @ 28 Vdc power-limited, 1/2A @ 120V ac nonpower-limited.
 - 3) 24 Vdc auxiliary power circuit(s) as required to suit relay operation and function.
 - 2. Remote Alarm Indicator For Use With Air Duct Smoke Sensors: LED type indicator mounted on single gang stainless steel faceplate.
 - 3. Remote Alarm Indicator And Test Switch For Use With Air Duct Smoke Sensors: LED type indicator and key operated switch mounted on single gang stainless steel faceplate.

2.04 NOTIFICATION APPLIANCES

- A. General:
 - 1. Audible signal appliances shall be UL 464 listed:
 - a. Classified "Public" or "Private Mode Only" to suit application.
 - b. Marked "F.A. Service" or "F.A. Service - Private Mode Only" to suit application.
 - 2. Visual signal devices shall be UL listed:
 - a. For private mode applications, UL 1638 "Fire Protective Visual Signaling Appliance".
 - b. For public mode applications, UL 1971 "Signaling Devices for the Hearing Impaired".
 - c. For wall mounting or ceiling mounting to suit application.
 - 3. Red housing or white housing, similar to existing base building system type.
 - 4. Strobe light shall be capable of delivering 100,000 peak candle power, 24/12 VDC, 90 mA, and synchronized type.
 - a. The maximum pulse duration shall be two-tenths of one second (0.2 sec) with a maximum duty cycle of 40 percent. The pulse

duration is defined as the time interval between initial and final points of 10 percent of maximum signal.

- b. The intensity shall be field-selectable 15/30/75/110 cd.
- c. The flash rate shall be a minimum of 1 Hz and a maximum of 2 Hz.
- d. Operating voltage shall be compatible with existing base building fire alarm system.

B. Audible/Visual Appliances:

- 1. Type AVA: Simplex's 4906-9127/9128/9129/9130 Series, with:
 - a. Xenon flashtube strobe:
 - 1) AVA-15/75: 15/75 candela.
 - 2) AVA-30/75: 30/75 candela.
 - 3) AVA-110: 110 candela.
 - b. Clear lens having FIRE imprinted thereon in red letters, or clear lens with red base having FIRE imprinted thereon in white letters.
 - c. Audible alarm notification appliance:
 - 1) Type as indicated on the drawings.
 - 2) Front mounted, if bells or horns.
 - 3) Field-selectable power taps: 1/8 watts – 2 watts.
 - d. Surface or flush mounted enclosure as indicated on the drawings.

C. Visual Appliances:

- 1. Type VA: Simplex's 4906-9101/9102/9103/9104 Series, with:
 - a. Xenon flasher:
 - 1) VA-15/75: 15/75 candela.
 - 2) VA-30/75: 30/75 candela.
 - 3) VA-110: 110 candela.
 - b. Clear lens having FIRE imprinted thereon in red letters, or clear lens with red base having FIRE imprinted thereon in white letters.
 - c. Surface or flush mounted enclosure as indicated on the drawings.

D. Horns: Simplex's 4901 Series Modular Horns, with:

- 1. Surface or flush mounted type as indicated on the drawings.
- 2. Basic grille type except where projector type is indicated on the drawings.
- 3. Weatherproof model where installed in damp or wet locations.

2.05 AUTOMATIC FIRE SUPPRESSION SYSTEM SIGNAL ATTACHMENTS

A. General:

- 1. Use non-addressable devices and individually wire each device to the FACP's as separate monitor points, making each non-addressable device individually identifiable, or:
- 2. Employ remote addressable network modules to make each non-addressable device individually addressable.

- B. Sprinkler Valve Supervisory Switches:
 - 1. For Outside Screw & Yoke Gate Valves: Simplex's 2097 Series.
 - 2. For Post Indicator Valves: Simplex's 2097 Series.
- C. Tamper Switches: By Micro Switch or Square D Company to suit installation conditions.
- D. Waterflow Switch, Vane Type: Simplex's 2097 Series having:
 - 1. Corrosion-resistant vane.
 - 2. Splash/dust resistant enclosure with anti-tamper switch.
 - 3. Adjustable pneumatic retard.
 - 4. Screw type wiring terminals.
 - 5. Switch rated minimum 7.0 amps at 125 Vac and 0.25 amps at 125 Vdc.

2.06 POWER-LIMITED INSULATED CONDUCTORS

- A. All electrical characteristics shall meet the requirements of the Company producing the system (conductor to conductor capacitance, dc resistance, velocity of propagation etc.).
- B. Multiconductor Cables N.E.C. Type FPLP, FPLR, FPL:
 - 1. Insulated copper conductors.
 - 2. Conductors twisted, shielded and jacketed as recommended by the Company producing the system.
 - 3. Voltage rating of not less than 300 volts (Voltage rating not marked on cable except where cable has multiple listings and voltage marking is required for one or more of the listings).
- C. Other types of cables may be used in accordance with N.E.C. Table 760-61 "Cable Uses and Permitted Substitutions", as approved, if listed as being suitable for the purpose.

2.07 NON-POWER-LIMITED INSULATED CONDUCTORS

- A. All electrical characteristics shall meet the requirements of the Company producing the system (conductor to conductor capacitance, dc resistance, velocity of propagation, etc.).
- B. Conductors twisted, shielded and jacketed as recommended by the Company producing the system.
- C. Single Conductors:
 - 1. No. 18 and No. 16 AWG: Insulated copper conductors suitable for 600 volts, N.E.C. types KF-2, KFF-2, PAFF, PTFF, PF, PFF, PGF, PGFF, RFH-2, RFHH-2, RFHH-3, SF-2, SFF-2, TF, TFF, TFN, TFFN, ZF, ZFF.
 - 2. Larger Than No. 16 AWG: Insulated copper conductors suitable for 600 volts, in compliance with N.E.C. Article 310.
 - 3. Conductors with other types and thickness of insulation may be used if listed for nonpower-limited fire alarm circuit use.
- D. Multiconductor Cables N.E.C. Types NPLFP, NPLFR, NPLF:

1. No. 18 and No. 16 AWG: Insulated copper conductors rated 600 volts, N.E.C. types KF-2, KFF-2, PAFF, PTFF, PF, PFF, PGF, PGFF, RFH-2, RFHH-2, RFHH-3, SF-2, SFF-2, TF, TFF, TFN, TFFN, ZF, ZFF.
2. No. 14 AWG and Larger: Insulated copper conductors suitable for 600 volts, one of the types listed in N.E.C. Table 310-13 or one that is identified for nonpower-limited fire alarm circuit use.
3. Marking: NPLFP, NPLFR, and NPLF marked to suit listings and marked with a maximum usage voltage rating of 150 volts.

2.08 MC CABLE

- A. Metal-Clad Cable, N.E.C. Type MC:
 1. All electrical characteristics shall meet the requirements of the Company producing the system (conductor to conductor capacitance, dc resistance, velocity of propagation, etc.).
 2. Conductors twisted, shielded and jacketed as recommended by the Company producing the system.
 3. Interlocked flexible galvanized steel armor sheath conforming to UL requirements for type MC metal clad cable.
 4. Insulated copper conductors suitable for 600 volts.
 - a. No. 18 and No. 16 AWG: A type listed in N.E.C. Table 402-3 with a maximum operating temperature not less than 90°C, or types KF-2, KFF-2, PAF, PAFF, PTFF, PF, PFF, PGF, PGFF, PTF, PTFF, SF-2, SFF-2, ZF, ZFF.
 - b. No. 14 AWG and Larger: One of the types listed in N.E.C. Table 310-13 or of a type identified for use in Type MC cable.
 5. Acceptable Companies: AFC Cable Systems Inc., Coleman Cable Co.
 6. Connectors for MC cable: AFC Fitting Inc.'s AFC Series, Arlington Industries Inc.'s Saddle Grip, or Thomas & Betts Co.'s Tite-Bite with anti-short Bushings.

2.09 2-HOUR FIRE RATED CABLE ASSEMBLIES

- A. Fire Alarm Circuit Integrity (CI) Cable: Cables identified as meeting the requirements for circuit integrity shall have the additional classification using the suffix "CI". Examples: FPLP-CI, FPLR-CI, FPL-CI, NPLFP-CI, NPLFR-CI, NPLP-CI.
 1. Cables shall have a minimum 2-hour fire resistance rating for the cable when tested in accordance with the Standard for Tests of Fire Resistive Cables-UL 2196.
- B. MI Cable: AFC Cable Systems' MI cable, or BICC/Pyrotenax Mineral Insulated System 1850 Pyrotenax Cable:
 1. All electrical characteristics shall meet the requirements of the Company producing the system (conductor to conductor capacitance, dc resistance, velocity of propagation, etc.).
 2. Solid copper conductors, twisted, shielded as recommended by the Company producing the system.
 3. Seamless copper sheath.

4. Two hour fire resistive rating UL system classified, listed in UL Building Materials Directory product category Fire Resistive Cables (FHJR).
5. PVC or HDPE jacketing (where shown on drawings).
6. Accessories as required for a complete system to suit installation conditions.

2.10 SIGNS, LABELS, MARKERS, AND NAMEPLATES

- A. Procedure Sign:
 1. Complete Unit: Card holder with aluminum or stainless steel frame, plexiglass front and sheet aluminum card backing plate. Minimum size card 8 x 10 inches. For each procedure sign, furnish 1 blank card in holder and 5 spare blank cards suitable for typing future procedures thereon.
 2. Revised Cards: Size as required to fit existing holder, suitable for typing revised procedures thereon.
- B. Zone Locator:
 1. Complete Unit: Card holder with aluminum or stainless steel frame, plexiglass front and sheet aluminum card backing plate. Minimum size card 8 x 10 inches. Type on card the zone number and location of each zone.
 2. Revised Cards: Size as required to fit existing card holder. Type on card the zone number and location of each zone.
- C. Code Locator: Card holder with aluminum or stainless steel frame, plexiglass front and sheet aluminum card backing plate. Minimum size card 8 x 10 inches. Type all codes on the card and the area associated with each coded alarm signal.
- D. Alarm Notification Appliance Locator: Card holder with aluminum or stainless steel frame, plexiglass front and sheet aluminum card backing plate. Minimum size card 8 x 10 inches. Type on card the switch numbers and location of notification appliances controlled by each switch.
- E. Nameplates: Precision engrave letters and numbers with uniform margins, character size minimum 3/16 inch high.
 1. Phenolic: Two color laminated engraver's stock, 1/16 inch minimum thickness, machine engraved to expose inner core color (white).
 2. Aluminum: Standard aluminum alloy plate stock, minimum .032 inches thick, engraved areas enamel filled or background enameled with natural aluminum engraved characters.
 3. Materials for Outdoor Applications: As recommended by nameplate manufacturer to suit environmental conditions.
- F. Markers:
 - a. Pre-marked self-adhesive; W.H. Brady Co.'s B292, B708, Ideal Industries' Mylar/Cloth wire markers, or Markwick Corp.'s permanent wire markers, Plastic Extruded Parts Inc.'s Flexible Sleeve or ID Band Markers, or Thomas and Betts Co.'s E-Z Code WSL self-laminating.
 - b. Other Styles: To suit application by W.H. Brady Co., Ideal Industries, Marwick Corp., Plastic Extruded Parts, Inc., or Thomas and Betts Co.

2.11 ACCESSORIES

- A. Include accessories required to perform the functions summarized in DESCRIPTION OF COMPLETED SYSTEM and indicated on the drawings.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Testing Existing System:
 - 1. Prior to modifying the system, make the following tests to ascertain the operating condition of the existing system:
 - a. Test spare zones that will be utilized for the work.
 - b. Test active zones which will be modified.
 - c. Test PSS, PPSS and ICU functions associated with the modifications.
 - 2. Test shall be witnessed by the Company Field Advisor and the Director's Representative.
 - 3. Conduct tests that are disruptive to facility personnel after normal working hours as directed.
 - 4. Prepare a written report for the Director's Representative indicating the repairs required, if any, to make the existing sub-systems function properly.
 - 5. Repairs to the existing sub-systems are not included in the Work unless requested by Order on Contract.

3.02 INTERRUPTIONS TO EXISTING SUB-SYSTEMS

- A. Maintain the existing system in its present condition to the extent possible while installing new Work.
- B. Prior to making changes or removals relative to the existing system, notify the Director's Representative and have procedures approved.
- C. When changes or removals are required to the existing fire alarm system such that its ability to act as a fire alarm system is impaired, provide a temporary fire alarm system so that the building is protected at all times by a functioning fire alarm system. Notify Building Supervisor (thru Director's Representative) of proposed temporary measures and scheduling. Both the proposed temporary measures and the scheduling must be approved by the Director's Representative.
- D. Provide signs, instructions and alternate methods for reporting a fire.

3.03 INSTALLATION

- A. Install the Work in accordance with the Company's printed instructions unless otherwise indicated.
- B. Coordinate exact location of fire alarm devices with architect and field conditions.

1. Mount the bottom of the lens of each notification appliance 80 inches above the highest floor level within the space, or 6 inches below the ceiling, whichever is lower.
 2. Mount fire warden station 48 inches above finished floor.
- C. All existing devices to remain shall be re-installed in their original locations or as noted on plans after ceiling is in place and wall finishes are complete. Provide temporary support for existing devices and keep operational during construction.
- D. Re-program the system to include new monitor and control points and update existing system program to include changes and additions requested by facility.
1. Obtain from the facility personnel through the Director's Representative, a list of desired system program changes, additions, etc.
- E. Each electric door lock or electric strike associated with card key readers shall be connected to the building's existing fire alarm system (fire alarm control panel) for door release under a fire alarm condition originated from the floor. Provide all required addressable modules, relays, power wiring and control wiring and conduit. Coordinate work and exact wiring with the fire alarm vendor and security systems contractor.
- F. Do not install smoke detecting devices until the Work (including cleaning) of all trades in the area has been completed. Protect installed smoke detecting devices from airborne dust and debris.
- G. Mount smoke detecting devices, and seal air holes in the back of the devices (including interior of raceways and holes associated with installation of boxes and raceways) so that air flow from inside of housing or from the periphery of the housing will not prevent entry of smoke during a fire or test condition. Seal air holes with gaskets, expanding silicone foam, or other sealants as approved.
- H. Wiring for Elevator Recall for Fire Fighter's Service and Other Elevator Emergency Functions:
1. Provide wiring to and including a terminal strip cabinet in elevator machine rooms.
 2. Contractor responsible for elevator installation will provide elevator control equipment for elevator operation and final electrical connections between terminal strip cabinet and the elevator controllers.
- I. Wiring for Survivability:
1. Signals from manual fire alarm boxes and other fire alarm initiating devices within a building transmitted over the same signaling line circuit shall not interfere with the manual fire alarm box signals when both types of initiating devices are operated at the same time.
 2. Failure of equipment or a fault on one or more installation wiring conductors of one notification appliance circuit shall not result in functional loss of any other notification appliance circuit.
 3. Connect PPSSs, ICUs and other system components requiring a primary power supply to dedicated branch circuits.

- a. Do not connect PPSS's and ICUs to a 2 pole device which can trip both poles at once, such as a 2 pole circuit breaker with handle tie (omit the tie).
 4. Splices in wiring in vertical risers is prohibited, except when the length of conductors approximate 150 feet in vertical risers, terminal strip cabinet may be used. Exception: For 2-hour fire rated cable assembly, use UL listed methods to maintain 2-hour rating.
 5. Avoid splices in horizontal runs. When splices are necessary, use junction boxes. Exception: For 2-hour fire rated cable assembly, use UL listed methods to maintain 2-hour rating.
 - a. Make splices with mechanical or hydraulic type pressure connectors. The use of wire nuts is prohibited.
 - b. Paint cover of terminal strip cabinets and junction boxes fire department red.
 6. Protect notification appliance circuits and other circuits necessary for the operation of the notification appliance circuits from the point at which they exit the fire alarm panel until the point that they enter the notification zone that they serve using one or more of the following methods:
 - a. A 2-hour fire rated cable assembly.
 7. Wiring Class A, Style 6, 7, D, E, or Z Signaling Line Circuits, Initiating Device Circuits and Notification Appliance Circuits: Do not install both legs of Class A, Style 6, 7, D, E, or Z circuits in same cable assembly, enclosure, or raceway back to PPSS's or ICUs.
 - a. Run return legs along another route to obtain maximum benefit of these alternate path circuits.
 8. Obtain permission from the director's representative for connections of tenant speaker loops to existing building alarm speaker loops on the floors.
 9. All routing and terminations of cables shall be as directed and approved by the director's representative. No terminations shall be made without prior approval of the director's representative.
- J. Identification, Labeling, Marking:
1. Procedure Sign Adjacent to PSS: Install revised card in existing procedure sign to suit modifications made to procedures.
 2. Code Locator: Install revised card in existing holders. Provide new holders with revised cards to suit modifications.
 3. Alarm Notification Appliance Locator:
 - a. New RA/CCs: Install new zone locator adjacent to RA/CCs.
 - b. Existing RA/CCs: Install revised card in existing zone locators to suit modifications made to the RA/CCs.
 4. Power-Limited Circuits: Mark circuits at terminations, indicating that circuit is a power-limited fire protective signaling circuit.
 5. Identification of Circuits: Identify wires and cables by system and function in interconnection cabinets, and FACP's to which they connect with pre-marked, self-adhesive, wraparound type markers. Designations shall correspond with point to point wiring diagrams.
- K. Fire Suppression Systems Signal Attachments:
1. Install tamper switches.

2. Install sprinkler system signal attachments.
- L. Protective Devices: Install where indicated on the drawings.
 1. Where devices are installed on suspended ceiling provide additional supports in the ceiling, such as channel support system, angle iron or additional runner bars. Fasten the additional supports rigidly to the ceiling runner bar system. Attach frame or brackets of protective device to the supports with vandal resistant fasteners. Install metal spacers between the protective device frame and the supports so that the ceiling tiles will not be a part of the support system.
 2. Use finishing collar between surface and protective device where protective device cannot be mounted tight against surface due to job conditions.
- M. Electrical contractor shall include all fees, costs, etc. for filing all required forms and drawings for the New York State Building Department, approvals, final connections, system re-programming, pre-testing, and Fire Department testing and sign-off.

3.04 FIELD QUALITY CONTROL

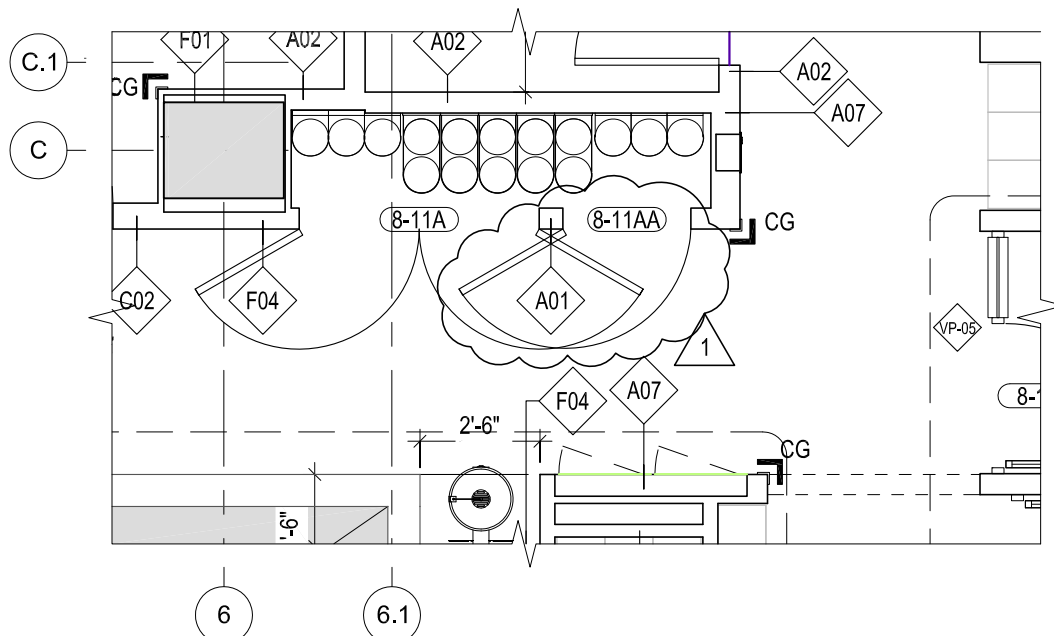
- A. Preliminary System Test:
 1. Preparation: Have the Company Field Advisor adjust the portion of the system applicable to the Work, and then operate it long enough to assure that it is performing properly.
 2. Run a preliminary test for the purpose of:
 - a. Determining whether the system is in a suitable condition to conduct an acceptance test.
 - b. Checking and adjusting equipment.
 - c. Training facility personnel.
- B. System Acceptance Test:
 1. Preparation: Notify the Director's Representative at least 3 working days prior to the test so arrangements can be made to have a Facility Representative witness the test.
 2. Supply all equipment necessary for system adjustment and testing.
 3. Make the following tests:
 - a. Test the portion of the system applicable to the Work in accordance with NFPA 72, 2007 Edition, Chapter 10.
 - 1) Follow test methods stated in Table 10.4.2.2.
 - 2) Record results on NFPA 72 Figure 4.5.2.1 Record of Completion.
 - b. Test system operation step by step as summarized in DESCRIPTION OF COMPLETED SYSTEM.
 4. Submit written report of test results signed by Company Field Advisor and the Director's Representative. Also complete an NFPA Record of Completion.
 - a. Mount a copy of the written report of test results, and the NFPA 72 Record of Completion in plexiglass enclosed frame assemblies adjacent to the PSS (one framed assembly for each report).

- C. Conduct tests that are disruptive to facility personnel after normal working hours as directed.

3.05 INSULATED CONDUCTOR SCHEDULE - TYPES AND USE

- A. Signaling Line Circuits, Initiating Device Circuits and Notification Appliance Circuits:
 - 1. Power-Limited Circuits: For interior wiring (in raceways) use power-limited insulated multiconductor cable types specified in PART 2 except where a 2-hour fire rated cable assembly is required.
 - a. Number of conductors and conductor size as recommended by the Company producing the system, except that conductor size shall not be less than No. 18 AWG for signaling line circuits and not less than No. 16 AWG for initiating device circuits and notification appliance circuits.
 - b. Using Non-power-Limited Wiring On Power-Limited Circuits: Wiring size and types specified for NONPOWER-limited circuits may be used for power-limited circuits if power-limited circuits are reclassified and the power-limited markings are eliminated. Refer to NEC Article 760-52(a) Exception No. 3.
 - 2. Nonpower-Limited Circuits: For interior wiring (in raceways) use nonpower-limited insulated single conductors or multiconductor cable types specified in PART 2 except where a 2-hour fire rated cable assembly is required.
 - a. Number of conductors and conductor size as recommended by the Company producing the system, except that conductor size shall not be less than No. 18 AWG for signaling line circuits, not less than No. 16 AWG for initiating device circuits, and not less than No. 14 AWG for notification appliance circuits.
 - 3. Where wiring is specifically indicated on drawings not to be run in raceway, use metal-clad cable type MC (concealed, unless otherwise indicated), except where a 2-hour fire rated cable assembly is required.
 - 4. Within mechanical spaces, shafts, unfinished areas (no hung ceiling and no drywall partition is available), and where required by building existing fire alarm system type, run fire alarm wiring / cables associated with all fire alarm devices and fire/smoke dampers in rigid steel conduit throughout the space. Exposed wiring / cables will not be allowed.
- B. Control Circuits Associated with the Fire Alarm System: use Class 1, 2, and 3 wiring specified in Section 260519.
- C. Primary Supply Circuits and Secondary Supply Wiring:
 - 1. Use electric light and power wiring specified in Section 260519.

END OF SECTION



1 8TH FL CONST. PLAN- SOUTHEAST - PARTIAL

1/4" = 1'-0"

ADDENDUM #2		REFERENCE DRAWING: A-102	
SHEET TITLE: 8TH FLOOR CONSTRUCTION PLAN – SOUTH DOOR 8-11AA DIRECTION REVISED		PROJECT: PROVIDE CONVERSION OF 8TH FLOOR TO ANIMAL LAB BUILDING NO. 4	
WARNING: THE ALTERATION OF THIS MATERIAL IN ANY WAY, UNLESS DONE UNDER THE DIRECTION OF A COMPARABLE PROFESSIONAL, I.E. ARCHITECT FOR AN ARCHITECT, ENGINEER FOR AN ENGINEER OR LANDSCAPE ARCHITECT FOR A LANDSCAPE ARCHITECT, IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW AND/OR REGULATIONS AND IS A CLASS 'A' MISDEMEANOR.		DWG NO: SK-A-01	
 Office of General Services DESIGN & CONSTRUCTION	ARCHITECT PERKINS EASTMAN 115 FIFTH AVENUE NEW YORK, NY 10003	LAB CONSULTANT JACOBS CONSULTANCY 303 SOUTH BROADWAY, SUITE G20 TARRYTOWN, NY 10591	
	MEP AKF GROUP ONE LIBERTY PLAZA 165 BROADWAY, 22ND FL NEW YORK, NY 10006	ACOUSTICS/IT/SECURITY CERAMI ASSOCIATES 404 FIFTH AVENUE NEW YORK, NY 10018	
	COST ESTIMATING VJ ASSOCIATES 100 DUFFY AVENUE HICKSVILLE, NY 11801	HAZARDOUS MATERIALS AIRTEK ENVIRONMENTAL CORP. 39-37 29TH STREET LONG ISLAND CITY, NY 11101	
	COMMISSIONING ARANKIN 52 JAMES STREET ALBANY, NY 12207		
	CONTRACT: CONSTRUCTION		
	PROJ. NO: 44219-C		
	DATE: 10/24/2016		
	DRAWN: PE		
	APPROVED: —		