

ALL CONSTRUCTION COMPANY ADDENDUM

ADDENDUM NO.: 03
PROJECT NAME: 1819 W. Pershing Renovation (Pershing Road Center Building)
PBC PROJECT NO.: 04026
BID PACKAGE NO.: Bid Package #1
DATE OF ISSUE: 12/07/2022

NOTICE OF CHANGES, MODIFICATIONS, OR CLARIFICATIONS TO CONTRACT DOCUMENTS

The following changes, modifications, or clarifications are hereby incorporated and made an integral part of the Contract Documents. Unless clearly expressed otherwise by this Addendum, all terms and conditions defined in the original Contract Documents shall continue in full force and effect and shall have the same meaning in this Addendum.

ITEM NO. 1: CHANGE TO KEY DATES

- Change 1** The **Bid Due Date** has been **RESCHEDULED** to Thursday, January 5, 2023 at 10:00a.m. The Bid Opening remains VIRTUAL and will be streamed on [YouTube](#).
- Change 2** The **RFI Due Date** Deadline has been **EXTENDED** to Wednesday, December 28, 2022 at 4:00p.m.

ITEM NO. 2: REVISIONS TO BOOK 1, INSTRUCTIONS TO BIDDERS

None.

ITEM NO. 3: REVISIONS TO BOOK 3, TECHNICAL SPECIFICATIONS

Change 1 **Book 3 – Technical Specifications – ADDED** Specification Sections Listed Below

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 01 78 23.1 OPERATIONS AND MAINTENANCE DATA
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- DIVISION 26 - ELECTRICAL

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Change 2 Book 3 – Technical Specifications – REVISED Specification Sections Listed Below

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21 05 53 IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT
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 21 13 00 FIRE SUPPRESSION SPRINKLER SYSTEMS
 21 13 16 DRY PIPE SPRINKLER SYSTEMS
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- DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 26 07 EMERGENCY CALL SYSTEM
 28 26 09 RESCUE ASSISTANCE SYSTEM
 28 31 00 DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEMS

ITEM NO. 4: REVISIONS TO DRAWING SHEETS

CHANGE 1 NEW A-142 FIRST FLOOR NORTH REFLECTED CEILING PLAN
CHANGE 2 NEW A-143 EXISTING CONDITIONS FIRST FLOOR REFLECTED CEILING PLAN – UNIT B
CHANGE 3 NEW A-144 SECOND FLOOR NORTH REFLECTED CEILING PLAN
CHANGE 4 NEW A-145 EXISTING CONDITIONS SECOND FLOOR REFLECTED CEILING PLAN – UNIT B
CHANGE 5 NEW A-146 THIRD FLOOR NORTH REFLECTED CEILING PLAN
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CHANGE 7 NEW A-148 FOURTH FLOOR NORTH REFLECTED CEILING PLAN
CHANGE 8 NEW A-149 EXISTING CONDITIONS FOURTH FLOOR REFLECTED CEILING PLAN – UNIT B
CHANGE 9 NEW A-150 FIFTH FLOOR NORTH REFLECTED CEILING PLAN
CHANGE 10 NEW A-151 EXISTING CONDITIONS FIFTH FLOOR REFLECTED CEILING PLAN – UNIT B
CHANGE 11 REVISED FA-001 FIRE ALARM NOTES AND SYMBOLS
CHANGE 12 REVISED FA-100A FIRE ALARM BASEMENT PLAN-NORTH
CHANGE 13 REVISED FA-100B FIRE ALARM BASEMENT PLAN-SOUTH
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CHANGE 15 REVISED FA-101B FIRE ALARM FIRST FLOOR PLAN-SOUTH
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CHANGE 23	REVISED FA-105B FIRE ALARM FIFTH FLOOR PLAN-NORTH
CHANGE 24	REVISED FA-106A FIRE ALARM SIXTH FLOOR NORTH
CHANGE 25	REVISED FA-106B FIRE ALARM SIXTH FLOOR PLAN-NORTH
CHANGE 26	REVISED FA-107 FIRE ALARM ROOF PLAN – PARTIAL
CHANGE 27	REVISED FA- 301 FIRE ALARM DIAGRAMS
CHANGE 28	REVISED FP-001 FIRE PROTECTION SYMBOLS, ABBREVIATIONS, DETAILS, NOTES, AND SCHEDULES.
CHANGE 29	REVISED FP- 100A FIRE PROTECTION BASEMENT PLAN - NORTH
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CHANGE 31	REVISED FP- 101A FIRE PROTECTION 1ST FLOOR PLAN - NORTH
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CHANGE 33	REVISED FP- 102A FIRE PROTECTION 2ND FLOOR PLAN - NORTH
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CHANGE 42	REVISED FP- 106B FIRE PROTECTION 6 TH FLOOR PLAN – SOUTH
CHANGE 43	REVISED FP- 201 FIRE PROTECTION RISER

ITEM NO. 5: REQUESTS FOR INFORMATION

1. **(Question) In the issued spec sections, Section 28 31 11 "Digital Addressable Fire-Alarm System, Chicago Class I (Mid Rise)" is referenced but not included in the PDF. Can Spec 28 31 11 be issued?**
 - **Response:** Correct specification section number for fire alarm is: 28 31 00, which is included in this Addendum 3. Bidders are advised to also review Specification sections 28 26 07, 28 26 09, and 28 31 00 included in this Addendum 3.
2. **(Question) 21-12-00 references a control panel . This appears to be a panel for a preaction system can this be ignored ?**
 - **Response:** – There is no Pre-action system. Specification Section has been revised and is included in this Addendum 3.
3. **(Question) 21-12-00 states Chrome hose valves. Is this reqd. also, there no spec on cabinet. Can valves be exposed? I suggest an 18" x 18" cabinet for (1) 2 1/2 hose valve**
 - **Response:** – Polished Chrome plated is required as indicated in the Contract Documents. Valves and hoses shall comply with all NFPA 13 and Chicago Building Code, and City of Chicago Requirements. No fire hose cabinets are required.
4. **(Question) 21-30-00 references wye delta fire pump controller - Is there a transfer switch for generator power or a dual utility alternate power?**
 - **Response:** - The fire protection contractor is responsible for ATS Controller. There is no dual utility alternate power. Bidder is advised they will need to provide a new transfer switch for generator power. The transfer switch for the fire pump controller is located in the basement of West Building. Bidders are advised to review diagram FP-200 included in the Contract Documents.
5. **(Question) Walls are shown throughout the 1st, 2nd, and 3rd floors. Are these to part of this phase of construction?**
 - **Response:** Walls located on 1st, 2nd, 3rd, 4th, and 5th floors are existing and are to remain.
6. **(Question) Building is approximately 85 ft to the top sprinkler Is this considered high rise?**

- **Response:** Yes, this building is considered a High-Rise.
7. **(Question) The drawings only call for mains, no secondary distribution. Are you anticipating bid estimates to be based on contractor layout and NFPA 13 requirements pursuant to existing conditions through the permitting/submittal process?**
- **Response:** All fire Protection work is delegated to the bidder. All Bidders to provide design, permitting and installation of automatic sprinkler system to comply with NFPA 13 and Chicago Building Code, and City of Chicago Requirements to fully sprinkler 1819 W. Pershing. Refer to General Notes on sheet FP-001 issued in this Addendum 3.
8. **(Question) In general notes it states sprinklers should be placed in the bottom of elevator shafts A3 & A8. Are they limited to just those 2 only or for all shafts?**
- **Response:** Bidders are to provide sprinklers at the bottom of all elevator shafts. Elevator shafts are labeled on the drawings included in the Contract Documents. See general note on sheet FP-001, included in this Addendum 3
9. **(Question) How, or are we to cap the 3" gas main that feeds the existing natural gas sprinklers pump generator?**
- **Response:** Capping 3" gas main is not part of this Bid Package.
10. **(Question) Will this contract use OCIP or CCIC type insurance or will standard insurance apply?**
- **Response:** Standard Insurance. Refer to Book1, Instructions to Bidders, Exhibit C
11. **(Question) As this building is considered a high rise with the city of Chicago, will a speaker / strobe device be required within 5 feet of each stairwell entryway of every floor?**
- **Response:** Yes. Bidders are advised to refer to the FA drawing series listed below included as a part of this Addendum 3:
 1. FA-001 Fire Protection Notes and Symbols
 2. FA-100A Fire Alarm Basement Plan – North
 3. FA-100B Fire Alarm Basement Plan – South
 4. FA-101A Fire Alarm First Floor Plan – North
 5. FA-101B Fire Alarm First Floor Plan – South
 6. FA-102A Fire Alarm Second Floor Plan – North
 7. FA-102B Fire Alarm Second Floor Plan – South
 8. FA-103A Fire Alarm Third Floor Plan – North
 9. FA-103B Fire Alarm Third Floor Plan – South
 10. FA-104A Fire Alarm Fourth Floor Plan – North
 11. FA-104B Fire Alarm Fourth Floor Plan – South
 12. FA-105A Fire Alarm Fifth Floor Plan – North
 13. FA-105B Fire Alarm Fifth Floor Plan – South
 14. FA-106A Fire Alarm Sixth Floor Plan – North
 15. FA-106B Fire Alarm Sixth Floor Plan – South
12. **(Question) As this building is considered a high rise with the city of Chicago, will a 2-way communicating firefighter phone be required in each stairwell of the 5th floor?**
- **Response:** Yes Bidders are advised that a two way communication firefighter phone is required in the stairwells at intervals as required by the code. Please refer to revised sheets FA-105A and FA-105B included in Addendum 3.

13. **(Question) The CBC requires strobe only devices inside offices, will there be a drawing set to reflect room names or room schedules?**

- **Response:** Yes. Strobe only devices, room names, and room schedules are now a part of the drawings. Bidders are advised to refer to the Revised FA drawing series listed below included as part of this Addendum 3:
 1. FA-001 Fire Alarm Notes and Symbols
 2. FA-100A Fire Alarm Basement Plan – North
 3. FA-100B Fire Alarm Basement Plan – South
 4. FA-101A Fire Alarm First Floor Plan – North
 5. FA-101B Fire Alarm First Floor Plan – South
 6. FA-102A Fire Alarm Second Floor Plan – North
 7. FA-102B Fire Alarm Second Floor Plan – South
 8. FA-103A Fire Alarm Third Floor Plan – North
 9. FA-103B Fire Alarm Third Floor Plan – South
 10. FA-104A Fire Alarm Fourth Floor Plan – North
 11. FA-104B Fire Alarm Fourth Floor Plan – South
 12. FA-105A Fire Alarm Fifth Floor Plan – North
 13. FA-105B Fire Alarm Fifth Floor Plan – South
 14. FA-106A Fire Alarm Sixth Floor Plan – North
 15. FA-106B Fire Alarm Sixth Floor Plan – South

14. **(Question) Will a visual strobe be required for the restroom in the NE corner of the 2nd Floor? Please reference sheet E-102A**

- **Response:** Yes. Bidders are advised that a visual strobe will be required for the restroom in the NE corner of the 2nd Floor. Please refer to revised sheets FA-102A and FA-102B included in Addendum 3.

15. **(Question) Will a visual strobe be required for the restroom in the SW corner of the 2nd floor? Please reference sheet E-102B**

- **Response:** Yes. Bidders are advised that a visual strobe will be required for the restroom in the SW corner of the 2nd Floor. Please refer to revised sheets FA-102A and FA-102B included in Addendum 3.

16. **(Question) Is a 1250 GPM Pump acceptable the Chicago Fire prevention Bureau ? Even half sprinkler demand (440 gpm) plus half Standpipe (875GPM)=1315 GPM . A 1500 GPM would seem in order**

- **Response:** Fire pump to be upsized to 1,500 GPM. Please refer to updated Schedule on Sheet FP-001 included in Addendum 3.

17. **(Question) Who is to carry the extinguishers? There is one note on FP-001 saying to supply but no spec or quantity?**

- **Response:** Bidders are advised they are not to include extinguishers. Note has been eliminated on Revised Sheet FP-001 included in Addendum 3.

18. **(Question) Code requires standpipes be located inside rated stair enclosures. The bid documents show them outside the stair with signs directing fire personnel to standpipes outside the enclosure. Has this been agreed to by the Chicago Fire Prevention bureau?**

- **Response:** This has been approved by the Fire Prevention Bureau as a means to satisfy code. The riser locations on the plans have been coordinated with structural and must be met. Any deviations from the core locations shown on the plans must be approved by the structural engineer. Contractor to “arm over” from riser location shown on plans, provide a valve inside of stairwells, and provide appropriate fire rated protection of the wall penetration. See sheet FP-201 for “arm over” addition on riser. Bidders are advised to refer to the Revised FP drawing series listed below as a part of this Addendum 3.
 1. FP-001 Fire Protection Symbols, Abbreviations, Details, Notes, and Schedules
 2. FP-100A Fire Protection Basement Plan – North
 3. FP-100B Fire Protection Basement Plan – South
 4. FP-101A Fire Protection First Floor Plan – North
 5. FP-101B Fire Protection First Floor Plan – South
 6. FP-102A Fire Protection Second Floor Plan – North
 7. FP-102B Fire Protection Second Floor Plan – South
 8. FP-103A Fire Protection Third Floor Plan – North
 9. FP-103B Fire Protection Third Floor Plan – South
 10. FP-104A Fire Protection Fourth Floor Plan – North
 11. FP-104B Fire Protection Fourth Floor Plan – South
 12. FP-105A Fire Protection Fifth Floor Plan – North
 13. FP-105B Fire Protection Fifth Floor Plan – South
 14. FP-106A Fire Protection Sixth Floor Plan – North
 15. FP-106B Fire Protection Sixth Floor Plan – South
 16. FP – 201 Fire Protection Riser

19. **(Question) Since this is for future build-out, should sprinklers be designed for the higher of the 2 specified occupancies? FP-001 states Light and Ordinary Hazard Group 1.**

- **Response:** The sprinkler design should be hydraulically calculated for Ordinary Hazard Group 1.. Refer to fire pump increase in Fire Pump Schedule on Revised Sheet FP-001 included in Addendum 3.
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20. **(Question) Please advise regarding Building Permit status.**

- **Response:** The building permit application was submitted on 11/23/22. The building permit approval is anticipated in February 2023.

List of Technical Specifications:

(Available and attached)

a) Insert the following attached specifications sections:

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- DIVISION 21 – FIRE SUPPRESSION

21 05 53	IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT
21 12 00	FIRE-SUPPRESSION STANDPIPES
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- DIVISION 26 - ELECTRICAL

26 05 29	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 05 33_13	CONDUIT FOR ELECTRICAL SYSTEMS
26 05 33_16	BOXES FOR ELECTRICAL SYSTEMS
26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS

- DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 26 07	EMERGENCY CALL SYSTEM
28 26 09	RESCUE ASSISTANCE SYSTEM
28 31 00	DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEMS

b) This Addendum includes the following attached Sheets :

- (1) A-142 FIRST FLOOR NORTH REFLECTED CEILING PLAN
- (2) A-143 EXISTING CONDITIONS FIRST FLOOR REFLECTED CEILING PLAN – UNIT B
- (3) A-144 SECOND FLOOR NORTH REFLECTED CEILING PLAN
- (4) A-145 EXISTING CONDITIONS SECOND FLOOR REFLECTED CEILING PLAN – UNIT B
- (5) A-146 THIRD FLOOR NORTH REFLECTED CEILING PLAN
- (6) A-147 EXISTING CONDITIONS THIRD FLOOR REFLECTED CEILING PLAN – UNIT B
- (7) A-148 FOURTH FLOOR NORTH REFLECTED CEILING PLAN
- (8) A-149 EXISTING CONDITIONS FOURTH FLOOR REFLECTED CEILING PLAN – UNIT B
- (9) A-150 FIFTH FLOOR NORTH REFLECTED CEILING PLAN
- (10) A-151 EXISTING CONDITIONS FIFTH FLOOR REFLECTED CEILING PLAN – UNIT B
- (11) FA-001 Fire Alarm Notes and Symbols
 - (a) Sprinkler Alarm with Visual Strobe
 - (b) Visual Strobe
 - (c) Sheet Drawing Number
- (12) FA-100A Fire Alarm Basement Plan – North

- (a) Speaker Alarm with Visual
- (b) Visual Strobe
- (c) Sheet Drawing Number
- (13) FA-100B Fire Alarm Basement Plan – South
 - (a) Speaker Alarm with Visual
 - (b) Visual Strobe
 - (c) Sheet Drawing Number
- (14) FA-101A Fire Alarm First Floor Plan – North
 - (a) Speaker Alarm with Visual
 - (b) Visual Strobe
 - (c) Sheet Drawing Number
- (15) FA-101B Fire Alarm First Floor Plan – South
 - (a) Speaker Alarm with Visual
- (16) FA-102A Fire Alarm Second Floor Plan – North
 - (a) Speaker Alarm with Visual
 - (b) Visual Strobe
 - (c) Sheet Drawing Number
- (17) FA-102B Fire Alarm Second Floor Plan – South
 - (a) Speaker Alarm with Visual
 - (b) Visual Strobe
 - (c) Sheet Drawing Number
- (18) FA-103A Fire Alarm Third Floor Plan – North
 - (a) Speaker Alarm with Visual
 - (b) Visual Strobe
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- (20) FA-104A Fire Alarm Fourth Floor Plan – North
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- (21) FA-104B Fire Alarm Fourth Floor Plan – South
 - (a) Speaker Alarm with Visual
 - (b) Visual Strobe
 - (c) Sheet Drawing Number
- (22) FA-105A Fire Alarm Fifth Floor Plan – North
 - (a) Speaker Alarm with Visual
 - (b) Visual Strobe
 - (c) Sheet Drawing Number
 - (d) Fireman's Phone with FA Speaker
- (23) FA-105B Fire Alarm Fifth Floor Plan – South
 - (a) Speaker Alarm with Visual
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 - (d) Fireman's Phone with FA Speaker
- (24) FA-106A Fire Alarm Sixth Floor Plan – North
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- (25) FA-106B Fire Alarm Sixth Floor Plan– South

- (a) Speaker Alarm with Visual
- (b) Visual Strobe
- (c) Sheet Drawing Number
- (26) FA-107 FIRE ALARM ROOF PLAN – PARTIAL
 - (a) Sheet Drawing Number
- (27) FA-301 FIRE ALARM DIAGRAMS
 - (a) Sheet Drawing Number
- (28) FP-001 Fire Protection Symbols, Abbreviations, Details, Notes and Schedules
 - (a) General Notes
 - (i) Fire Protection Contractor shall install sprinkler heads in the bottom of each elevator and every elevator shaft as required by the City of Chicago Code. See Also notes on lower-level floors plans.

END OF ADDENDUM NO. 03

BOOK 3

ALL CONSTRUCTION GROUP



Partnering with

Assets and Information and Services (AIS)

and the

Public Building Commission of Chicago (PBC)

on the following project

**1819 W. PERSHING BUILDING RENOVATION
(PERSHING ROAD CENTER BUILDING) – BID PACKAGE 1**

located at

1819 PERSHING ROAD
CHICAGO, IL 60609

PBC Project #04026

Architect

Harding Mode Joint Venture
224 S. Michigan Ave., Suite 245
Chicago, IL 60604

ISSUED FOR BID ON 10/25/2022

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END OF SECTION

**SECTION 01 14 11
CONSTRUCTION OPERATIONS AND SITE UTILIZATION PLAN**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction Operations Parameters
- B. Site Utilization Plan

1.02 SUBMITTALS

- A. Site Utilization Plan: The Contractor shall utilize the PBC's Electronic Document Submittal Service to submit the Site Utilization Plan.
 - 1. The Contractor shall re-submit proposed revisions provided by the PBC's Representative and the Architect/Engineer of Record.

1.03 CONSTRUCTION OPERATIONS PARAMETERS

A. General:

The following information is intended to facilitate a coordinated construction environment for orderly, secure, and safe operations within the existing building and the entire building property, consequently forming the basis for the Site Utilization Plan prepared by the Contractor.

- 1. All Construction Operating issues shall be channeled through and require approval by the Public Building Commission of Chicago and user agency.
- 2. The Site Utilization Plan and Construction Schedule will be prepared by the Contractor based on the requirements of the project and in coordination with the existing building operations and program outlined in this Section.

B. EXISTING PROJECT CONDITIONS

- 1. Maintain all exiting in building clear to a Public Way in a manner acceptable to the Authorities having Jurisdiction.
- 2. Maintain all domestic water service while building is occupied by staff or community.
- 3. Maintain full electrical service while building is occupied.
- 4. Maintain all life safety systems while building is occupied.
- 5. Maintain all phone and data service while building is occupied.

C. PROJECT SCHEDULE

- 1. Project schedule is available from contractor.

1.04 GENERAL REQUIREMENTS

- A. General Contractor shall review and be familiar with the site conditions.
- B. General Contractor shall provide all temporary and permanent driveway apron and alley permits for the duration of the construction if required. The General Contractor is to pay all fees required for processing permits and is to contact and comply with all authorities and jurisdiction required for permitting.
- C. General Contractor shall provide snow removal and generally maintain ingress and egress ensuring the site is clear and free of debris further maintaining accessibility that conforms with OSHA, Chicago Building Code, and emergency egress standards.
- D. General Contractor shall provide all required permits for street access for truck delivery from the local and state jurisdiction.
- E. General Contractor shall, at all times, provide access to the work for the Architect/Engineer of Record, Owner's Representative, and PBC, their employees or representatives and the representative of any other authority having jurisdiction. The General Contractor shall provide safe and proper facilities for access and inspection, including standby personnel as required.
- F. General Contractor shall be required to coordinate and complete the work within the contractual completion date(s) for the work as described within Section 00 73 00 - Supplemental Conditions and this section. The General Contractor shall be also held responsible for meeting all related provisions as described within this section.
- G. General Contractor shall coordinate access to the building at a mutually agreed upon location. Contractor may be required to remove AIS core from construction entry door and replace it with a construction core provided by the General Contractor for the duration of the project. At project conclusion, General Contractor shall reinstall original AIS core removed for construction.
- H. General Contractor shall survey the site and photograph the area of construction operations. Upon completion of the work the Contractor is to restore the area to the documented condition prior to the start of work or as otherwise indicated in the Contract Documents. The GC shall provide evidence of compliance.
- I. General Contractor is to replace all removed trees, bushes, ground covers and grass on the PBC's property disrupted, or otherwise damaged as a result of construction activities. Hard surfaces including but not limited to concrete pavement walks and asphalt surfaces shall be restored to condition prior to construction. Restoration of hard surfaces may require cleaning, repair or replacement.
- J. General Contractor shall coordinate and maintain all exit egress during construction as required by the City of Chicago code, other entities with jurisdiction, and as directed by PBC's Representatives. The General Contractor shall provide and maintain all materials and labor including barricades, construction fence, doors, partitions, and fire rated walls as required for safe egress. All costs for this work shall be included in the Contract Base Bid regardless of whether it is indicated in the Contract Documents or not.
- K. The Contractor is to set up and stage the entire project within the boundaries of the construction fence. The General Contractor is responsible for maintaining and modifying the fence as necessary and as approved in the Site Utilization Plan for the life of the project. Removal and disposal of the fence and project signage at the conclusion of the project is the responsibility of the General Contractor.

PART 2 - EXECUTION

2.01 SITE UTILIZATION PLAN

- A. Prior to Notice to Proceed, the Contractor shall prepare and submit to the PBC's Representative, and the Building Engineer, and the Architect/Engineer of Record for approval a Site Utilization Plan based on the Construction Operations Parameters outlined in this section. Mobilization on-site is not to occur until approval of the Site Utilization Plan is obtained. A preliminary meeting to review site elements and Construction Operations with PBC's Representative and Architect/Engineer of Record prior to submission of the Site Utilization Plan shall be held.
- B. The Site Utilization Plan shall be provided in a full-size graphic drawing electronic format (same size as the Construction Document drawings), printable in 11x17 inch format. Provide a separate plan for the site and for each floor of the existing building where work is being performed. Modifications to the format and sheet size shall be permitted if pre-approved by PBC's Representative and if proposed modifications shall facilitate preparation, presentation and review of the Site Utilization Plan. Electronic copies of the Contract Document drawings as appropriate shall be provided for this purpose upon request. The Site Utilization Plan shall at a minimum include the following elements:
1. Title block information including Building Name, Contract Number, General Contractor, Building floor/level information, and current plan date.
 2. Building footprint of both new (if applicable) and existing buildings, trees, landscaping, paving, drainage structures, existing and ornamental fencing and other important site features.
 3. Areas of staging for staff, drop-off points, existing building entrances and exits, staff parking areas, and traffic patterns for both construction and non-construction vehicles.
 4. Limits of construction and required construction fencing including any existing fencing to remain.
 5. Required covered construction barricade walkways.
 6. Areas allowed for staging purposes: construction personnel parking, material storage, and construction trailer(s). Such activities are to only take place in areas designated.
 7. Any specific site conditions required to be observed such as keeping alleys clear next to adjacent properties, and any other issues listed on the Construction Operations Site Plan.
 8. Areas allowed for site access gates.
 9. Areas of work within the existing building for the period of time covered by the Site Utilization Plan, coordinated with the Project Schedule. Each area should indicate planned beginning and end dates for work in that area. Areas where all work is completed are to be noted.
 10. Construction worker ingress/egress, material staging areas in the existing building.
 11. Proposed locations of temporary protection, barricades, and temporary walls within the existing building.
 12. Location of all temporary exits and path of travel.
 13. Indication of specific areas and their required contractual completion dates. If overtime work is required to meet the project dates it shall be at no additional cost to PBC.
 14. Locations of construction signage.
 15. Indicate truck routes to nearest highway. Deliveries shall not deviate from this route.
 16. Limits of phasing with associated sequencing and dates (if applicable).

2.02 SITE UTILIZATION PLAN UPDATES

- A. The General Contractor is required to submit for approval updated Site Utilization Plans whenever conditions in the current approved plan have changed. Approval is required prior to proceeding on any changed conditions not previously approved. Requirements for updating include the following:

1. In coordination with the project schedule provide detailed information regarding work in the existing building including phasing, vacation of existing in-use areas, and any other information requested by PBC's Representative, or Building Engineer.
2. Revision to the site plan to reflect changing conditions regarding construction fencing, ingress and egress, staff staging, construction deliveries, areas of stored materials, parking, and any other construction facility revisions.

END OF SECTION

**SECTION 01 23 00
ALTERNATES**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Description of Alternates.

1.02 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.
 - 2. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

1.03 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at PBC's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.
- C. Execute accepted alternates under the same conditions as other work of the Contract.

1.04 SCHEDULE OF ALTERNATES

- A. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.
- B. Alternate No.1: <Not Applicable >.
 - 1. Base Bid: <Insert brief description of base-bid requirement> [as indicated on Sheet <Insert title of sheet>] [and] [as specified in Section <Insert Section number> "<Insert Section title>."]]
 - 2. Alternate: <Insert brief description of alternate requirement> [as indicated on Sheet <Insert title of sheet>] [and] [as specified in Section <Insert Section number> "<Insert Section title>."]]

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 23 00

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability: The specified product or method of construction is no longer available.
 - b. Regulatory changes.
 - c. There is no condition under which the specified product or method of construction can be installed as shown on the Contract Documents.
 - d. There is no condition under which the specified product or method of construction can be provided within the time limits of the Contract.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project and to PBC.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. All Substitution Requests are to utilize the form 01 25 00.01 - Substitution Request Form.
- B. Refer to 01 60 00 - Product Requirements for additional requirements for product selection and substitution limitations.
- C. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to PBC.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- D. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Note explicitly any non-compliant characteristics.

- E. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms included in Section 00 25 01 - Substitution Request Form are adequate for this purpose, and must be used.
 - 2. Attach applicable supporting documentation. Provide point-by-point side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item.
- F. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.
- G. There shall be no time extensions granted due to time required for completion of the Substitution process either successfully or unsuccessfully.

3.02 SUBSTITUTION PROCEDURES

- A. Submittal Form: Submit substitution requests by completing the form in Section 01 25 01 - Substitution Request Form. Use only this form; other forms of submission are unacceptable.
- B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect/Engineer of Record, in order to stay on approved project schedule.
- C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect/Engineer of Record, in order to stay on approved project schedule.
 - 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the PBC through cost savings, time savings, greater energy conservation, or in other specific ways.
 - 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
- D. The Architect/Engineer of Record shall consider requests for substitutions which are received within thirty (30) days after the Notice to Proceed. Any such requests which are received by the Architect/Engineer of Record more than thirty (30) days after the date of the Notice to Proceed may be considered or rejected in the sole and absolute discretion of the Architect/Engineer of Record.

3.03 RESOLUTION

- A. Architect/Engineer of Record may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner. Architect/Engineer of Record will request additional information or documentation for evaluation within one week of receipt of a request for substitution.
- B. Architect/Engineer of Record will notify Contractor in writing of decision to accept or reject request within 14 days of receipt of the request, or 7 days of receipt of additional information or documentation, whichever is later..
 - 1. Architect/Engineer of Record's decision following review of proposed substitution will be noted on the submitted form.
 - 2. Use the product specified if the Architect/Engineer of Record cannot make a decision on the use of a proposed substitute within the time allocated.

END OF SECTION 01 25 00

**SECTION 01 25 00.01
SUBSTITUTION REQUEST FORM**

FACILITY/PROJECT: _____

TO: ARCHITECT/ENGINEER OF RECORD: _____

CC: PBC'S REPRESENTATIVE: _____

DATE SUBMITTED: _____

GENERAL CONTRACTOR: _____

SUBMITTING CONTRACTOR: _____
(if different from GC)

Address: _____

Contact Name: _____

Phone Number: _____

Email Address: _____

Referenced Specification Section: _____ **Paragraph:** _____

REQUESTED SUBSTITUTION:		In Lieu of Specified Manufacturer/Product:
Manufacturer Name		
Product/Model		
Manufacturer Address		
Contact Name		
Phone Number		

Reason For Substitution (select one of the following):

- The specified product or method of construction is no longer available.
- There is no condition under which the specified product or method of construction can be installed as shown on the Contract Documents.
- There is no condition under which the specified product or method of construction can be provided within the time limits of the Contract.
- Additional benefits (in cost, time, or performance) are available to the PBC with the requested substitute product.

Additional Explanation: _____

Attach applicable supporting documentation including, but not limited to, the following (select all that are included with this request):

- Itemized Comparison of the requested substitution with product specified. **REQUIRED**
- Performance and Test Data, including performance against specified reference standards. **REQUIRED**
- Manufacturer's Qualifications: Evidence of manufacturer qualifications and reputation for prompt delivery and efficiency in servicing products. **REQUIRED**
- Previous Installations: Attach list of not less than 5 similar projects on which proposed substitution was used. List projects in the Chicago area. List name and address of project, date of installation, and name, address, and phone number of Architect. **REQUIRED**
- Color Chart, illustrating Manufacturer's full range. **IF APPLICABLE**
- Installation Instructions. **IF APPLICABLE**
- Maintenance Instructions. **IF APPLICABLE**
- Changes in Work: Attach data relating to changes required in other work to permit use of proposed substitution and changes required in construction schedule. **IF APPLICABLE**
- Cost Data: Attach accurate cost data on proposed substitution in comparison with product specified. **IF APPLICABLE**

In making this request for substitution, the Submitting Contractor and General Contractor represents that:

- a. Contractor has examined the Contract Documents and investigated the proposed product/system and has determined that the proposed substitution is appropriate for the use intended for this Project, and shall meet or exceed the quality level of the specified product/system.
- b. Contractor shall provide the same warranties for the substituted product/system as required for the product/system specified.
- c. Contractor shall coordinate installation of accepted substitution into work and make changes to other Work that may be required for the Work to be complete with no additional cost to the PBC.
- d. Contractor waives all claims for additional costs related to accepted substitutions that may subsequently become apparent.
- e. Cost data is complete and includes all related costs for this Project.

Submitting Company Name:

Authorized Signature:

Printed Name: _____ **Date:** _____

REVIEWED BY INSTALLER: (company name): _____

Signature: _____ **Date:** _____

REVIEWED BY MANUFACTURER: (company name): _____

Signature: _____ **Date:** _____

REVIEWED BY GENERAL CONTRACTOR: (company name): _____

Signature: _____ **Date:** _____

Requests that are not complete will be returned by the AOR/EOR for additional information.

Requests that do not meet PBC requirements for acceptable substitutions will be rejected.

AOR/EOR REVIEW: The submitted information has been reviewed by the Architect/Engineer of Record and found to be complete and meets PBC'S requirements for acceptable substitution

Agreement By (Name):

AOR/EOR Firm Name: _____ ***Date:*** _____

PBC REVIEW:

Substitution **Accepted** by PBC: _____ Date: _____ Submit substituted product for review

Substitution **Rejected** by PBC: _____ Date: _____ Submit specified product for review

SECTION 01 32 16

CONSTRUCTION PROJECT SCHEDULE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Administrative and procedural requirements for preparation, submission, updating, and reporting of Contractor's construction schedule.

1.02 DEFINITIONS

- A. Activity: A discrete part (task or event) of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule have a definable start and stop and consume time and resources, such as people, materials, or facilities. Each activity shall be assigned a unique alphanumeric identification code (Activity ID).
 - 1. Controlling Activity: The first incomplete activity on the critical path.
 - 2. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times, and that contains zero or less total float.
 - 3. Predecessor Activity: An activity that precedes another activity in the network and may require completion prior to the start of a successor activity. A predecessor activity may control the start or finish of a successor activity.
 - 4. Successor Activity: An activity that follows another activity in the network. The start or finish of a successor activity may be controlled by the predecessor activity.
- B. Completion Date, Contract: The date specified in the Contract Documents for completion of the Work, or a revised date resulting from approved extensions of the Contract Time.
- C. Completion Date, Scheduled: The date projected or forecasted by the project schedule.
- D. Constraint: A factor or restriction imposed on, and that controls, an activity's start or finish date, regardless of other logic that may be applied to the activity.
- E. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved in writing by the PBC's Representative.
- F. Critical Path: The path (sequence) of activities that represent the minimum time required to complete the project and contains no float. A delay in any activity in the critical path will cause a delay in the completion of the project.
- G. Critical Path Method (CPM) Scheduling: A method of planning and scheduling a construction project that breaks the project down into activities that are arranged in a logical sequence, based on activity relationships, to determine the overall schedule and time required to successfully complete the project. CPM scheduling focuses attention on the critical path of activities that affect the completion date, or interim milestones, for the project.
- H. Data Date: The date to use as the starting point for schedule calculations. The data date shall be changed to the specified date when recording progress.
- I. Date, Early: The earliest date an activity can start or finish.

- J. Date, Late: The latest date an activity can start or finish without affecting successor activities, interim milestone date(s), and/or the project completion date.
- K. Duration: The estimated time needed to perform an activity or project.
- L. Float: The amount of time that an activity can be delayed without delaying the rest of the project and/or the project completion date. Float (also known as "Total Float") is owned by the project, is not for the exclusive use by or the benefit of the PBC or the Contractor, and is therefore a resource available to both the PBC and the Contractor on a first needed basis.
 - 1. Extensions of Contract Time shall not be granted unless the accepted delay affects the critical path, all available float has been used, and a time impact analysis has been performed.
- M. Free Float: The amount of time an activity can be delayed without delaying the early start of any successor activities.
- N. Gantt Chart: A graphic representation of a project schedule, with bars arranged in a chronological order, without relationships shown, and project calendar days shown along the horizontal axis.
- O. Logic Relationship: A dependency between two project activities.
- P. Milestone: An activity with zero duration that represents a clearly identifiable and significant point in the project.
- Q. Network Diagram: A graphic diagram of a CPM schedule, showing activities and the relationships among activities.
- R. Open End: The condition that exists when an activity has either no predecessor or no successor, or when an activity's only predecessor relationship is a finish-to-finish relationship or an activity's only successor relationship is a start-to-start relationship.
- S. Recovery Schedule: A revised critical path analysis and CPM schedule that demonstrates how the Contractor will recover the progress of Work that has fallen behind schedule in order to meet the approved milestone dates.
- T. Relationships: The interdependence among activities, linking activities to predecessors and successors.
- U. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled, or the identification of subcontractor performing the Work.
- V. Schedule: A set of activities, organized by relationships, that depict the plan for execution of the Project.
 - 1. Baseline Schedule: The approved plan for a project, against which construction progress is compared and deviations are measured. The baseline schedule may include dates related to interim milestones, completion of project phase(s), and other aspects of the Project.
 - 2. Initial Schedule: Schedule showing the proposed initial plan for the Project.
 - 3. Bi-Weekly Updated Schedule:
 - 4. Monthly Updated Schedule: Schedule incorporating the Project's actual progress every month during non-summer construction period.
 - 5. Revised Schedule: Schedule prepared and submitted by the Contractor that includes significant changes to the Contractor's plan and schedule.

6. Final Schedule: The last schedule update, containing the actual start and finish dates for every activity in the project schedule. The Contractor must certify the final schedule's accuracy.

1.03 SUBMITTALS

- A. Schedule Narrative: Submit a written narrative with the construction schedules, including updates, as indicated.
- B. Contractor's Construction Schedule: Using PBC's scheduling software (or other format approved by the PBC's Representative), submit the following:
 1. Baseline Schedule: Submit an electronic copy of the baseline schedule, showing the entire construction period, within the timeframe specified.
 2. Updated Schedule: Submit updates to the construction schedule at required intervals.
 3. Revised Schedule: Submit revised schedules as required or as requested by the PBC's Representative.
- C. Qualifications: Submit qualifications for project scheduler not less than seven (7) days prior to Notice of Award. Include resume, years of experience, certifications, licenses, and examples of prepared schedules.
 1. The PBC's Representative will approve or reject the project scheduler proposed by the Contractor and will notify the Contractor in writing of their approval or rejection within four (4) days of receipt of the required documentation.
 - a. If rejected by the PBC's Representative, the Contractor shall submit documentation for a replacement project scheduler within three (3) days of receipt of written notice of rejection.
 - b. This procedure shall be followed until a project scheduler is approved by the PBC's Representative.
 2. The project scheduler must be approved by the PBC's Representative prior to Notice of Award.

1.04 QUALITY ASSURANCE

- A. Qualifications - Project Scheduler: Employ an experienced project scheduler, skilled in the application of network techniques for construction projects, with not less than three (3) years' experience in CPM scheduling and reporting, including experience in the creation and maintenance of CPM construction project schedules utilizing the specified software on not less than three (3) projects of comparable scale and complexity to this Project. If skilled personnel are not employed, engage the services of a consultant with the same experience and capabilities to provide planning, evaluation, and reporting of the CPM schedule for the duration of the Project.
 1. The project scheduler shall be responsible for development of the project schedule, implementing required updates and requested changes to the schedule, and maintenance of the project schedule.
 2. The project scheduler shall cooperate with the PBC's Representative, be on the project site periodically, and attend all meetings related to Project progress, alleged delays, and time impacts as required to accurately modify and update the construction project schedule.
 3. Upon approval by the PBC's Representative, the project scheduler shall be maintained throughout the Project and shall not be replaced without written approval from the PBC's Representative.
 - a. Should the project scheduler voluntarily leave the Contractor's staff, the Contractor shall submit to the PBC'S a resume and qualifications for a replacement project scheduler within five (5) days.
 4. The PBC'S reserves the right to reject project scheduling staff or consultant(s) proposed by the Contractor.

5. The PBC'S reserves the right to request replacement of the project scheduler at any point during the Project should the project schedule, in the opinion of the PBC'S, not meet the degree of detail described in the Contract Documents.

B. Project Scheduling Conference: Prior to submission of baseline schedule, coordinate a project scheduling conference with the PBC'S's Representative and Architect/Engineer of Record to review methods and procedures related to the construction schedule including, but not limited to, the following:

1. Verification of availability of qualified personnel needed to develop and update schedule.
2. Phasing, work stages, building requirements, milestones, and partial PBC'S occupancy.
3. Delivery dates for the PBC'S-furnished products, if any.
4. Schedule for work of the PBC'S's separate contracts, if any.
5. Time required for review of submittals and resubmittals.
6. Time required for fabrication and delivery of key and long lead items.
7. Requirements for tests and inspections by independent testing and inspecting agencies.
8. Time required for completion and startup procedures, including commissioning activities.
9. Closeout procedures and documentation, including project record documents and warranties.
10. Review and finalize list of construction activities to be included in schedule.
11. Procedures for updating schedule.
12. Building's programmatic schedule (which should be reflected by assigning a calendar).

1.05 PAYMENT

A. Contractor's Application for Payment - Initial: Approval of the first Application for Payment submitted by the Contractor shall be withheld until the Contractor has an approved baseline construction schedule.

B. Contractor's Application for Payment - Subsequent: Approval of subsequent Applications for Payments shall be withheld until the Contractor provides required updates of the construction schedule.

PART 2 - PRODUCTS

2.01 BASELINE CONSTRUCTION SCHEDULE

A. Delivery: Within seven (7) days of receipt of Notice of Award, submit a preliminary baseline construction schedule to the PBC'S's Representative for review and approval or rejection.

1. The preliminary baseline construction schedule shall be created in the PBC'S's scheduling software, and shall be sorted by early start and total float.

B. Preparation: The preliminary baseline construction schedule shall include all work by subcontractors, sub-subcontractors, suppliers, and other entities contracted to provide services or manpower required to complete the Work.

1. Narrative: With the preliminary baseline construction schedule, a written narrative shall be provided to the PBC'S's Representative. The narrative shall describe the Project sequencing, calendars used, critical path, PBC'S constraints, phasing showing existing operational conditions, resource utilizations, major equipment used, weather days accounted for, risks analysis, proposed building engineer's overtime request, and any other PBC'S applied or required resources.

C. Review: The preliminary baseline construction schedule shall be reviewed by the PBC'S's Representative and approved or rejected. The PBC'S's Representative shall notify the Contractor in writing of their approval or rejection of the preliminary baseline construction schedule within four (4) days of receipt of initial construction schedule from the Contractor.

1. If rejected by the PBC'S's Representative, the Contractor shall submit a revised initial construction schedule within three (3) days of receipt of written notice of rejection.
 2. This procedure shall be followed until the preliminary baseline construction schedule is acceptable to the PBC'S's Representative.
 - a. When directed by the PBC'S's Representative, the Contractor shall add cost- and resource-loading to the baseline construction schedule
- D. Upon review and approval of the preliminary baseline construction schedule by the PBC'S's Representative, the preliminary baseline construction schedule, as approved, shall become the Project's baseline construction schedule, including cost- and resource-loading.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Schedule, General: The PBC'S requires a schedule using the CPM. The schedule shall be created using the PBC'S's latest Primavera format (or other format acceptable to the PBC'S), and shall be used to monitor construction progress.
1. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of the PBC'S's Representative or Architect/Engineer of Record's approval of the schedule.
 2. Lack of an approved schedule, or qualified scheduling personnel, shall prevent the PBC'S's Representative from properly evaluating progress of the Work and reviewing progress payments.
 3. Failure to provide the information specified shall result in rejection of the baseline construction schedule, bi-weekly schedule updates, and revised schedules.
 4. When revisions requested by the PBC'S's Representative are not addressed in subsequent updates to the schedule, the PBC'S may withhold approval of Contractor's Application for Payment each pay period until the required revisions are incorporated into the schedule.
 5. The Contractor shall monitor and update the CPM schedule, and report progress to the PBC'S's Representative.
- B. Delivery: Within seven (7) days of approval of Project baseline construction schedule, submit a cost- and resource-loaded construction schedule to the PBC'S's Representative for review and approval or rejection.
1. Review: Within four (4) days of receipt of the Contractor's construction schedule, the PBC'S's Representative shall review and approve or reject the Contractor's construction schedule, and notify the Contractor in writing of their approval or rejection.
 - a. If rejected by the PBC'S's Representative, the Contractor shall submit a revised construction schedule within three (3) days of receipt of written notice of rejection.
 - b. This procedure shall be followed until the Contractor's construction schedule is approved by the PBC'S's Representative.
- C. Narrative: With the Contractor's construction schedule, including each update to the schedule, a written narrative shall be provided to the PBC'S's Representative. The narrative shall describe the Project sequencing, calendars used, critical path, PBC'S constraints, phasing showing existing operational conditions, resource utilizations, major equipment used, weather days accounted for, risks analysis, proposed building engineer's overtime request, and any other PBC'S applied or required resources.
- D. Time Frame: Extend schedule from the date established for the Notice of Award to the date identified for Final Acceptance.
1. Use "one workday" as the unit of time for individual activities. Include nonworking days and holidays incorporated into the schedule in order to coordinate with the established Contract Time.

- E. Activities: Include work to be performed by the Contractor and its subcontractors or suppliers, the PBC'S, other contractors, and/or other entities as required for successful completion of the Project. Indicate the estimated time duration, sequence requirements, and relationship for each activity in relation to other activities.
1. Duration: Define activities so no activity is longer than 14 days, unless the PBC'S's Representative has agreed to a greater time period in writing. Exceptions include long lead items and deliveries.
 2. Relationships: All activities are to be linked to each other with predecessors/successors relationships so that the only activity without predecessors is the first activity (Notice of Award) on the schedule, and the only activity without successors is the last activity on the schedule (Final Completion).
 - a. Include as many predecessor/successor relationships as required to produce a chain of logic that automatically and accurately adjusts as status of the Work changes.
 - b. The following relationship types shall not be used:
 - 1) Lags.
 - 2) Open ended relationships.
 - 3) Constraints.
 3. Attributes: For each activity in the schedule, include the following:
 - a. Unique activity description, using attributes such as type of work and location as required to distinguish activities.
 - b. Contractor shall create each activity to reside within the WBS template defined by the PBC'S.
 - c. Resource values for cost, major equipment, and manpower. The sum of costs assigned to activities shall equal the total Contract Sum.
 - d. Logically assign each activity to a calendar.
 - 1) The number of building days may change during the Project's duration. Any changes in the number of building days shall be reflected in the schedule update immediately following receipt of a written notification of the change from the PBC'S's Representative.
 - e. Weather dependent activity durations are calculated using the NOAA 10 year average. In order to properly compute any anticipated weather delays, add the appropriate number of working days to each weather dependent activity based on the NOAA 10 year average.
 4. Milestones: Milestones are activities of zero day's duration that represent a key point in the Project. Include in the Project schedule as indicated in the Contract Documents and as otherwise required.
 - a. Include the following, at a minimum:
 - b. Include the following as applicable to the Project and as directed by the PBC'S's Representative:
 - 1) Start of heating season.
 - 2) End of heating season.
 - 3) Start/end of Project phases.
 - 4) Building enclosure complete (dry-in).
 - 5) HVAC system complete and operational.
 5. Building Activities, Breaks, and Holidays: Include observed holidays, building holidays, and building activities that affect construction-related activities. These activities include:
 6. Procurement Activities: Include procurement process activities for long-lead items and major items as separate activities in the schedule. Procurement activities shall include submittals, approvals, purchasing, fabrication, delivery, installation, and start-up activities (if required).
 7. Submittal Review Time: Include review and resubmittal times indicated in Section 01 30 00 - Administrative Requirements in the schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 8. PBC'S-Furnished Products: Include a separate activity for each product, with delivery date indicating the earliest possible delivery date.

9. Preliminary Acceptance: Indicate completion in advance of date established for Preliminary Acceptance, and allow time for inspections, receipt of Certificate of Occupancy, and other administrative procedures necessary for Architect/Engineer of Record's and PBC'S's Representative review and certification of Preliminary Acceptance.
 10. Punch List and Final Acceptance: Include not more than 60 days following Preliminary Acceptance for completion of minor (punch list) work and Final Acceptance.
 11. Miscellaneous Activities: Include and indicate the following as separate activities (as applicable):
 - a. Mobilization and demobilization.
 - b. Receipt of required permits, temporary closure of public way (if required), and inspections by authorities having jurisdiction.
 - c. Installation and removal of temporary facilities and utilities.
 - d. Utility notification(s), interruption(s), and relocation(s).
 - e. HVAC system start-up and commissioning.
 - f. Project record document preparation and submission.
 - g. Demonstration and training, as required.
- F. Recovery Schedule: When a periodic update indicates the Work is seven (7) or more days behind the approved schedule, submit, no later than the next schedule update, a separate recovery schedule indicating a workable plan to come into compliance with the approved schedule and complete the Project, including achieving interim milestone dates, by the previously approved date. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance with the approved schedule and narrative, and date by which recovery shall be accomplished. The PBC'S may withhold a portion of progress payments until an acceptable recovery schedule is submitted.

PART 3 - EXECUTION

3.01 GENERAL

- A. The Contractor has the duty to deliver to the PBC'S an approved construction schedule. The Contractor shall not assert any claim whatsoever for any delay or additional cost incurred in connection with the development, maintenance, and updating of the schedule. No payment shall be awarded to the Contractor until a baseline schedule has been submitted and approved.

3.02 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the Schedule of Values, Submittal Schedule, progress reports, payment requests, and other required schedules and reports.

3.03 ELECTRONIC SCHEDULING

- A. Scheduling Software: Contractor shall use the PBC'S's scheduling software (or other format approved by the PBC'S's Representative) for creating the baseline schedule, preparing all bi-weekly schedule updates, monthly schedule updates, revised schedules, and preparing recovery schedules as required.

3.04 REVIEWS

- A. General: Review and acceptance of the Contractor's construction schedule, including any revisions and/or updates, by the PBC'S's Representative and Architect/Engineer of Record is advisory only and does not relieve the Contractor of the responsibility for accomplishing each portion of the Work within the time provided by the Contract Documents. Omissions and errors in the accepted schedule, including any revisions and/or updates, shall not excuse performance that is not in compliance with the Contract Documents.

- B. Baseline Construction Schedule: Immediately following submission of the preliminary baseline construction schedule, the PBC'S's Representative shall coordinate a meeting with the Contractor and Architect/Engineer of Record to review the submitted schedule.
 - 1. All issues regarding the schedule shall be reviewed and resolved at this meeting.
 - 2. If issues remain unresolved at the end of the meeting, the PBC'S's Representative shall establish the date and time for a second meeting
- C. The PBC'S's Representative shall review each submitted schedule and return the reviewed schedule, including any comments and required revisions, to the Contractor within the following time frames:
 - 1. Baseline Schedule: Four (4) days of receipt by the PBC'S's Representative.
 - 2. Updated Schedule: Four (4) days of receipt by the PBC'S's Representative.
 - 3. Revised Schedule: Four (4) days of receipt by the PBC'S's Representative.
- D. A schedule found to be impractical for any reason shall be revised and resubmitted by the Contractor within three (3) days.

3.05 UPDATES

- A. The Contractor's construction schedule shall be updated on a bi-weekly basis or monthly basis to indicate the status of the Project and progress of the Work, as well as the plan for completion of the Project. The updated schedule shall include a new data date. Indicate the projected days remaining for each activity in the schedule as the Work progresses.
 - 1. The updated schedule and update narrative shall be submitted within two (2) days following the data date.
 - 2. Coordinate a meeting two days following the data date to review, and to resolve any issues with, the updated schedule. Attendees shall include the Contractor, PBC'S's Representative, and Architect/Engineer of Record.
- B. Update Narrative: With each schedule update, submit a written narrative listing all activities that have been revised since the last schedule update. Also include a list of itemized explanations of all changes to the construction schedule, including all activities that have been added to or deleted from the schedule, and logic changes. This narrative shall be created with a word processing program and shall be submitted as portable document format (PDF).

3.06 REVISIONS

- A. PBC'S Requested Revisions: The PBC'S retains the right to request a revised schedule for reasons that include, but are not limited to, the following:
 - 1. A projected or forecasted delay to critical activities.
 - 2. Delay of a non-critical activity that changes the course of the critical path.
 - 3. A Change Order or RFI that affects the completion date or sequence of activities.
- B. Contractor Requested Revisions: The Contractor shall notify the PBC'S's Representative in writing of any requested changes to the schedule, including changes to the logic or duration of activities. The written request shall clearly outline the reason(s), in detail, for each change requested.
 - 1. All Contractor requested revisions to the schedule including, but not limited to, any change to the schedule logic, order or sequence of activities, or duration of activities, shall be approved by the PBC'S's Representative in writing before the revisions are implemented and the schedule revised.

3.07 CONTRACT MODIFICATIONS

- A. Extensions of the Contract Time shall not be allowed unless approved in writing by the PBC'S's Representative.
- B. Scheduling of approved changes in the Work is the responsibility of the Contractor.
- C. With each proposed contract modification, prior to initiation of related work, submit a separate schedule analysis to the PBC'S's Representative for review. Each schedule analysis shall include all activities required to complete the proposed change and indicate the effect of the proposed change on the overall project schedule.
 - 1. The schedule analysis shall indicate all affected and revised activities, the duration of the change, the cost(s) of the change, any constraints that result from the change, and whether the change is concurrent or sequential.
 - 2. This analysis shall be attached to any Contractor proposal if time extensions are requested.
- D. If the PBC'S's Representative accepts the proposed revision, including the schedule analysis, the revised schedule, including all activities required to incorporate the change and complete the Project, shall become the basis for the next bi-weekly update to the schedule.

3.08 DELAYS AND EXTENSIONS OF TIME

- A. The Contractor shall execute its work as required to maintain progress of the Work in accordance with the accepted construction schedule. Should the Contractor fail to maintain progress according to the approved schedule, the Contractor shall take measures necessary to bring progress of the Work into line with the schedule at no additional cost to the PBC'S.
- B. The Contractor shall be responsible for requesting an extension of the Contract Time due to a delay or occurrence that negatively impacts, in the opinion of the Contractor, the critical path of the Project. All requests shall be submitted to the PBC'S's Representative in writing within seven (7) days of the delay.
 - 1. Failure to submit a written request to the PBC'S's Representative within the specified time period shall result in rejection of the request for extension of the Contract Time and any related request(s) for a change to the Contract Sum.
 - 2. Delays to non-critical activities (those with float) shall not be considered a basis for either a change in the Contract Time or a change in the Contract Sum.
 - 3. Extensions of the Contract Time shall not be considered accepted and shall not be incorporated into the schedule unless accepted in writing by the PBC'S's Representative.
 - a. When the PBC'S's Representative finds the Contractor is entitled to an extension in Contract Time, the total number of days extension shall be based upon the current analysis of the schedule and upon the data relevant to the extension.
 - b. When agreement to an acceptable extension in time cannot be reached, the Contractor shall incorporate schedule changes in accordance with the PBC'S's Representative's direction.
- C. With each request for an extension of the Contract Time, a separate schedule analysis and written narrative shall be submitted to the PBC'S's Representative.
 - 1. The schedule analysis shall be in the form of a bi-weekly schedule update, with adjusted activity durations and appropriate resource-loading, and logic relationships for the added scope. The schedule analysis shall clearly indicate how all of the schedule's activities are affected, including float related to the affected activities, and how the Project's completion date is impacted, by the requested time extension.
 - 2. The written narrative shall list all activities that are to be added to or deleted from the schedule, as well as all activities that are to be changed in any way. The narrative shall include a list of itemized explanations of all changes to the schedule.

3.09 DISTRIBUTION

- A. Distribution: Distribute copies of approved schedule to Architect/Engineer of Record, PBC'S's Representative, subcontractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility and as otherwise directed by the PBC'S's Representative.
1. Post large scale copy of the baseline schedule in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.10 REPORTS

- A. General: Reports shall be created and prepared, and electronically submitted within the PBC'S's contract management software (Primavera CM).
- B. Daily Construction Reports: Prepare daily construction reports recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. Approximate count of personnel and equipment at Project site.
 3. All visitors the job site. Include each person's name and name of company.
 4. Material delivery information.
 5. High and low temperatures and general weather conditions.
 6. Accidents.
 7. Meetings and significant decisions.
 8. Unusual events (refer to special reports).
 9. Stoppages, delays, shortages, and losses.
 10. Meter readings and similar recordings.
 11. Emergency procedures.
 12. Orders and requests of authorities having jurisdiction.
 13. Change Orders received and implemented.
 14. Bulletins received.
 15. Services connected and disconnected.
 16. Equipment or system tests and startups.
 17. All work performed that day on a time and materials basis. Include hours expended for labor and equipment and any material(s).
 18. Any proposed change order work not yet approved, completed that day.
- C. Special Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise the PBC'S's Representative in advance when these events are known or predictable.

END OF SECTION 01 32 16

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Delegated Design
- F. Control of installation.
- G. Mock-ups.
- H. Tolerances.
- I. Manufacturers' field services.
- J. Defect Assessment.

1.02 REFERENCE STANDARDS

- A. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2017.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect/Engineer of Record and to Contractor.
 - 1. Test report submittals are for Architect/Engineer of Record's knowledge as construction contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for PBC's information.
- C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect/Engineer of Record, in quantities specified for Product Data.
 - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the PBC's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

- E. Delegated-Design Documents: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time specialist and responsible officer.
 - 2. Provide documentation that the agency has experience and capability to conduct testing and inspecting indicated.
 - 3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

1.05 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer of Record before proceeding.
- D. Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- E. Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from the publication source and make them available on request.
- F. Abbreviations and acronyms are frequently used in the Project Manual and other Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Contract Documents, they mean the recognized name of these entities.

1.06 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Testing and inspecting services are intended to verify compliance with requirements specified. These services do not relieve the Contractor of the responsibility for compliance with the Contract Documents.
- B. PBC will employ and pay for services of an independent testing agency to perform certain specified testing and inspections as indicated in individual specifications sections.

1. Fully cooperate and coordinate with PBC's testing agency. Provide a minimum of 24 hours advance notice to allow scheduling of tests. Do not cover up work requiring testing.
 2. The PBC will furnish the Contractor with names, addresses, and telephone numbers of testing agencies engaged by the PBC and a description of the types of testing and inspecting they are engaged to perform.
- C. Unless explicitly indicated as PBC engaged testing, Contractor shall employ and pay for services of an independent testing agency to perform other specified testing and inspections.
- D. Contractor Employed Agency:
1. Do not employ the same entity engaged by the PBC unless agreed to in writing by the PBC.
- 1.07 DELEGATED DESIGN
- A. Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
- B. If criteria indicated are not sufficient to perform services or certification required, request clarification from Architect/Engineer of Record before proceeding.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

- 3.01 CONTROL OF INSTALLATION
- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer of Record before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.
- 3.02 MOCK-UPS
- 3.03**
- A. See 01 62 10 - Pre-Construction Project Mock-Up for full-scale, integrated, project mock-up.

- B. Before installing portions of the Work where mock-ups are required, for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- C. Construct mock-ups in location and size indicated or, if not indicated, as directed by Architect/Engineer of Record.
- D. Accepted mock-ups establish the standard of quality the Architect/Engineer of Record will use to judge the Work. Maintain mock-ups during construction in an undisturbed condition.
- E. Notify Architect/Engineer of Record five (5) working days in advance of dates and times when mock-ups will be constructed.
- F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- G. Obtain Architect/Engineer of Record's approval of mock-ups before starting work, fabrication, or construction.
- H. Where mock-up has been accepted by Architect/Engineer of Record and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect/Engineer of Record.
- I. Where possible salvage and recycle the demolished mock-up materials.

3.04 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer of Record before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.05 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect/Engineer of Record and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect/Engineer of Record and Contractor of observed irregularities or non-conformance of Work or products.
 - 5. Perform additional tests and inspections required by Architect/Engineer of Record.
 - 6. Submit reports of all tests/inspections specified to Contractor, Architect/Engineer of Record, and authorities having jurisdiction, when they so direct.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.

2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:

1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
4. Notify Architect/Engineer of Record and Testing Agency 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with PBC's Testing Agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
7. Coordinate sequence of activities to accommodate required testing and inspection services with a minimum of delay and to avoid removing and replacing construction to accommodate testing and inspecting.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect/Engineer of Record.

F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.06 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and other inspections as applicable, and to initiate instructions when necessary.

B. Report, in writing, observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.07 DEFECT ASSESSMENT

A. Replace work or portions of the work not conforming to specified requirements.

3.08 REPAIR AND PROTECTION

A. On completion of testing, inspecting, sample taking, and similar activities, repair damaged construction and restore substrates and finishes.

B. Repair and protection are Contractor's responsibility, regardless of assignment of responsibility for testing and inspections.

END OF SECTION 01 40 00

SECTION 01 42 16

DEFINITIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section supplements the definitions contained in the Conditions of the Contract.
- B. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

- A. Approved: When used in conjunction with Architect/Engineer of Record's action on Contractor's submittals, applications, and requests, the term "Approved" is limited to Architect/Engineer of Record's duties and responsibilities as stated in the General Contracting Services Agreement.
- B. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- C. Experienced: When used with the term "installer," means having successfully completed a minimum of five (5) previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- D. Furnish: To supply, deliver to Project site, unload, and inspect for damage.
- E. Indicated: Refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.
- F. Install: To unpack, temporarily store, assemble, erect, apply, place, anchor, finish, cure, protect, clean, start up, and make ready for use.
- G. Installer: A contractor or another entity engaged by the Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.
- H. Owner: City of Chicago.
- I. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.
- J. Preliminary Acceptance: The date on which Architect/Engineer of Record and the PBC have determined that the work required under the Contract Documents has been essentially completed for the Project (except for Punch List Work), such that the Users may occupy and fully use the Work. If the nature of the Work requires a Certificate of Occupancy be issued,

Preliminary Acceptance will typically coincide with the date of issuance of the City's Certificate of Occupancy.

- K. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- L. Project Manual: The book-sized volume, or volumes, that includes the procurement requirements, the contracting requirements, and the technical specifications.
- M. Project Site: The space available for performing construction activities, either exclusively or in conjunction with others performing other work as part of this Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which Project is located.
- N. Provide: To furnish and install complete and ready for the intended use.
- O. Regulations: Includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- P. Supply: Same as Furnish.
- Q. Substantial Completion: Same as Preliminary Acceptance.
- R. User: The AIS staff

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01 42 16

SECTION 01 50 03

TEMPORARY FACILITIES AND CONTROLS - RENOVATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Project identification sign.
- I. Field offices.

1.02 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.
- B. NFPA 70 - National Electrical Code; 2017.

1.03 TEMPORARY UTILITIES

- A. Use Charges: Cost or use charges for temporary facilities (where not indicated to be provided by the AIS) are not chargeable to the AIS and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
 - 1. The AIS's construction forces.
 - 2. Occupants of Project.
 - 3. Architect/Engineer of Record.
 - 4. Testing agencies.
 - 5. Personnel of authorities having jurisdiction.
- B. AIS will provide the following without metering and without payment of use charges by Contractor
 - 1. Electrical power , consisting of connection to existing facilities.
 - a. Comply with NECA, NEMA, and UL standards and regulations for temporary electric service.
 - b. Install service to comply with NFPA 70.
 - 2. Water supply, consisting of connection to existing facilities.

- C. Use of the AIS's existing utility service will be permitted, as long as equipment is maintained in a condition acceptable to the AIS.
- D. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
- E. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
 - 1. Obtain required certifications and permits.
 - 2. Provide copies of reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

1.04 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office and field personnel, as required for adequate Project communication..

1.05 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.06 ELEVATORS, STAIRS, AND HOISTS

- A. Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- B. Use of the AIS's existing elevators will be permitted, as long as elevators are cleaned and maintained in a condition acceptable to the AIS.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
 - 2. Comply with loading restrictions of existing elevator.
- C. Use of the AIS's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to the AIS.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

1.07 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
 - 1. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard.
 - 2. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building. Comply with authorities having jurisdiction.

- C. Provide barriers and covered walkways on building property to the satisfaction of the AIS at all walkways and entrances/exits. Covered walkways shall extend a minimum of 20 feet from entrances. Barriers shall be provided to restrict patch of travel to protected areas.
 - 1. Construct covered walkways using scaffold or shoring framing.
 - 2. Provide wood-plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe, clean, and well-drained walkways, and similar provisions for protection and safe passage.
 - 3. Paint and maintain in a manner approved by the AIS and Architect/Engineer of Record.
 - 4. For safety barriers, sidewalk canopies, and similar uses, provide minimum 5/8-inch thick exterior plywood.
- D. Provide protection for trees and plants designated to remain. Install temporary fencing as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion. Replace damaged plants.
- E. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction..

1.08 FENCING

- A. Construction: Commercial grade chain link fence.
 - 1. 9 gauge 2" galvanized steel mesh, 8 feet high
 - 2. 3" outside dimension galvanized end posts with caps
 - 3. 2" outside dimension galvanized line (intermediate) posts
 - 4. 10 ft. max. center to center, with caps
 - 5. 1-5/8" outside dimension galvanized top and bottom rails
 - 6. 12 gauge min. galvanized ties
 - 7. Required fittings for proper installation of above.
 - 8. Opaque fabric meshing affixed to fence as required by Chicago Municipal Code Section 13-32-125.
- B. Provide 8 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.09 EXTERIOR ENCLOSURES

- A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 - 2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
 - 3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
 - 4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
 - 5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.
 - 1. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.

2. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer.

1.10 INTERIOR ENCLOSURES AND PROTECTION

- A. Provide temporary partitions and ceilings as indicated to separate work areas from AIS-occupied areas, to prevent penetration of dust, noise, odors, and moisture into AIS-occupied areas, and to prevent damage to existing materials and equipment.
- B. Construction (where adjacent to occupied areas): Framing and gypsum AIS sheet materials with closed joints and sealed edges at intersections with existing surfaces:
 1. 1/2-inch fire-retardant plywood is permitted on construction side.
 2. Insulate partitions to provide noise protection to occupied areas.
 3. Paint surfaces exposed to view from AIS-occupied areas.
- C. Construction (where concealed from occupied areas): dustproof, floor-to-ceiling partitions of not less than nominal 4-inch studs, 2 layers of 3-mil polyethylene sheets, inside and outside temporary enclosure.
- D. Protect floors with 2 layers of 3-mil polyethylene sheets, extending sheets 18 inches up the side walls. Overlap and tape full length of joints. Cover floor with 3/4-inch fire-retardant plywood.
- E. Equip partitions with dustproof doors and security locks. Maintain water-dampened foot mats at doors.
- F. Construct a vestibule and airlock at each entrance to temporary enclosure with not less than 48 inches between doors.

1.11 HEATING, VENTILATION, AND COOLING

- A. Provide temporary heating, ventilation, and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that shall not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- B. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.

1.12 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and AIS's operations from unauthorized entry, vandalism, or theft.
- B. Provide temporary enclosures with lockable entrances to protect partially completed areas.

1.13 FIRE PROTECTION

- A. Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
 - a. Field Offices: Class A stored-pressure water-type extinguishers.

- b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
 - c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
 4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
 5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
 6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 7. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
 8. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

1.14 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and AIS.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Do not allow vehicle parking on existing pavement.

1.15 DEWATERING FACILITIES

- A. Comply with requirements in applicable Division 31 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.
- B. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.
- C. Dispose of rainwater in a lawful manner that shall not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
- D. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
- E. Remove snow and ice as required to minimize accumulations.

1.16 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers of adequate size to handle waste from construction operations. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
- E. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste.
- F. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.

1.17 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction as indicated by AIS.
 - 1. Standard sign is 4'-0" x 8'-0" 1/2 inch thick,
 - 2. Sign vendor will be identified by the AIS's Representative.
- B. Erect on site at location established by Architect/Engineer of Record.
- C. Provide temporary signs to indicate directional information to construction personnel and visitors; and as required by law.
- D. No advertising signage is permitted. Do not allow installation of unauthorized signs.

1.18 FIELD OFFICES

- A. AIS will provide space in the existing facilities for use as Contractor's Field Office.
- B. Office: Prefabricated or Mobile Units with lockable entrances, operable windows, on foundations adequate for normal loading. Offices to be weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture.
 - 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
- C. Provide space for Project meetings, with table and chairs to accommodate 10 persons.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect/Engineer of Record. Provide materials suitable for use intended.

2.02 EQUIPMENT

- A. General: Provide equipment suitable for use intended.
- B. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- C. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

PART 3 - EXECUTION - NOT USED

3.01 GENERAL

- A. Refer to 01 70 00 - Execution Requirements for additional requirements for the execution of temporary facilities.
- B. Locate facilities where they shall serve Project adequately and result in minimum interference with performance of the Work.
- C. Relocate temporary services and facilities as required by progress of the Work.
- D. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- E. Engage appropriate local utility company or authorized personnel to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
- F. Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- G. Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that shall minimize complaints from persons or firms near Project site.

3.02 PREPARATION

- A. Arrange with utility company, the AIS, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Provide and plan for adequate capacity for temporarily facilities at each stage of construction.
- C. Obtain easements to bring temporary utilities to Project site where the AIS's easements cannot be used for that purpose.

3.03 INSTALLATION

- A. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
 - 1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths shall not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
 - 2. Provide warning signs at power outlets other than 110 to 120 V.
 - 3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
 - 4. Provide metal conduit enclosures or boxes for wiring devices.
 - 5. Provide 4-gang outlets, spaced so 100-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.
- B. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- C. Water Service: Provide rubber hoses as necessary to serve Project site..
 - 1. Use trigger-operated nozzles for water hoses, to avoid waste of water.
- D. Fencing: Unless otherwise indicated on the drawings, posts are to be set at a depth of no less than 3'0" below ground level and anchored in concrete to full depth. Posts shall be properly capped. End posts and line posts will be evenly spaced at a distance of no more than 10'-0" apart, center to center. Fence shall be erected with top and bottom rails of 1-5/8" o.d. and ties of no less than 12 gauge, securing the galvanized steel mesh to the rails. The bottom rail shall be placed at a distance of no greater than 2" from the bottom of the posts and shall be secured by the use of proper fittings to corner and intermediate posts. Top rail shall run continuously through line post caps and shall be fastened to end posts no less than 2" from the top by the use of proper fittings.

3.04 CLEANING

- A. Provide cleaning of temporary facilities on a daily basis; including, but not limited to: temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.
- B. Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
- C. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- D. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

3.05 CLOSEOUT ACTIVITIES

- A. Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Preliminary Acceptance.

- B. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility.
- C. Materials and facilities that constitute temporary facilities are the property of Contractor. The AIS reserves right to take possession of Project identification signs.
- D. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
- E. Prior to Preliminary Acceptance, restore AIS's existing facilities to condition established before initial use.
- F. Prior to Preliminary Acceptance, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
- G. Remove all support facilities near and prior to Preliminary Acceptance. Personnel remaining after Preliminary Acceptance will be permitted to use permanent facilities, under conditions acceptable to the AIS.
- H. Clean and repair damage caused by installation or use of temporary work.
- I. Restore new permanent facilities used during construction to specified condition.
- J. Refer to final cleaning requirements in Section 01 77 00 - Closeout Procedures

END OF SECTION 01 50 03

SECTION 01 50 05

TEMPORARY FACILITIES AND CONTROLS - NEW CONSTRUCTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Pest control.
- F. Security requirements.
- G. Vehicular access and parking.
- H. Waste removal facilities and services.
- I. Project identification sign.
- J. Field offices.

1.02 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.
- B. NFPA 70 - National Electrical Code; 2017.

1.03 TEMPORARY UTILITIES

- A. Use Charges: Cost or use charges for temporary facilities (where not indicated to be provided by the AIS) are not chargeable to the AIS and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
 - 1. The AIS's construction forces.
 - 2. Occupants of Project.
 - 3. Architect/Engineer of Record.
 - 4. Testing agencies.
 - 5. Personnel of authorities having jurisdiction.
- B. Provide and pay for all electrical power, lighting, water, heating and cooling, ventilation, and sewer service required by all entities for construction purposes at the Project site.
 - 1. Install electrical service to comply with NFPA 70.
- C. Implementation and Termination Schedule: Within 15 days of date established for submittal of Contractor's Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.

- D. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
- E. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
 - 1. Obtain required certifications and permits.
 - 2. Provide copies of reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

1.04 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office and field personnel, as required for adequate Project communication.
- B. Provide, maintain, and pay for broadband and WiFi capability at field offices.

1.05 TEMPORARY SANITARY FACILITIES AND PEST CONTROL

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
 - 2. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
 - 3. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.
 - a. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
 - 4. Drinking-Water Facilities: Provide bottled-water, drinking-water units.
 - 5. Locate toilets and drinking-water fixtures so personnel need not walk more than two stories vertically [or 200 feet horizontally] to facilities.
 - 6. Maintain daily in clean and sanitary condition.
- B. Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project shall be free of pests and their residues at Preliminary Acceptance. Obtain extended warranty for the AIS. Perform control operations lawfully, using environmentally safe materials.

1.06 ELEVATORS, STAIRS, AND HOISTS

- A. Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- B. Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with protective covering of plywood or similar material so finishes shall be undamaged at time of acceptance.
- C. Use of the AIS's existing elevators will be permitted, as long as elevators are cleaned and maintained in a condition acceptable to the AIS.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
 2. Comply with loading restrictions of existing elevator.
- D. Use of the AIS's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to the AIS.
1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

1.07 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
1. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard.
 2. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building. Comply with authorities having jurisdiction.
- C. Provide barriers and covered walkways on building property to the satisfaction of the AIS at all walkways and entrances/exits. Covered walkways shall extend a minimum of 20 feet from entrances. Barriers shall be provided to restrict patch of travel to protected areas.
1. Construct covered walkways using scaffold or shoring framing.
 2. Provide wood-plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe, clean, and well-drained walkways, and similar provisions for protection and safe passage.
 3. Paint and maintain in a manner approved by the AIS and Architect/Engineer of Record.
 4. For safety barriers, sidewalk canopies, and similar uses, provide minimum 5/8-inch thick exterior plywood.
- D. Provide protection for trees and plants designated to remain. Install temporary fencing as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion. Replace damaged plants.
- E. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction..

1.08 FENCING

- A. Provide 8 foot high fence around construction site; equip with vehicular and pedestrian gates with locks. Locate where indicated.
- B. Construction: Commercial grade chain link fence.
1. 9 gauge 2" galvanized steel mesh, 8 feet high. Temporary fencing (where allowed) may be 6 feet high).
 2. 3" outside dimension galvanized end posts with caps
 3. 2" outside dimension galvanized line (intermediate) posts

4. 10 ft. max. center to center, with caps
5. 1-5/8" outside dimension galvanized top and bottom rails
6. 12 gauge min. galvanized ties
7. Required fittings for proper installation of above.
8. Opaque fabric meshing affixed to fence as required by Chicago Municipal Code Section 13-32-125.

- C. Construction: Wood. At Contractor's option, or as indicated.
1. Plywood, 8 feet high.
 2. Framing: four 2-by-4-inch rails.
 3. Preservative-treated wood posts spaced not more than 8 feet apart.
- D. Set fence posts in compacted mixture of gravel and earth.
- E. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
- F. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide the AIS with one set of keys.

1.09 EXTERIOR ENCLOSURES

- A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.
1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 2. Vertical Openings: Close openings of 25 sq. ft. or less with plywood or similar materials.
 3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
 4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
 5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.
1. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
 2. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer.

1.10 INTERIOR ENCLOSURES AND PROTECTION

- A. Provide temporary partitions and ceilings as indicated to separate work areas from AIS-occupied areas, to prevent penetration of dust, noise, odors, and moisture into AIS-occupied areas, and to prevent damage to existing materials and equipment.
- B. Construction (where adjacent to occupied areas): Framing and gypsum AIS sheet materials with closed joints and sealed edges at intersections with existing surfaces:
1. 1/2-inch fire-retardant plywood is permitted on construction side.
 2. Insulate partitions to provide noise protection to occupied areas.
 3. Paint surfaces exposed to view from AIS-occupied areas.

- C. Construction (where concealed from occupied areas): dustproof, floor-to-ceiling partitions of not less than nominal 4-inch studs, 2 layers of 3-mil polyethylene sheets, inside and outside temporary enclosure.
- D. Protect floors with 2 layers of 3-mil polyethylene sheets, extending sheets 18 inches up the side walls. Overlap and tape full length of joints. Cover floor with 3/4-inch fire-retardant plywood.
- E. Equip partitions with dustproof doors and security locks. Maintain water-dampened foot mats at doors.
- F. Construct a vestibule and airlock at each entrance to temporary enclosure with not less than 48 inches between doors.

1.11 HEATING, VENTILATION, AND COOLING

- A. Provide temporary heating, ventilation, and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that shall not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- B. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.
- C. Unless the AIS authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

1.12 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and AIS's operations from unauthorized entry, vandalism, or theft.
- B. Provide temporary enclosures with lockable entrances to protect partially completed areas.

1.13 FIRE PROTECTION

- A. Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
 - a. Field Offices: Class A stored-pressure water-type extinguishers.
 - b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
 - c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
 - 2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
7. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
8. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

1.14 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and AIS.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate to support loads and to withstand exposure to traffic during construction period. Locate temporary roads and paved areas within construction limits indicated on Drawings.
 1. Provide a reasonably level, graded, well-drained subgrade of satisfactory soil material, compacted to not less than 95 percent of maximum dry density in the top 6 inches.
 2. Provide gravel paving course of subbase material not less than 3 inches thick; roller compacted to a level, smooth, dense surface.
 3. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.

1.15 DEWATERING FACILITIES

- A. Comply with requirements in applicable Division 31 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.
- B. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.
- C. Dispose of rainwater in a lawful manner that shall not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
- D. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.

- E. Remove snow and ice as required to minimize accumulations.

1.16 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers of adequate size to handle waste from construction operations. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
- E. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste.
- F. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.

1.17 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction as indicated by AIS.
 - 1. Standard sign is 4'-0" x 8'-0" 1/2 inch thick,
 - 2. Sign vendor will be identified by the AIS's representative.
- B. Erect on site at location established by Architect/Engineer of Record.
- C. Provide temporary signs to indicate directional information to construction personnel and visitors; and as required by law.
 - 1. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.
 - 2. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.
- D. No advertising signage is permitted. Do not allow installation of unauthorized signs.

1.18 FIELD OFFICES

- A. Offices: Prefabricated or Mobile Units with lockable entrances, and operable windows, on foundations adequate for normal loading. Offices to be weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture.
 - 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
 - 2. Provide private toilet complete with water closet, lavatory, and medicine cabinet with mirror.
 - 3. Provide coffee machine and supplies, including regular and decaffeinated coffee, filters, cups, stirring sticks, creamer, sugar, and sugar substitute
- B. Provide space for Project meetings, with table and chairs to accommodate 10 persons.

- C. An alternative accessible location will be designated for Project meetings when requested. Location will be coordinated and agreed upon by Building, AIS, and Contractor.
- D. Provide containerized, tap-dispenser, bottled-drinking-water units, including paper cup supply.
 - 1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect/Engineer of Record. Provide materials suitable for use intended.
- B. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

2.02 EQUIPMENT

- A. General: Provide equipment suitable for use intended.
- B. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- C. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.
- D. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION - NOT USED

3.01 GENERAL

- A. Refer to 01 70 00 - Execution Requirements for additional requirements for the execution of temporary facilities.
- B. Locate facilities where they shall serve Project adequately and result in minimum interference with performance of the Work.
- C. Relocate temporary services and facilities as required by progress of the Work.
- D. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- E. Engage appropriate local utility company or authorized personnel to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

- F. Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- G. Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that shall minimize complaints from persons or firms near Project site.

3.02 PREPARATION

- A. Arrange with utility company, the AIS, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Provide and plan for adequate capacity for temporarily facilities at each stage of construction.
- C. Obtain easements to bring temporary utilities to Project site where the AIS's easements cannot be used for that purpose.

3.03 INSTALLATION

- A. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.
 - 1. Install electric power service underground, unless overhead service must be used.
 - 2. Install power distribution wiring overhead and rise vertically where least exposed to damage.
 - 3. Connect temporary service to the AIS's existing power source, as directed by electric company officials.
- B. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
 - 1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths shall not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
 - 2. Provide warning signs at power outlets other than 110 to 120 V.
 - 3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
 - 4. Provide metal conduit enclosures or boxes for wiring devices.
 - 5. Provide 4-gang outlets, spaced so 100-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.
- C. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - 2. Provide one 100-W incandescent lamp per 500 sq. ft., uniformly distributed, for general lighting, or equivalent illumination.
 - 3. Provide one 100-W incandescent lamp every 50 feet in traffic areas.
 - 4. Provide one 100-W incandescent lamp per story in stairways and ladder runs, located to illuminate each landing and flight.

5. Install exterior-yard site lighting that shall provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.
 6. Install lighting for Project identification sign.
- D. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use. Sterilize temporary water piping before use.
1. Provide rubber hoses as necessary to serve Project site. Use trigger-operated nozzles for water hoses, to avoid waste of water.
 2. As soon as water is required at each level, extend service to form a temporary water- and fire-protection standpipe. Provide distribution piping. Space outlets so water can be reached with a 100-foot hose. Provide one hose at each outlet.
 3. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
 4. Provide pumps to supply a minimum of 30-psi static pressure at highest point. Equip pumps with surge and storage tanks and automatic controls to supply water uniformly at reasonable pressures.
- E. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
 2. Connect temporary sewers to municipal system as directed by sewer department officials.
 3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
 4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.
- F. Fencing: Unless otherwise indicated on the drawings, posts are to be set at a depth of no less than 3'0" below ground level and anchored in concrete to full depth. Posts shall be properly capped. End posts and line posts will be evenly spaced at a distance of no more than 10'-0" apart, center to center. Fence shall be erected with top and bottom rails of 1-5/8" o.d. and ties of no less than 12 gauge, securing the galvanized steel mesh to the rails. The bottom rail shall be placed at a distance of no greater than 2" from the bottom of the posts and shall be secured by the use of proper fittings to corner and intermediate posts. Top rail shall run continuously through line post caps and shall be fastened to end posts no less than 2" from the top by the use of proper fittings.

3.04 CLEANING

- A. Provide cleaning of temporary facilities on a daily basis; including, but not limited to: temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.
- B. Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
- C. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

- D. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

3.05 CLOSEOUT ACTIVITIES

- A. Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Preliminary Acceptance.
 - 1. Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Preliminary Acceptance.
- B. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility.
- C. Materials and facilities that constitute temporary facilities are the property of Contractor. The AIS reserves right to take possession of Project identification signs.
- D. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
- E. Prior to Preliminary Acceptance, restore AIS's existing facilities to condition established before initial use.
- F. Prior to Preliminary Acceptance, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
- G. Remove all support facilities near and prior to Preliminary Acceptance. Personnel remaining after Preliminary Acceptance will be permitted to use permanent facilities, under conditions acceptable to the AIS.
- H. Clean and repair damage caused by installation or use of temporary work.
- I. Restore new permanent facilities used during construction to specified condition.
- J. Refer to final cleaning requirements in Section 01 77 00 - Closeout Procedures

END OF SECTION 01 50 05

SECTION 01 50 10

COMMISSION REPRESENTATIVE FIELD OFFICE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings
- B. Book 1: Project Information, Instructions to Bidders, and Execution Documents
- C. Book 2: Standard Terms and Conditions for Construction Contracts

1.2 COMMISSION REPRESENTATIVE'S FIELD OFFICE

- A. Furnish, erect and maintain a clean, weather-tight office at the site of the Work for the duration of the Contract, through final completion, for the sole and exclusive use of the Commission. No on-site Work may commence until the Commission Representative's Field Office required by this Subsection is in place, fully functional and approved by the Commission. The proposed location of the Commission Representative's Field Office and the pedestrian gate for access to the fenced site is indicated on the Approved Site Utilization Plan.
- B. Provide the Commission Representative's Field Office with toilet facility entirely separate from, unconnected to, and not to be shared with the Contractor's Field Office.
- C. Provide the Commission Representative's Field Office not less than 400 square feet in area and with a ceiling not less than 7 feet high with a minimum of one private offices and one common area, and one toilet. The one private offices and common area shall be equipped with minimum of (4) 110-120v 20amp 3-prong grounded duplex receptacles each section, equally distributed across (2) power circuits each section. The field office shall be equipped with a minimum of 100 amp electrical service. The field office shall include an interior toilet facility, shall be painted, heated, air-conditioned, lighted, provided with lockable windows with blinds or shades that operate, and doors with cylinder locks and deadbolt locks. Provide appropriate signage on the outside of the trailer indicating PBC Field Office. Enclose the air space beneath the trailer with exterior grade plywood panel siding painted to match office exterior. Provide hinged access doors at utility connection area. Provide stair access with handrails per code requirements.
- D. Provide weekly janitorial service for the Commission Representative's Field Office and interior toilet facility.
- E. Pay all expenses in connection with the Commission Representative's Field Office, including but not limited to, the installation and high speed internet service, heat, air-conditioning, light, water, sewerage, janitorial services, equipment, pest control, snow removal, set up and take down. HVAC filters shall be replaced every month.
- F. Furnish the following equipment and furniture:
 - 1. (2) - 60" x 30" desks with two 2 drawer (one file and one miscellaneous) pedestal file cabinets and 2 non folding chairs with upholstered seat and back.
 - 2. (2) - 2 drawer lateral file cabinets.

3. (1) - layout table with minimum top size of 42" x 60". An adjustable height drafting stool with upholstered seat and back shall be provided.
4. (2) - 8' x 3' folding conference tables and 20 folding chairs.
5. Provide (1) 48" x 72" (min) and (1) 48" x 96" wall mounted dry erase boards.
6. (1) - equipment cabinet with lock of minimum inside dimensions of 72" high x 48" wide x 24" deep with (5) shelves. The walls shall be of steel with a 3/32" minimum thickness with concealed hinges and enclosed lock constructed to prevent entry by force.
7. (1) 1200 watt Microwave oven.
8. (1) – Keurig Office Pro brewing system or approved equal.
9. (1) - first aid cabinet fully equipped and maintained on monthly basis.
10. (1) - 5 gallon hot and cold water dispenser with cup dispenser, cups and bottled drinking water supply service.
11. Central heating and air conditioning appropriate to trailer size and construction per ASHRAE 90.1 efficiency requirement.
12. (1) - 6 cubic feet refrigerator with freezer compartment.
13. (1) - plan rack with (12) 42" capacity hanging clamps.
14. (1) - fire extinguisher.
15. (1) – space heater
16. Printer: Provide a multifunction color printer (fax, copy, scan and print) the latest version with toner cartridges, paper, and a maintenance service contract for the duration of project.
 - a. Canon Image Runner Advance C3525i III Color Multifunction Printer or equal (Dual Tray - 8-1/2" x 11" and 11" x 17" format) with scanning capability (PDF format)
 - b. Provide required toner cartridges throughout duration of the project.
 - c. Provide 24lb 8 1/2" x 11" and 11" x 17" format paper throughout duration of project.
17. Network: Provide Local Area Network (LAN) and a Wireless Area Network (WAN) communication and Internet access for Commission computers with all associated equipment, drops, patch cords, power cords, etc., for the duration of the project. Network the printer/scanner to all Commission computers to enable direct printing and scanning to and from any computer.
18. Internet Access: Provide an unlimited Internet access account to achieve a minimum of 100MB per second download speed.

- G. The Commission Representative's field office and all furnishing and equipment will remain the property of the Contractor at the completion of the Project.
- H. Provide (2) on-site parking spaces adjacent to Commissions Trailer for duration of project.
- I. Submit two (2) copies of the site field office layout plan required for approval by the Commission Representative.

1.3 SUBMITTALS

- A. Unless provided for elsewhere in the contract documents, prior to any onsite work, the Contractor is to prepare and submit to the Architect for approval the Commission Representative's Site Field Office Location Plan showing field offices and related temporary support facilities. If requested by the Contractor, a preliminary meeting to review site elements and construction operations including trailer and gates location with the Architect and Commission Representative prior to submission of the Plan will be held.

PART 2 PRODUCTS

- 2.1 Provide new materials and equipment. Undamaged, previously used materials and equipment in serviceable condition may be used if approved by the Commission Representative. Provide materials suitable for use intended.

PART 3 EXECUTION

- 3.2 The proposed location of the Commission Representatives field office and the pedestrian gate for access to the fenced site is indicated on the approved Site Utilization Plan.
- 3.3 Locate and maintain the field office with temporary walkways providing easy and safe access.
- 3.4 Maintain support facilities until substantial completion or as directed the Commission Representative.

END OF SECTION

SECTION 01 56 11

GENERAL DUST, FUME, AND ODOR CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Dust Control.
- B. Fume and Odor Controls.
- C. Requirements for VOC-Content-Restricted products.

1.02 PERFORMANCE STANDARD

- A. Dust and fume emission control is required to maintain a healthful learning environment for students, maintain good public relations with neighbors and employees, prevent damage, minimize cleaning and maintenance costs, and to comply with regulations and laws. All contractors (including subcontractors, lower-tier subcontractors, and suppliers) who perform work or provide services at Chicago Public School facilities are required to control dust and fume emissions from their operations and/or activities.
- B. Controls include the containment or removal of all nuisance or noxious dust, vapors, fumes, odors or emissions caused by construction, demolition, renovation, restoration, or related activities including, but not limited to sawing, cutting, grinding, sanding, abrading, sweeping, crushing, scraping, gluing, prying, plowing, heating, finishing, painting, welding, torch cutting or burning, or any other related processes that can create noxious dust, fumes or odors.
- C. No visible emissions or unreasonable odors shall be permitted outside the work area.

1.03 DEFINITIONS

- A. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- B. CDPH: Chicago Department of Public Health
- C. HEPA Filter: High Efficiency Particulate Air filter capable of trapping 99.97% percent of particles greater than 0.3 micrometers in mass median aerodynamic equivalent diameter.
- D. IDPH: Illinois Department of Public Health.
- E. Interior of Building: Anywhere inside the exterior weather barrier.
- F. MEC: Managing Environmental Consultant. Entity engaged by the Board responsible for the design of environmental work, maintenance of related documents, and conducting oversight and review of the environmental work, submittals, and reports.
- G. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- H. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:

1. Interior paints and coatings.
2. Interior adhesives and sealants, including flooring adhesives.
3. Wet-applied roofing and waterproofing.
4. Other products when specifically stated in the specifications.

1.04 REFERENCE STANDARDS

- A. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.
- B. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
- C. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- D. 40 CFR 61 - National Emission Standards For Hazardous Air Pollutants; U.S. Environmental Protection Agency; current edition.
- E. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).
- F. Chicago Building Code; current edition
- G. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).
- H. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.
- C. SDS: For all products used that could potentially emit dusts, fumes, vapors or odors, etc. shall be submitted to the Project Environmental Coordinator, MEC, and/or Board's Representative for approval prior to the use of the product.

1.06 QUALITY ASSURANCE

- A. Contractor is responsible for compliance with all applicable federal, state, county and municipal laws, regulations and ordinances including, but not limited to, those listed below, which are incorporated by reference.
 1. 29 CFR 1910
 2. 29 CFR 1926
 3. 40 CFR Part 61
 4. Chicago Building Code: 11-4-2170: Demolition and renovation safeguards.
 5. Chicago Building Code: 11-4-2190: Sandblasting, grinding and chemical washing of buildings, facilities or other structures - Dust minimization--Containment, wetting or vacuuming; plan required.
- B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
 - b. Published product data showing compliance with requirements.

- c. Certification by manufacturer that product complies with requirements.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. VOC-Content-Restricted Products: VOC content not greater than required by the following:
 - 1. Adhesives and Sealants, Including Flooring Adhesives: SCAQMD 1168 Rule.
 - a. Wood Glues: 30 g/L.
 - b. Metal to Metal Adhesives: 30 g/L.
 - c. Adhesives for Porous Materials (Except Wood): 50 g/L.
 - d. Subfloor Adhesives: 50 g/L.
 - e. Plastic Foam Adhesives: 50 g/L.
 - f. Carpet Adhesives: 50 g/L.
 - g. Carpet Pad Adhesives: 50 g/L.
 - h. VCT and Asphalt Tile Adhesives: 50 g/L.
 - i. Cove Base Adhesives: 50 g/L.
 - j. Gypsum Board and Panel Adhesives: 50 g/L.
 - k. Rubber Floor Adhesives: 60 g/L.
 - l. Ceramic Tile Adhesives: 65 g/L.
 - m. Multipurpose Construction Adhesives: 70 g/L.
 - n. Fiberglass Adhesives: 80 g/L.
 - o. Contact Adhesive: 80 g/L.
 - p. Structural Glazing Adhesives: 100 g/L.
 - q. Wood Flooring Adhesive: 100 g/L.
 - r. Structural Wood Member Adhesive: 140 g/L.
 - s. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
 - t. Top and Trim Adhesive: 250 g/L.
 - u. Plastic Cement Welding Compounds: 350 g/L.
 - v. ABS Welding Compounds: 400 g/L.
 - w. CPVC Welding Compounds: 490 g/L.
 - x. PVC Welding Compounds: 510 g/L.
 - y. Adhesive Primer for Plastic: 650 g/L.
 - z. Sheet Applied Rubber Lining Adhesive: 850 g/L.
 - aa. Aerosol Adhesive, General Purpose Mist Spray: 65 percent by weight.
 - bb. Aerosol Adhesive, General Purpose Web Spray: 55 percent by weight.
 - cc. Special Purpose Aerosol Adhesive (All Types): 70 percent by weight.
 - dd. Other Adhesives: 250 g/L.
 - ee. Architectural Sealants: 250 g/L.
 - ff. Non-membrane Roof Sealants: 300 g/L.
 - gg. Single-Ply Roof Membrane Sealants: 450 g/L.
 - hh. Other Sealants: 420 g/L.
 - ii. Sealant Primers for Nonporous Substrates: 250 g/L.
 - jj. Sealant Primers for Porous Substrates: 775 g/L.
 - kk. Modified Bituminous Sealant Primers: 500 g/L.
 - ll. Other Sealant Primers: 750 g/L.

2. Paints and Coatings: SCAQMD 1113 Each color; most stringent of the following:
 - a. Flat Paints and Coatings: VOC not more than 50 g/L.
 - b. Nonflat Paints and Coatings: VOC not more than 150 g/L.
 - c. Primers: VOC not more than 50 g/L.
 - d. Anti-corrosive and Anti-rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 - e. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
 - f. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
 - g. Floor Coatings: VOC not more than 100 g/L.
 - h. Shellacs, Clear: VOC not more than 730 g/L.
 - i. Shellacs, Pigmented: VOC not more than 550 g/L.
 - j. Stains: VOC not more than 250 g/L.
3. Wet-Applied Roofing and Waterproofing: Comply with requirements for paints and coatings.
4. Composite Wood and Agrifiber Products: May not contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.01 BARRIERS OR WORK AREA ISOLATION

- A. Contractor shall prevent the spread of dust, fumes and odors from their immediate work areas by:
 1. Erecting dust-tight barriers between indoor work areas and adjacent occupied areas. Construction barriers may be used for this purpose if suitably constructed to prevent dust, fume or odor migration.
 2. Closing and or covering windows, intake vents, louvers, or other building openings in the immediate vicinity of outdoor work, sufficient to prevent dust, fume or odor migration into the building interior. If such openings cannot be adequately sealed by closing, then poly sheeting, tape, or other impermeable covers shall be used.
 3. The Contractor shall provide a filtered, local exhaust system for the isolated work area.
- B. Contractor is prohibited from creating other hazardous or uncomfortable conditions for building occupants, such as very hot, humid, cold, or other conditions created by ventilation system alterations or blockages, closed or open windows in hot or cold weather conditions.
- C. Contractor is responsible for making itself familiar with building conditions and shall take care to isolate its work area in such a manner that building occupant activities and comfort are not unreasonably disrupted.

3.02 DUST, FUME AND ODOR CONTROL

- A. Dust, fume or odor release shall be prevented by a suitable means, including but not limited to:
 1. Tools equipped with shrouds, HEPA filter equipped vacuum pickups.
 2. Alteration, shut down, or isolation of building ventilation systems in the immediate work vicinity.
 3. Shrouding around work activities.
 4. Shrouding stages, scaffolds, or other work platforms.
 5. Local exhaust ventilation systems exhausted to the outside of the building.
 6. Wet work methods.
- B. Contractor is responsible for selecting the means and methods it considers most suitable to achieve dust, fume and odor control.

3.03 FIELD QUALITY CONTROL

- A. Board reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Board.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.
- C. In the event that dust or fumes escape from the work area or create dirty conditions or contamination to nearby building spaces or grounds, the Contractor is responsible for all costs associated with the cleaning, testing and/or repair deemed necessary by the Board's Representative.

END OF SECTION 01 56 11

SECTION 01 57 13

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, and storm and sanitary sewers due to construction activities.

1.02 REFERENCE STANDARDS

- A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.
- B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2014).
- C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015.
- D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.
- E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2016.
- F. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2017.
- G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.

1.03 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.
- B. Also comply with all more stringent requirements of City of Chicago and the State of Illinois.
- C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- D. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- E. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.

1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 - F. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 1. Control movement of sediment and soil from temporary stockpiles of soil.
 2. Prevent development of ruts due to equipment and vehicular traffic.
 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to the PBC.
 - G. Prevent polluting the air with dust and particulate matter from stored materials or construction debris.
 - H. Sedimentation of Storm Sewer and Receiving Waterways: Prevent sedimentation of waterways, storm sewers, and sanitary sewers.
 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to the PBC; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
 - I. Open Water: Prevent standing water that could become stagnant.
 - J. Maintenance: Maintain temporary preventive measures until permanent measures have been established.
- 1.04 SUBMITTALS
- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
 - B. Erosion and Sedimentation Control Plan:
 1. Submit within 10 Days after Notice to Proceed.
 2. Include:
 - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
 - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities. Coordinate with construction schedule
 - e. Include narrative describing the program and maintenance.
 - C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
 - D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Bales: Air dry, rectangular straw bales.
 - 1. Cross Section: 14 by 18 inches, minimum; containing 5 cu. ft. or more of material.
 - 2. Bindings: Wire or nylon string, around long dimension.

- B. Bale Stakes: One of the following, minimum 3 feet long:
 - 1. Steel U-, C- or T-section, with minimum mass of 1.33 lb per linear foot.
 - 2. Wood, 2 by 2 inches, or 4 inches in diameter in cross section.

- C. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
 - 1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
 - 2. Permittivity: 0.05 sec^{-1} , minimum, when tested in accordance with ASTM D4491.
 - 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
 - 4. Tensile Strength: 90 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
 - 5. Elongation: 50 percent maximum, when tested in accordance with ASTM D4632/D4632M.
 - 6. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533/D4533M.
 - 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

- D. Silt Fence Posts: One of the following, minimum 5 feet long:
 - 1. Steel U-, C- or T-section, with minimum mass of 1.33 lb per linear foot.
 - 2. Hardwood, 2 by 2 inches, or 4 inches diameter in cross section.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

- A. Do not start operations until the erosion and sediment control plan has been submitted and features are in place.

- B. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

- B. Do not allow storm water to flow into excavations and disturbed areas.

- C. Do not discharge water into sanitary sewers, watercourses or offsite.

- D. Do not allow sediment to flow into vegetated areas.
- E. Do not discharge water-containing sediment in accordance with Performance Requirements and as presented in the erosion and sediment control plan submittal or a maximum retained as 30 milligrams of sediment per liter of water. Conduct continuous monitoring of sediment.
- F. Construction Entrances: Traffic-bearing aggregate surface.
 - 1. Width: As required; 20 feet, minimum.
 - 2. Length: 50 feet, minimum.
 - 3. Provide at each construction entrance to prevent tracking of mud onto right-of-way.
- G. Linear Sediment Barriers: Made of silt fences.
 - 1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope of Less Than 2 Percent: 100 feet.
 - b. Slope Between 2 and 5 Percent: 75 feet.
 - c. Slope Between 5 and 10 Percent: 50 feet.
 - d. Slope Between 10 and 20 Percent: 25 feet.
 - e. Slope Over 20 Percent: 15 feet.
- H. Storm Drain Inlet Sediment Trap: Protect each inlet using one of the following measures:
 - 1. For manholes, the filter fabric can be placed around the lid and secured by the lid weight
 - 2. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
- I. Soil Stockpiles: Mist or provide other means to keep dust from being scattered to the air.

3.04 INSTALLATION

- A. General: Control surface water runoff on-site and provide temporary soil stabilization measures as required to prevent erosion of soil by action of water. Protect storm sewers adjacent to work site from sedimentation by installation of erosion and sediment control measures. Provide, as a first step in construction operations, barriers, and other measures intended to deter erosion and transport of sediment associated with construction activities before construction starts or as it progresses.
- B. Traffic-Bearing Aggregate Surface:
 - 1. Excavate minimum of 6 inches.
 - 2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
 - 3. Place and compact at least 6 inches of 1 1/2 to 3 1/2 inch diameter stone.
- C. Silt Fences:
 - 1. Store and handle fabric in accordance with ASTM D4873/D4873M.
 - 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
 - 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
 - 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
 - 5. Install with top of fabric at nominal height and embedment as specified.

6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
7. Fasten fabric to wood posts using one of the following:
 - a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gage, 0.083 inch shank diameter.
 - b. Five staples per post with at least 9 gauge wire, 3/4 inch crown width and 1 inch long legs.
 - c. Do not staple fabric to trees.
8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

D. Straw Bale Rows:

1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
2. Install bales so that bindings are not in contact with the ground.
3. Embed bales at least 4 inches in the ground.
4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
5. Fill gaps between ends of bales with loose straw wedged tightly.
6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

3.05 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 2. Remove silt deposits that exceed one-third of the height of the fence.
 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Straw Bale Rows:
 1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
 2. Remove silt deposits that exceed one-half of the height of the bales.
 3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.

F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect/Engineer of Record.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.

- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION 01 57 13

SECTION 01 57 19
INDOOR AIR QUALITY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction procedures to promote adequate indoor air quality after construction.

1.02 PROJECT GOALS

- A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
 - 1. Cleaning of ductwork is not contemplated under this Contract.
 - 2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
- B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
 - 1. Furnish products meeting the specifications.
 - 2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017.
- B. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction; 2007.

1.04 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Sustainable Design Documentation: Submit all submittals required in this section in accordance with procedures specified in Section 01 33 29 - LEED Sustainable Design Reporting.

- C. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
 - 1. Submit not less than 60 days before enclosure of building.
 - 2. Identify potential sources of odor and dust.
 - 3. Identify construction activities likely to produce odor or dust.
 - 4. Identify areas of project potentially affected, especially occupied areas.
 - 5. Evaluate potential problems by severity and describe methods of control.
 - 6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
 - 7. Describe cleaning and dust control procedures.
 - 8. Describe coordination with commissioning procedures.
- D. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.
- E. Duct and Terminal Unit Inspection Report.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
- B. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE Std 52.2.

PART 3 - EXECUTION

3.01 CONSTRUCTION PROCEDURES

- A. Prevent the absorption of moisture and humidity by adsorptive materials by:
 - 1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
 - 2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
 - 3. Provide sufficient ventilation for drying within reasonable time frame.
- B. Begin construction ventilation when building is substantially enclosed.
- C. HVAC equipment and supply air ductwork may be used for ventilation during construction:
 - 1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
 - 2. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency.
 - 3. Do not use return air ductwork for ventilation unless absolutely necessary.
 - 4. Where return air ducts must be used for ventilation, install auxiliary filters at return inlets, sealed to ducts; use filters with at least the equivalent efficiency as those required at supply air side; inspect and replace filters when they lose efficiency.
- D. Do not store construction materials or waste in mechanical or electrical rooms.
- E. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.

1. Inspect duct intakes, return air grilles, and terminal units for dust.
 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
 3. Clean tops of doors and frames.
 4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 5. Clean return plenums of air handling units.
 6. Remove intake filters last, after cleaning is complete.
- F. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
- G. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

END OF SECTION 01 57 19

SECTION 01 57 51

INTEGRATED PEST MANAGEMENT

PART 1 - - GENERAL

1.01 SECTION INCLUDES

- A. Supervision, labor, materials, reporting and equipment necessary to facilitate an Integrated Pest Management program for the construction duration.
- B. Prevention of the ingress of rodents and pests during construction.

1.02 DEFINITIONS

- A. Integrated Pest Management (IPM): An approach to pest control that utilizes regular monitoring and record keeping to determine if and when treatments are needed.
- B. Integrated Pest Management Plan (IPMP): The IPMP monitors, identifies, assesses injury levels, sets action levels, implement treatments, and monitors results.
- C. Integrated Pest Management Coordinator (IPMC): individual provided by Contractor to develop and oversee the IPMP and to oversee pesticide application on PBC property.
- D. Pesticide: any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest.
- E. Rodents and Pests: means arthropods, rodents, roaches, nematodes, snails, insects, termites, snakes and other vermin that adversely affect readiness, building operations, or the well-being of personnel and animals; attack or damage real property, supplies, equipment, or vegetation; or are otherwise undesirable.

1.03 PERFORMANCE REQUIREMENTS

- A. IL Structural Pest Control Act 225 ILCS 235 3.24.
- B. EPA Registration of Pesticide Products in accordance with the Federal Insecticide Fungicide and Rodenticide Act (FIFRA).
- C. City of Chicago Department of Public Health.
- D. When there is a conflict between applicable regulations, the most stringent will apply.

1.04 SUBMITTALS

- A. Qualification Data: For Contractor's IMPC.
- B. IPMP Initial: All aspects of the IPMP shall be in accordance with Federal, State, and the City of Chicago laws and regulations. The Contractor's initial IPMP submittal shall be submitted within 30 days of Contractor's mobilization to the project site and shall include, but not necessarily be limited to, the following items:
 - 1. Proposed Materials and Equipment for Service.
 - 2. Proposed Methods for Monitoring and Detection.

3. Proposed Service Schedule for each building, site, or phase.
4. Commercial Pesticide Applicator Name, Address, Phone contact, Certificates or
5. Licenses.
6. List of existing buildings or structures within 50 feet of limits of construction.
7. Site locator map on 11x17 size showing each building, site, or phase.

C. IPMP Updates: The Contractor is responsible for maintaining a pest control logbook. The Contractor's IPMP shall be updated monthly for the duration of the project and shall include, but not necessarily be limited to, the following:

1. All contents of IPMP Initial submittal.
2. Records pertaining to routine inspections for signs of pests.
3. Records pertaining to responses to pest emergencies.
4. Record of recommendations for structural and procedural modifications necessary to achieve pest prevention.
5. Records of the control measures performed, all pesticides used, surveillance and trapping components used, labels and MSDS sheets, brand names.
6. Monthly update to include dates and times Contractor's IPMC visited the site, names of personnel who applied the pest control pesticides and set up trapping devices.
7. Contractor's personnel training meeting minutes.
8. Certificate of Final Acceptance'

1.05 PROJECT CONDITIONS

- A. Include separate section within IPMP when listing existing buildings.
- B. Conduct an initial facility survey. Submit written report with floor plan.
 1. Floor plan of building shall be drawn to scale not to exceed 11x17 size and showing location of basement or crawl space, primary corridors, exterior doors, food service egress, food service equipment, adjacent mechanical, plumbing, and electrical services and ventilation. Include title block with building name, property address, and north arrow.
 2. Identify food-transporting vehicles, vending machines, food storage rooms, garbage and rubbish areas and their path.
 3. Identify wall, floor, and ceiling conditions.
 4. Identify existing signage when applicable.
 5. Identify limits of construction.

1.06 QUALITY ASSURANCE

- A. IPMC Qualifications: Contractor to provide the services of an Illinois licensed and certified exterminator company with minimum 10 years' experience, whose principal business is pest control.
- B. Training of Personnel: The Contractor's personnel shall be trained that IPM is being implemented on the project. Conduct a pest control meeting for all personnel prior to commencing IPM activities. Conduct additional meetings for new personnel and when site conditions change. Include in the training and meeting agenda: familiarization with the methods of installation, care of devices and instruments used for monitoring, anticipated hazardous or toxic chemicals or other regulated contaminants when applicable. Contractor shall keep meeting notes to include in the IPMP updates.
- C. Pesticide Treatment Plan:
 1. Comply with Federal, State, and Local pest management record keeping and reporting requirements.
 2. Reporting: Include and update records in the IPM the sequence of treatment, dates, times, locations, pesticide trade name, EPA registration numbers, authorized uses, chemical composition, formulation, original and applied concentration, application rates of

active ingredient (i.e. pounds of active ingredient applied), equipment used for application and calibration of equipment.

3. Application of all pesticides shall be by an Illinois licensed and certified exterminator with minimum 5 years' experience on projects of similar size and scope.

1.07 FINAL ACCEPTANCE

- A. Before Final Acceptance of the project, the Contractor shall provide a statement in affidavit form, signed by the IPMC that the building premises are free from rodents and pests, and that all pesticides and related control devices and instruments have been properly removed or disposed of in accordance with label directions.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver pesticides to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses. Store pesticides according to manufacturer's instructions and under lock and key when unattended.
- B. Licensed Applicator may bring pre-mixed product in EPA approved compressed sprayer- type container providing product is listed in the IPMP and follows all EPA and manufacturer label requirements
- C. Pesticide Handling Requirements: Formulate, treat with, and dispose of pesticides and associated containers in accordance with label directions and use the clothing and personal protective equipment specified on the labeling for use during all phases of the application. Furnish Material Safety Data Sheets (MSDS) for all pesticide products for PBC's use.

PART 2 - - PRODUCTS

2.01 PEST CONTROL CONTRACTOR

- A. Engage one of the following Firms:
 1. Alpha Omega Pest Control Corp.
 2. Chem-Wise Ecological Pest Managing, Inc.
 3. Pest Management Services
 4. Pest Pros Unlimited
 5. Quality Excellence Pest Control, Inc.

PART 3 - - EXECUTION

3.01 EXAMINATION

- A. Comply with all applicable laws, rules and regulations.

3.02 PROTECTION

- A. Provide egress, barricades, signage and warnings as may be required by the IPMC during IPM operations.

3.03 CLEANING

- A. Remove all pesticides, related control devices and instruments in accordance with label directions and the IPMC.

3.04 PERSONAL PROTECTION AND EQUIPMENT

- A. Apply pesticides using an Illinois licensed and certified exterminator in accordance with EPA label restrictions and recommendations.
- B. The Licensed Applicator shall wear clothing and personal protective equipment as specified on the pesticide label.
- C. The PBC's Representative will designate locations for water used in formulating. Do not allow the equipment to overflow.
- D. Inspect all equipment for leaks, clogging, wear, or damage and repaired prior to application of pesticide.
- E. Clean all previously used equipment prior to bringing it onto the project site. Ensure that the equipment is free from residuals.

3.05 PESTICIDE USE

- A. The Contractor shall adhere to the following minimum rules for pesticide use in accordance with the IPMP:
 - 1. Minimize environmental pollution and damage that may occur as the result of Pest Control measures.
 - 2. Protect the environmental resources within the project boundaries, and those affected outside the limits of permanent work, during the entire duration of the project.
 - 3. Comply with all applicable environmental Federal, State, and local City of Chicago laws and regulations. Any delays resulting from failure to comply with environmental laws and regulations shall be the Contractor's responsibility.
 - 4. Do not apply any pesticide product that has not been included in the IPMP.
 - 5. Do not store any pesticide product in any area on the construction site not specified in the IPMP.
 - 6. Pesticide application shall be according to need and not by schedule.
 - 7. When pesticide use is necessary, employ the least hazardous material, most precise application technique, and minimum quantity of pesticide necessary to achieve control.

3.06 RODENT CONTROL

- A. The Contractor shall adhere to the following minimum rules for rodent control in accordance to the IPMP:
 - 1. Trapping Devices: All such devices shall be in protected areas so as not to be affected by routine operations. Trapping devices shall be checked on a schedule approved by the IPMC.
 - 2. All rodenticides shall be placed either in locations not accessible to children, pets, wildlife, and domestic animals, or in EPA-approved tamper-resistant bait boxes.
 - 3. Use of Bait Boxes: All bait boxes shall be maintained in accordance with EPA regulations, lids shall be securely locked or fastened shut, bait boxes shall be securely attached or anchored to the floor, ground, or wall, or in EPA-approved tamper resistant boxes labeled on the interior with IPMC business name and address.
 - 4. The Contractor shall be responsible for disposing of all trapped rodents and all rodent carcasses in an appropriate manner.

END OF SECTION 01 57 51

**SECTION 01 60 00
PRODUCT REQUIREMENTS**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Procedures for PBC-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.
- H. Warranties on products.

1.02 DEFINITIONS

- A. Products: Items to be purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through the Substitution Procedures to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that meet or exceed those of a listed product.
 - 4. Basis-of-Design Products: Where a specific Manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named Manufacturers. Submission for approval of a Basis-of-Design product which is not of a named Manufacturer is to be through the Substitution Procedures.
- B. Manufacturer's Warranty: Preprinted written warranty published by individual Manufacturer for a particular product and specifically endorsed by Manufacturer to the PBC.
- C. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for the PBC.

1.03 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 - PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Unforeseen historic items encountered remain the property of the PBC; notify PBC promptly upon discovery; protect, remove, handle, and store as directed by PBC.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the PBC, or otherwise indicated as to remain the property of the PBC, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. DO NOT USE products having any of the following characteristics:
 - 1. Containing lead, cadmium, asbestos.
- C. Where all other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 01 56 11 - General Dust, Fume, and Odor Controls, unless Section 01 61 16 - LEED VOC Content Restrictions applies.
 - 2. If wet-applied, have lower VOC content, as defined in Section 01 56 11 - General Dust, Fume, and Odor Controls, unless Section 01 61 16 - LEED VOC Content Restrictions applies.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
- C. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications. Where specific products or model numbers are provided, use the identified product. Substitutions will only be considered if there is a

demonstrated benefit to the PBC, and the substituted product can be clearly demonstrated, by the Contractor, to meet or exceed the specified performance standards. No other substitutions will be considered by the PBC except as indicated in Section 01 25 00 - Substitution Procedures.

- D. Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with Section 01 25 00 - Substitution Procedures to obtain approval for use of an unnamed product.
- E. Where products are accompanied by the term "as selected," Architect/Engineer of Record will make selection.
- F. Where products are accompanied by the term "match sample," sample to be matched will be provided by the Architect/Engineer of Record.
- G. If Contractor is given option of selecting between two or more products or manufacturer's, product selected shall be compatible with products previously selected, even if previously selected products were also options.
- H. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
- I. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver and place in location as directed; obtain receipt prior to final payment.

2.05 PRODUCT WARRANTIES

- A. Refer to 01 77 00 - Closeout Procedures and 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. The PBC reserves the right to limit selection of products to those offering warranties that are in the best interest of the PBC if such products are not in conflict with requirements of the Contract Documents.
- C. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- D. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Refer to individual Sections for specific content requirements and particular requirements for submitting special warranties.

PART 3 - EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.
- B. The following are not considered to be requests for substitutions and are not subject to the provisions of this Section:
 - 1. Changes requested during the bidding period and accepted by Addendum prior to award of the Contract.
 - 2. Revisions to the Contract Documents requested by the PBC or Architect/Engineer of Record and issued to the Contractor via Bulletin.
 - 3. Specified options of products and construction methods included in the Contract Documents.

3.02 PBC-SUPPLIED PRODUCTS AND PRODUCTS PROVIDED BY OTHERS

- A. Contractor's Responsibilities:
 - 1. Receive and unload products at site; inspect for completeness or damage jointly with PBC.
 - 2. Handle, store, install and finish products.
 - 3. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.
- I. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

3.04 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

1. On-site storage shall be limited to the locations indicated in the Site Utilization Plan. Should the construction site not have adequate on site storage, the provide proper off site material storage.
 2. Any storage of materials on PBC's property outside of the Contractor's work area or within PBC's existing facilities is to be pre-approved by the Building Engineer and PBC and indicated on the Site Utilization Plan.
- B. Store and protect products in accordance with manufacturers' written instructions for temperature, humidity, ventilation, and weather-protection.
- C. Store with seals and labels intact and legible.
- D. Store products to allow for inspection and measurement of quantity of units.
- E. Store materials in a manner that shall not endanger Project structure.
- F. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- G. For exterior storage of fabricated products, place on sloped supports above ground.
- H. Provide off-site storage and protection when site does not permit on-site storage or protection.
1. No payments shall be made for material stored off site without prior approval. If approved, review and payment shall be made according to the requirements of the Contract Documents, the General Construction Contract, and applicable provisions of the Specifications.
- I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- J. Comply with manufacturer's warranty conditions, if any.
- K. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- L. Prevent contact with material that may cause corrosion, discoloration, or staining.
- M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 60 00

SECTION 01 61 16

VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Requirements for Indoor-Emissions-Restricted products.
- B. Requirements for VOC-Content-Restricted products.
- C. Requirement for installer certification that they did not use any non-compliant products.
- D. Requirements in this section are in addition to any specified in 01 56 11 - General Dust, Fume, and Odor Controls. The more restrictive requirement prevails in the case of any conflicting information.

1.02 DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Flooring.
 - 4. Composite wood.
 - 5. Products making up wall and ceiling assemblies.
 - 6. Thermal and acoustical insulation.
 - 7. Other products when specifically stated in the specifications.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Wet-applied roofing and waterproofing.
 - 4. Other products when specifically stated in the specifications.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
 - 1. Concrete.
 - 2. Clay brick.
 - 3. Metals that are plated, anodized, or powder-coated.
 - 4. Glass.
 - 5. Ceramics.
 - 6. Solid wood flooring that is unfinished and untreated.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).
- C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.
- D. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board; current edition.
- E. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.
- F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.
- G. GreenSeal GS-36 - Adhesives for Commercial Use; 2013.
- H. SCS (CPD) - SCS Certified Products; Current Edition.
- I. UL (GGG) - GREENGUARD Gold Certified Products; current listings at <http://http://productguide.ulenvironment.com/QuickSearch.aspx>.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.
- C. Sustainable Design Reporting: Submit evidence of compliance along with Material Content Form.
- D. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.

1.05 QUALITY ASSURANCE

- A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
 - 1. Wet-Applied Products: State amount applied in mass per surface area.
 - 2. Paints and Coatings: Test tinted products, not just tinting bases.
 - 3. Evidence of Compliance: Acceptable types of evidence are the following;
 - a. Current UL (GGG) certification.
 - b. Current SCS (CPD) Floorscore certification.
 - c. Current SCS (CPD) Indoor Advantage Gold certification.
 - d. Current listing in CHPS (HPPD) as a low-emitting product.
 - e. Current CRI (GLP) certification.
 - f. Test report showing compliance and stating exposure scenario used.

4. Product data submittal showing VOC content is NOT acceptable evidence.
 5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.
- B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
- C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scscertified.com.
 - b. Report of laboratory testing performed in accordance with requirements.
 - c. Published product data showing compliance with requirements.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.
 2. Inherently Non-Emitting Materials.
- C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
1. Aerosol Adhesives: GreenSeal GS-36.
 2. Wet-Applied Roofing and Waterproofing: Comply with requirements for paints and coatings.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

- A. The PBC reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to the PBC.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION 01 61 16

**SECTION 01 62 10
PRE-CONSTRUCTION PROJECT MOCK-UP**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construct the Project Mock-Up independent of the building construction as indicated on the drawings to be used to demonstrate aesthetic effects and set quality standards for materials and execution of the building enclosure components indicated, as supported by and connected to abutting components.
 - 1. Construction of the Project Mock-Up components shall be ongoing and in sequence as trades arrive on-site.
 - 2. Construct in a location intended to stay undisturbed for project duration.

1.02 SUBMITTALS

- A. Installer Qualifications:
 - 1. The construction team for the Project Mock-Up shall be the same team who perform the work.
- B. Component Submittal:
 - 1. Provide submittals required by the technical specification for each component to be incorporated into the Project Mock-Up before the component is to be incorporated into the Project Mock-Up.
 - a. Shop Drawings specific to the Project Mock-Up may be required if indicated on the Project Mock-Up drawings.
- C. Construction Schedule:
 - 1. Submit a schedule for the construction of the Project Mock-Up, at the same time the Project Construction Schedule is submitted. Show sequencing of participation of all the Sub-Contractors/ installers allowing time for submittals, fabrication (if required) and delivery of each component of the Project Mock-Up and allowing two (2) weeks for testing of each component before approval for installation of the component. The Contractor is responsible for delays caused by failure of any component requiring re-testing.

1.03 QUALITY ASSURANCE

- A. Installers: the supervisor and all workmen that will install each component of the building enclosure shall be experienced in the installation of the component, trained for the work, and accepted in writing by the component provider.
- B. Project Mock-Up testing: The PBC will employ qualified testing services to conduct field testing of the Project Mock-Up and connection to abutting components as required to demonstrate compliance with the Contract Documents. Initial testing will be paid for by the PBC. Additional testing required by failure to comply with the requirements of the Contract Documents including cost of re-execution of the Project Mock-Up will be the responsibility of the Contractor until the requirements of the Contract Documents are met.
- C. Mockup to include, but is not limited to, both interior and exterior components as follows:
 - 1. Membrane waterproofing mock up including all typical terminations.

PART 2 - PRODUCTS

2.01 MATERIALS/FABRICATION

- A. Refer to the Drawings and Specifications for each component of the Project Mock-Up.

2.02 INCIDENTAL MATERIALS, CONSTRUCTION AND FACILITIES

- A. Provide materials, construction and equipment required for maintenance and protection of the Project Mock-Up and the PBC's testing program.

PART 3 - EXECUTION

3.01 CONSTRUCTION

- A. Construct the Project Mock-up under the supervision of the General Contractor in the sequence required to allow observation and testing of each component and connection to abutting components before covering.
- B. Utilize the supervisor and workmen approved for each component for execution of the Work.
- C. Notify the PBC a minimum of one (1) week in advance of the time each component and connection to abutting component will be available for testing.
- D. Provide environmentally conditioned enclosure of the Project Mock-Up as required by specifications and recommended for each component. Enclosure to be large enough for construction, observation and testing of each component and connection to abutting component.

3.02 REMOVAL

- A. The Project Mock-Up will be used as the basis of comparison for all work on the Project. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
- B. At such time as mutually acceptable to the PBC and Contractor, de-construct and completely remove the Project Mock-Up and dispose of in accordance with demolition and removal requirements of this Project.

END OF SECTION 01 62 10

SECTION 01 70 00
EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Surveying for laying out the work.
- D. Shoring, bracing, and scaffolding.
- E. Progress cleaning and protection of work.
- F. Starting of systems and equipment.
- G. Correction of the Work.
- H. Final cleaning.

1.02 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. See Division 02 for requirements related to removal and waste management.
- C. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. Qualification Data: Demonstrate Surveyor's capabilities and experience. Include list of completed projects with project names and addresses, names and addresses of architects and owners, and size and type of project.
 - 2. On request, submit documentation verifying accuracy of survey work.
 - 3. Submit a six (6) copies of site drawing signed/certified by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents. Provide electronic drawings in both *.dwg and *.pdf format.
 - 4. Submit 2 copies of certified surveys and survey logs for the project record.
- D. Cleaning:
 - 1. Product Data: Submit complete printed data for cleaning agents and floor sealers finishes.
 - 2. Qualification Data: Submit supporting documentation demonstrating personnel engaged for Final Cleaning are regularly engaged in commercial and institutional building cleaning and maintenance as a primary business for a minimum of five (5) years.
 - 3. Certification: Submit a statement that all final cleaning as specified is complete on company letter head signed by an officer of the cleaning company.

- E. Project Record Documents: Submit 6 copies of record documents. Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

- A. For surveying work, employ a land surveyor registered in Illinois and acceptable to Architect/Engineer of Record. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.05 PROJECT CONDITIONS

- A. All work shall comply with all applicable laws, codes and regulations.
- B. Signs: No signs advertising the work or identifying any person, firm or entity concerned with the work shall be allowed at the site unless approved in advance by the PBC's Representative. The Contractor is to maintain the project sign provided by the PBC.
- C. No press or public relation releases are to be made without approval of the PBC.
- D. Use of explosives is not permitted.
- E. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- F. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- G. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- H. Conduct operations to minimize fumes or odors to building air intakes. Advise PBC's Representative if a problem is foreseen so that concerned parties can be notified in advance.
- I. The Contractor shall include in the bid costs for all standby trades should work need to be performed during other than normal work hours. This may include electrical tie-in, water taps, abatement (lead/asbestos/tank removal), work which is excessively noisy (i.e. grinding, demolition etc.); removal of materials containing lead based paints etc. Costs for inspections and any other additional work related to the Contract scope deemed necessary by Commonwealth Edison, City - Water, Sewer and Sanitary department are to borne by the Contractor.
- J. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Install, maintain and effectively operate appliances, machines or equipment in a manner approved by authorities having jurisdiction for the elimination of dust.
- K. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations. Do not use tools or equipment that produce harmful noise levels.
- L. Dewatering: If required, dewater trenches, footings, pits and excavations made for the work. Discharge the water so as not to interfere or create safety hazards to the public or allow water to run on other property. Adhere to all federal, state and city regulations.

- M. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Coordinate scheduling and timing of required administrative procedures with construction activities and activities of other contractors (where applicable) to avoid conflicts and to ensure orderly progress of the Work.
- C. Notify affected utility companies and comply with their requirements.
- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
- F. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- G. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- H. Coordinate completion and clean-up of work of separate sections.
- I. After PBC occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of PBC's activities.

PART 2 - PRODUCTS - NOT USED

2.01 CLEANING MATERIALS

- A. Cleaning Agents and floor sealers-finishes: Use cleaning materials and agents and floor sealers-finishes recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
- B. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Review conditions with installer or applicator present where indicated to confirm compliance with with requirements for installation tolerances and other conditions affecting performance.
 - 1. Record observations. Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
- B. Verify that existing substrate is suitable for new work being applied or attached including structural readiness and compatibility with finishes.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
- E. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- F. Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- G. Do not scale drawings.
- H. Verify that utility services are available, of the correct characteristics, and in the correct locations. Failure to do so does not constitute a change order to the Work. The existence and location of underground and other utilities and construction indicated as existing are not guaranteed.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish information to the PBC that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- I. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.
- J. Notify PBC's Representative in writing, immediately on discovery of errors, omissions, discrepancies and non-compliance with applicable codes and regulations within the documents or any work which will not fit, meet acceptable tolerances, or properly function if it were to be installed as indicated in the Contract Documents. Use Request or Information processes indicated in Section 01 30 00 - Administrative Requirements. This item is in no way intended to relieve the Architect/Engineer of Record of design responsibility.

- K. Start of work specified in each section indicates contractor's acceptance of conditions related to the work including existing construction and substrates.

3.02 PREPARATION

- A. See Division 02 for requirements related to removal and waste management.
- B. Clean substrate surfaces prior to applying next material or substance.
- C. Seal cracks or openings of substrate prior to applying next material or substance.
- D. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, or as requested by the Architect/Engineer of Record or PBC's Representative, or as required by the progress of the work, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section; including the following:
 - 1. Contractor.
 - 2. PBC
 - 3. AIS site manager.
 - 4. Architect/Engineer of Record.
 - 5. Installer's affected by the work.
 - 6. Manufacturer's or Fabricator's Representatives affected by the work.
 - 7. All participants shall be familiar with Project and authorized to conclude matters relating to the Work.
- C. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
 - 3. Review installation requirements with approved submittals.
- D. Record minutes and distribute copies within 5 days of meeting, to participants and those affected by decisions made.
- E. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and if necessary, reconvene the conference at earliest feasible date.

3.04 SURVEYING FOR LAYING OUT THE WORK

- A. Verify locations of survey benchmark or control points prior to starting work.
- B. Promptly notify Architect/Engineer of Record of any discrepancies discovered.
- C. Protect survey benchmark or control points prior to starting site work; preserve permanent benchmark or control points during construction.
- D. Promptly report to Architect/Engineer of Record the loss or destruction of any benchmark or control point or relocation required because of changes in grades or other reasons.

- E. Replace dislocated survey benchmark control points based on original survey control. Make no changes without prior written notice to Architect/Engineer of Record.
- F. Utilize recognized engineering survey practices.
- G. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- I. Periodically verify layouts by same means.
- J. Maintain a complete and accurate log of benchmark, control, and survey work as it progresses. Make log accessible to PBC at all times.
- K. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- L. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.
- M. Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. At Preliminary Acceptance, have the final property survey recorded by or with authorities having jurisdiction as the official property survey.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Contractor is to provide equipment necessary for the completion of the work including equipment for hoisting and staging of materials.
- D. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- E. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- F. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
- G. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

- H. Lay out required blocking, backings and grounds in concealed areas.
 - I. Install products at the time and under conditions that shall ensure the best possible results. Maintain conditions required for product performance until Preliminary Acceptance.
 - J. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
 - K. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect/Engineer of Record.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - L. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
 - M. Provide necessary access panels for work provided under the contract.
 - N. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.
 - O. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
 - P. Make neat transitions between different surfaces, maintaining texture and appearance.
- 3.06 PBC-INSTALLED PRODUCTS/WORK BY OTHER CONTRACTORS
- A. Provide access to Project site for PBC's construction forces.
 - B. Coordinate construction and operations of the Work with work performed by PBC's construction forces.
 - C. Inform PBC of Contractor's preferred construction schedule for PBC's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify PBC if changes to schedule are required due to differences in actual construction progress.
 - D. Include PBC's construction forces at preinstallation conferences covering portions of the Work that are to receive PBC's work. Attend preinstallation conferences conducted by PBC's construction forces if portions of the Work depend on PBC's construction.

3.07 ALTERATIONS

- A. See Section 01 73 29 - Cutting and Patching
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions as necessary to protect PBC's property and operations .
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.

2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Protect existing work to remain from damage or loss at all times during the execution of the Work. This includes all existing fixed, movable, or built-in furniture, equipment, and materials.
 1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
 4. Protection of items to remain is to include all measures necessary to prevent any accumulation of dust, dirt, construction debris or any physical damage. The Contractor shall be responsible for the cost of any cleaning, repair, or replacement required due to inadequate protection.

3.08 SHORING, BRACING, AND SCAFFOLDING

- A. Provide all shoring and bracing required for safety and the proper execution of the work. Install bracing and shoring so it does not interfere with the work of the PBC or other Contractors.
- B. Remove shoring and/or bracing that is no longer required.
- C. Scaffolding - Provide and maintain scaffolding required in connection with the work. All scaffolding shall conform to the rules and regulations of all authorities having jurisdiction.

3.09 PROGRESS CLEANING

- A. Contractor is to comply with all requirements of the City of Chicago Construction Site Cleanliness Ordinance as applicable to this project.
 1. Portions of the ordinance that become effective subsequent to the commencement of this Contract shall be followed from the time they become effective. No change orders shall be considered for work related to provisions of the Construction Site Cleanliness Ordinance.
- B. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition. Clean debris outside of work area, including public spaces, which has resulted from construction activities.
- C. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- D. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- E. Clean areas of cutting and patching.
- F. Collect and remove waste materials, debris, and trash/rubbish from site and work areas daily and dispose in dumpsters; do not burn or bury. Do not allow washed-down debris to enter sewers or waterways.
 1. All crates and boxes are to be dismantled or flattened before being placed in the container.
 2. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 3. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 4. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

5. See Division 02 for additional waste disposal requirements.
 - G. Provide and maintain all dumpsters and/or disposal boxes as may be required for the execution of the work. Dumpsters are to be immediately removed from the site when level full. Do not over-fill.
 1. Use of dumpsters and waste containers belonging to the PBC or User (AIS) is strictly prohibited
 - H. Snow Removal: Remove snow and ice from the site and in all work areas for access, equipment, and material storage.. This includes all fenced boundaries of the construction site and sidewalks. No salt or calcium chloride is to be used in snow and ice removal.
 - I. Maintain haul roads, public roads, stockpiles and paving areas that are used for construction operations free from any debris or damage. .
- 3.10 PROTECTION OF INSTALLED WORK
- A. Protect installed and existing work from damage by construction operations. Keep installed work clean.
 1. Comply with manufacturer's written instructions for temperature and relative humidity.
 2. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended and that are not hazardous to health or property.
 - B. Provide special protection where specified in individual specification sections.
 - C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
 - D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
 - E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
 - F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.
 - G. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
 - H. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer. Any damage resulting from roof leaks caused by roof operations shall be the responsibility of the Contractor.
 - I. Prohibit traffic from landscaped areas.
 - J. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.
 - K. Refinish or replace all damaged surfaces, assemblies, and equipment representing the finished work
 - L. Clean concealed areas before enclosing.

- M. Supervise work to prevent damage to existing and installed construction.

3.11 SAFETY, SECURITY, AND FIRE PROTECTION

- A. The Contractor is solely responsible for all safety and security at the project site. Assign a designated job safety person.
- B. Conduct operations in accordance with all applicable regulations and requirements of local state and federal laws, including OSHA.
- C. Provide safety protection, fall protection, barricades, warning signs, and coverings as required by the City of Chicago Building Code and Ordinance, OSHA or by the PBC. Maintain lights or signals as warning during the work, removing same when completed. Maintain MSDS/SD Sheets on site for products used in the work. Submit with close-out documents.
- D. Replace protection, barriers, safety devices or warnings immediately upon completion of work requiring the removal of same or at the end of a working day should the work exceed one day.
- E. Provide all safety equipment or weather protective gear required to perform the work including personal protective equipment such as eye, ear protection, and hard hats. Access to roofs shall be through roof scuttles where available, otherwise use properly anchored, OSHA approved ladders.
- F. Furnish all flagmen required for deliveries to the site..
- G. Watchman Service: No watchmen will be provided. The PBC will not be responsible for a loss on account of theft of or damage to the property and/or equipment of any Contractor.
- H. When working in the existing facility, lock and secure the premises at the end of the workday. Protect all work from damage, vandalism, and theft.
- I. Fire Protection: Conform with all regulations for the City of Chicago Fire Department and of the Contractor's and PBC's Fire Insurance carrier for storage of flammable materials on site.
- J. Provide blankets and auxiliary fire protection as required to prevent damage to adjacent work or materials as a result of welding, burning, or cutting by torch. Obtain PBC's approval of welding or torch work in the existing facility before starting.
- K. Fire prevention facilities shall include fire extinguishers in adequate supply where flammable demolished materials accumulate and as otherwise required by OSHA and NFPA regulations.

3.12 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage. Adjust for proper operation.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.

- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- G. See Section 01 40 00 - Quality Requirements for additional requirements.
- H. Start equipment and operating components and test to confirm proper operation. Remove damaged or malfunctioning units, replace with new units, and retest.

3.13 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. See Section 01 73 29 - Cutting and Patching for additional requirements.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

3.14 FINAL CLEANING

- A. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial/institutional building cleaning and maintenance program.
- B. Use cleaning materials that are nonhazardous. Comply with manufacturer's written instructions.
- C. Complete the following cleaning operations before requesting inspection for certification of Preliminary Acceptance for entire project or for a portion of project:
 - 1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - 2. Sweep paved areas broom clean and power wash to remove equipment marks. Remove petrochemical spills, stains, and other foreign deposits.
 - 3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - 4. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - 5. Remove snow and ice to provide safe access to building.
 - 6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - 7. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

8. Sweep concrete floors broom clean in unoccupied spaces using sweeping compound or other non-dust producing product.
 9. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 10. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 11. Clean washroom floor, walls, fixtures, toilet partitions, mirrors and etc with non- acid cleaning products and provide a sanitary condition.
 12. Clean, mop all wood floors in areas of new construction and renovation work. Clean walls, woodwork in classrooms, offices and corridors.
 13. Scrub tile floors in all food service areas and finish according to manufacturers' specifications. Comply with requirements of CDPH.
 14. Clean resilient floors in accordance with manufacturer's written instructions for post installation initial cleaning. Use only manufacturer recommended products and materials. Seal floors as directed in product specifications.
 15. Clean terrazzo floors in accordance with manufacturer's written instructions for post installation initial cleaning. Use only manufacturer recommended products and materials. Polish floors as directed in product specifications.
 16. Remove labels that are not permanent. Do not remove "UL" labels and other similar identifiers including mechanical and electrical nameplates.
 17. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 18. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 19. Replace parts subject to unusual operating conditions.
 20. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 21. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 22. Clean ducts, blowers, and coils if units were operated without filters during construction.
 23. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 24. Verify entire project area is clean and ready for occupancy.
- D. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

END OF SECTION 01 70 00

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Cutting and patching of existing construction.

1.02 SUBMITTALS

- A. Alterations to Existing Construction: Submit written request in advance of cutting or alteration that affects:
 1. Structural integrity of any element or assembly
 2. Integrity of weather exposed or moisture resistant element.
 3. Efficiency, maintenance, or safety of any operational element.
 4. Visual qualities of sight exposed elements.
 5. Work of the PBC or separate Contractor.

1.03 QUALITY ASSURANCE

- A. General: Contractor shall take reasonable care prior to all cutting and drilling in order to minimize unintended damage to concealed conduits, cables, pipes, reinforcing steel, etc. In circumstances where the absence of such concealed elements is not established conclusively, utilize detection and mapping technology, e.g., X-ray or Sub-surface Interface Radar (SIR), to locate any such elements that may be present before proceeding with the cutting or drilling work.
- B. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio. Notify Architect/Engineer of Record if progress of work may have structural impact.
- C. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Notify Architect/Engineer of Record if progress of work may have operational impact. Operational Elements include the following:
 1. Air or smoke barriers.
 2. Fire-protection systems.
 3. Control systems.
 4. Communication systems.
 5. Conveying systems.
 6. Electrical wiring systems.
 7. Operating systems of special construction.
- D. Miscellaneous Elements: Do not cut and patch building elements or related components in a manner that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Notify Architect/Engineer of Record if progress of work may have performance impact. Miscellaneous Elements include the following:
 1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Exterior curtain-wall construction.
 4. Equipment supports.
 5. Piping, ductwork, vessels, and equipment.
 6. Noise- and vibration-control elements and systems.

- E. Physical Appearance: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect/Engineer of Record's opinion, reduce the building's aesthetic qualities.

1.04 FIELD CONDITIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated. Failure to do so does not constitute a change order to the Work.
 - 2. Report discrepancies to Architect/Engineer of Record before disturbing existing installation.
 - 3. Beginning of cutting and patching work constitutes acceptance of existing conditions.

1.05 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. New Materials: As specified in product sections; match existing adjacent products and work for patching and extending work.
- B. Existing and In-Place Materials: Use materials identical to existing materials.
 - 1. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. If identical materials are unavailable or cannot be used, use materials that, when installed, shall match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.01 GENERAL

- A. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-conforming work.

3.02 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.03 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 2. Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to prevent interruption of services to occupied areas.
 3. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 4. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Provide temporary connections as required to maintain existing systems in service.
 5. Verify that abandoned services serve only abandoned facilities.
 6. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
 7. If existing services to occupied areas must be interrupted, coordinate and receive approval of the interruption of services prior to starting work.

3.04 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
 2. Remove existing work as indicated and as required to accomplish new work.
 3. Prior to starting work in an area, make arrangements for moving of and subsequent reinstallation of any existing items which may conflict with the work area.
 4. Remove and replace existing walls and ceilings as required to facilitate installation of new work. Replacement of the existing walls & ceilings shall be coordinated as directed by the Architect/Engineer of Record and as delineated in the Contract Documents.
 5. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.

6. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
 7. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 5. Proceed with patching after construction operations requiring cutting are complete.
 6. See Section 31 23 16 - Excavation and 31 23 17 - Excavating, Backfilling, and Compacting for Utilities for site work,
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible.
1. Finish patched surfaces to match finish that existed prior to patching, unless noted otherwise. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 2. Match color, texture, and appearance.
 3. Comply with installation requirements of individual sections.
 4. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
 5. Restore work with new products in accordance with requirements of Contract Documents.
 6. Where feasible test and inspect patched areas after completion to demonstrate integrity of installation.
 7. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
 8. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that shall eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 9. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface

containing the patch. Provide additional coats until patch blends with adjacent surfaces.

- b. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material , to full thickness of the penetrated element. Maintain designated fire rating of the wall, partition, ceiling, or floor construction.
- 10. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
- 11. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

3.05 CLEANING

- A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
- B. Refinish, repair, or remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

END OF SECTION 01 73 29

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. PBC requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Contractor shall submit bi-weekly Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- E. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- F. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- G. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, mastics, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Disposal: Removal off-site of waste and subsequent recycling, reuse, or deposit in a Subtitle D landfill, Clean Construction Demolition Debris site, or incinerator acceptable to authorities having jurisdiction.
- D. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- E. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- F. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

- G. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- H. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- I. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- J. Return: To give back reusable items or unused products to vendors for credit.
- K. Reuse: To reuse a construction waste material in some manner on the project site.
- L. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- M. Salvage and Reuse: Recovery of waste and subsequent incorporation into the Work.
- N. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- O. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- P. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- Q. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- R. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Sustainable Design Submittals: Submit Waste Management Plan and bi-weekly Waste Disposal Reports in accordance with procedures specified in Section 01 33 29 LEED Sustainable Design Reporting.
- C. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.
 - 1. Submit to Architect/Engineer of Record for PBC's review and approval.
 - 2. If PBC wishes to implement any cost alternatives, the Contract Price will be adjusted as specified elsewhere.
 - 3. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
 - 4. Describe as many alternatives to landfilling as possible:
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the proposed local market for each material.
 - c. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.
 - 5. Provide alternatives to landfilling for at least the following materials:

- a. Aluminum and plastic beverage containers.
 - b. Corrugated cardboard.
 - c. Wood pallets.
 - d. Clean dimensional wood.
 - e. Land clearing debris, including brush, branches, logs, and stumps.
 - f. Concrete.
 - g. Bricks.
 - h. Concrete masonry units.
 - i. Asphalt paving.
 - j. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - k. Glass.
 - l. Gypsum drywall and plaster.
 - m. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (<http://flooring.dupont.com>) and Interface (www.interfaceinc.com) conduct reclamation programs.
 - n. Plumbing fixtures.
 - o. Electrical equipment.
 - 1) Lighting fixtures: separate lamps by type and protect from breakage.
 - 2) Electrical Devices: separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
 - 3) Conduit: Reduce conduit to straight lengths and store by type and size.
- D. Once PBC has determined which of the landfill alternatives addressed in the Proposal above are acceptable, prepare and submit Waste Management Plan; submit within 10 calendar days after notification by Architect/Engineer of Record.
- E. Waste Management Plan: Include the following information:
- 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the local market for each material.
 - c. State the estimated net cost, versus landfill disposal.
 - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 - 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
- F. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
- 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to PBC.
 - 3. Landfill Disposal: Include the following information:

- a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Incinerator Disposal: Include the following information:
- a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
 - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - d. Include signed manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
5. Recycled and Salvaged Materials: Include the following information for each:
- a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include signed manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
6. Material Reused on Project: Include the following information for each:
- a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.
- G. Subtitle D Landfill and Incinerator Disposal Records: Submit record indicating receipt and acceptance of waste by the permitted Subtitle D landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices. Submit concurrently with waste reduction progress reports.
- H. Statement of Refrigerant Recovery (if applicable): Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

PART 2 - PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

- A. See Section 01 60 00 - Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00 - Product Requirements:
 1. Relative amount of waste produced, compared to specified product.
 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
 3. Proposed disposal method for waste product.

4. Markets for recycled waste product.

PART 3 - EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 30 00 - Administrative Requirements for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 03(05) - Temporary Facilities and Controls for additional requirements related to trash/waste collection and removal facilities and services.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, PBC, and Architect/Engineer of Record.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 1. Pre-bid meeting.
 2. Pre-construction meeting.
 3. Regular job-site meetings.
- E. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- F. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 1. Provide containers as required.
 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- G. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- H. Recycling, General: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
 1. Recycle paper and beverage containers used by on-site workers in addition to construction waste.
 2. Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor
 3. Waste may be co-mingled at the site and separated at a recycling facility.
 4. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

5. Inspect containers and bins for contamination and remove contaminated materials if found.
 6. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 7. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 8. Store components off the ground and protect from the weather.
- I. Recycling Demolition Waste:
1. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.
 2. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 - a. Pulverize concrete to maximum 1-1/2-inch (38-mm size).
 - b. Crush concrete and screen to comply with requirements in other Sections for use as satisfactory soil for fill or sub base.
 3. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 - a. Clean and stack undamaged, whole masonry units on wood pallets.
 4. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
 5. Metals: Separate metals by type.
 - a. Structural Steel: Stack members according to size, type of member, and length.
 - b. Remove and dispose of bolts, nuts, washers, and other rough hardware.
 6. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
 7. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
 8. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
 - a. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
 9. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 - a. Store clean, dry carpet[and pad] in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
 10. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
 11. Plumbing Fixtures: Separate by type and size.
 12. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
 13. Lighting Fixtures: Separate lamps by type and protect from breakage.
 14. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
 15. Conduit: Reduce conduit to straight lengths and store by type and size.
- J. Recycling Construction Waste:
1. Packaging:
 - a. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - b. Polystyrene Packaging: Separate and bag materials.
 - c. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 - d. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
 2. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

- a. Comply with requirements in Division 32 Sections for use of chipped organic waste as organic mulch.
- 3. Wood Materials:
 - a. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 - b. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- 4. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
 - a. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
- K. Salvaged Items for Reuse in the Work:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- L. Salvaged Items for Sale and Donation: Not permitted on Project site.
- M. Salvaged Items for PBC's Use:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to PBC.
 - 4. Transport items to PBC's storage area designated by PBC.
 - 5. Protect items from damage during transport and storage.
 - 6. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

3.03 DISPOSAL OF WASTE

- A. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a permitted Subtitle D landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn waste materials.

END OF SECTION 01 74 19

SECTION 01 78 23.1

OPERATIONS AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance data.

1.2 SUBMITTALS

- A. Provide outline of O&M structure as described in section 2.1 to Architect and CxA at 50% construction completion milestone.
- B. Draft Submittal: Submit to Architect and CxA one electronic copy of each draft manual 60 days after O&M outline is accepted. Include a complete operation and maintenance directory.
 - 1. Draft manual shall constitute the full compilation of documentation by Division as outlined under this section. Manuals or documentation submitted in portions or by individual specification section shall be rejected and returned without review.
 - 2. Contractor will make any corrections required and resubmit all copies until Architect and CxA find manuals acceptable.
- C. Final Submittal: Submit five (5) hard copies of each manual and one (1) electronic copy of each manual in final form evidencing acceptance by the Architect and CxA. The Operation and Maintenance Manuals must be delivered to the Owner (end user) a minimum of 7 days prior to the commencement of any Owner's training on any systems or equipment.
 - 1. Submit all copies to the Owner's Authorized Representative with a transmittal indicating compliance with requirements for submittal of Operation and Maintenance Manuals.
 - 2. Owner's Authorized Representative will be responsible for distribution to the appropriate parties, including the end user.

1.3 OPERATIONS AND MAINTENANCE MANUALS GENERAL

- A. The commissioning process requires detailed O&M documentation. O&M documentation requirements identified in this section, in Division 01 Section "Commissioning (Cx) Requirements" and other Division 21 through 28 sections.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

- A. The General Contractor shall compile O&M manuals for every piece of equipment, building operating or electrical system, and/or building materials as called for within these specifications or outlined by manufacturer/vendor.
- B. Organization: There shall be a title page and table of contents in the front of each manual for each manual's contents. In each manual, there shall be a main tab for each specification section. Behind the section number tab there shall be the equipment ID tag sub-tab for each piece of

major equipment (or group, if small or numerous). These sub-tabs shall be similar to the specification number tabs but have a different color. Behind each equipment name tab shall be the sections noted below, in the given order, divided by a double weight colored sheet labeled with the title of the section.

1. Title Page: For paper copies of manuals enclose title page in transparent plastic sleeve, electronic copies shall have title page as first page of file for manual. Include the following information:
 - a. Subject matter included in manual.
 - b. Name and address of Project.
 - c. Name and address of the Owner.
 - d. Date of submittal.
 - e. Name, address, and telephone number of primary Contractors.
 - f. Name and address of A/E.
 - g. Cross-reference to related systems in other operation and maintenance manuals.
2. Table of contents for each volume.
3. Indices for each volume
4. Specification Section Tab
 - a. Equipment ID Tag Tab
 - 1) Equipment ID Tag Summary
 - 2) Contractor: The first page behind the equipment tab shall contain the name, address and telephone number of the manufacturer and installing contractor and the 24-hour number for emergency service for all equipment in this section, identified by equipment.
 - 3) Submittal and Product Data: This section shall include all approved submittal data, cut sheets and appropriate shop drawings. If submittal was not required for approval, descriptive product data shall be included.
 - 4) Operation and Maintenance Instructions: These shall be the written manufacturer's data with the model and features of this installation clearly marked and edited to omit reference to products or data not applicable to this installation. This section shall include data on the following:
 - a) Installation, startup and break-in instructions
 - b) All starting, normal shutdown, emergency shutdown, manual operation, seasonal changeover and normal operating procedures and data, including any special limitations.
 - c) O&M and installation instructions that were shipped with the unit.
 - d) Preventative maintenance and service procedures and schedules.
 - e) Troubleshooting procedures.
 - f) A parts list, edited to omit reference to items, which do not apply to this installation.
 - g) A list of any special tools required to service or maintain the equipment.
 - h) Performance data, ratings and curves.
 - 5) Warranty, which clearly lists conditions to be maintained to keep warranty in effect and conditions that would affect the validity of the warranty.
 - 6) Any service contracts issued.
 - 7) Supplemental Data: Prepare written text and/or special drawings to provide necessary information, where manufacturer's standard printed data is not available and information is necessary for a proper understanding and operation and maintenance of equipment or systems, or where it is necessary

- to provide additional information to supplement data included in the manual or project documents.
- 8) Control Drawings: Include the control drawings for the piece of equipment and its components, including the sequence of operation. This section will be provided by the controls contractor. The drawings will be repeated in the control contractor's O&M submittals.
 - 9) Specifications: This section is comprised of the component or system specification section copied and inserted complete with all addenda.
 - 10) System Description: This section shall include the individual equipment portion of the overall system Design Documentation Narrative, if available. It will contain simplified professionally drawn single line system diagrams on 8-1/2 x 11 or 11 x 17 sheets, if the system's control drawing is not adequate.
 - 11) Preventive Maintenance Instructions: This section shall include condensed typewritten excerpts from the manufacturers written instructions for weekly, monthly, quarterly, annual, etc. maintenance. This summary shall be prepared by the HVAC mechanical contractor with help from the equipment supplier. It shall be prepared for all items listed under condensed operating instructions (below), plus package, window or through the wall AC units and electric unitary heating equipment.
 - 12) Condensed Operating Instructions: This section shall include condensed instructions for start-up, shutdown, emergency operation, safety precautions, unusual features and troubleshooting suggestions. Where control is clearly covered in controls description, it is not to be duplicated here. In addition, a copy of these instructions shall be clearly laminated and secured adjacent to the equipment where it can be easily read by operating personnel. These instructions shall be provided for boilers, furnaces, chillers, pumps, heat rejection equipment, large air handling units (greater than 10 tons), heat pump systems, control system, air compressors and dryers.
- C. Controls and Test and Balance (TAB) O&M Manuals: The controls contractor and TAB contractor have special O&M manual preparation requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC" that shall be merged with those of this section.
- D. Paper Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem and equipment. If possible, assemble instructions for subsystems, equipment and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.

4. Supplementary Text: Prepared on 8-1/2-by-11-inch, 20-lb/sq. ft. white bond paper.
 5. Supplemental Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 6. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - a. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents and drawing locations.
- E. Electronic Manual Contents: Organize into sets of manageable size to ensure files for manual are contained within a single compact disc. Arrange contents alphabetically by file name or bookmarking, for organization to coincide with system, subsystem and equipment. Ensure instructions for subsystems, equipment and components of one system into a single compact disc.
1. DVDs or Solid State Memory Device: All files shall be burned on to and provided in plastic cases. Discs shall be clearly labeled with the same information as required for the manual title page. If more than one manual is present on the disc a listing of the manual contained shall be provided on the label.
 - a. If two or more discs are necessary to accommodate data of a system, organize data in each disc into groupings by subsystem and related components. Cross-reference other discs by bookmarking or annotations in the electronic files contained on the disc if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Discs shall be clearly labeled with the same information as required for the manual title page. If more than one manual is present on the disc a listing of the manual contained shall be provided on the label.
 2. Bookmarking: The O&M manuals shall be fully integrated and navigable. "Fully integrated and navigable", is defined in this context as the ability for users to review and locate information utilizing bookmarks or other file organization methods. Use of folder structures for this purpose will be permitted provided file nomenclature utilized clearly indicates the type of document the file contains and all information pertinent to a given system, subsystem and/or unit is contained within a single folder.
 3. Searching: All files shall be fully searchable using standard text search functions. If scanned copies of documents are provided, these files shall be converted into OCR recognized text format with original image overlay.
 4. Acceptable Electronic Formats: Acceptable electronic formats for files provided for manuals shall be as listed below. Contractor shall be responsible to provide free viewers for all formats not listed below for any files provided in their submission. Scanned copies of paper documents must have prior approval from Owner.
 - a. Word, current version
 - b. Excel, current version
 - c. Adobe Acrobat, current version
 - d. WAV
 - e. WMV
 - f. DWF

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems where indicated in specific specification sections.
- B. Training of AIS personnel in operation, maintenance, care, cleaning, maintenance, and repair of:
 - 1. Items specified in individual product Sections.
 - 2. Products and systems identified in Part 2

1.02 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Draft Training Session Matrix: AIS will designate personnel to be trained; tailor training to needs and skill-level of attendees. Matrix shall be used to confirm scheduling of all required training sessions with the designated personnel.
 - 1. Submit not less than four weeks prior to Preliminary Acceptance.
 - 2. Revise and resubmit until acceptable.
 - 3. Provide an overall schedule showing all training sessions.
 - a. Coordinate instruction schedule with the AIS's operations and schedule through the AIS's Representative. Adjust schedule as required to minimize disrupting the AIS's operations and to ensure attendance by designated personnel.
 - 4. Include at least the following for each training session:
 - a. Identification.
 - b. Proposed date, time, and duration.
 - c. Description of products and/or systems to be covered.
 - d. Name of firm and person conducting training; include qualifications.
 - e. Intended audience, such as job description.
 - f. Objectives of training and suggested methods of ensuring adequate training.
 - g. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - h. Media to be used, such as slides, hand-outs, etc.
 - i. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Coordinate content of training sessions with content of emergency, operation, and maintenance manuals.
 - 2. Include applicable portion of O&M manuals.
 - 3. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 4. Provide one extra copy of each training manual to be included with operation and maintenance data.

- D. Sign-off sheets: Submit copies of proposed sign-off sheets for each training session not less than 10 days prior to the scheduled training. Sign-off sheets are to include the following information:
 - 1. Name of training session
 - 2. Date of training
 - 3. Beginning/Ending time
 - 4. Detailed, itemized summary listing all areas of training for that session.
 - 5. Listing of hand-out materials distributed at the session.
 - 6. Signature lines for Trainer, Contractor, and AIS's Personnel being trained.
 - a. Signature by AIS's personnel evidences training received only to the extent listed on the sign-off sheet summary.
- E. Video Recordings: Submit digital video recording of each demonstration and training session for AIS's subsequent use.
 - 1. Format: DVD Disc. Provide three (3) copies.
 - 2. Label each disc and container with session identification and date.

1.03 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 - 2. Where applicable, training is to be provided by a factory-authorized service representative experienced in the operation and maintenance procedures and training of the specified product/system..

PART 2 - PRODUCTS

PART 3 -

3.01 INSTRUCTION MODULES

- A. Motorized doors, including [overhead coiling doors] [overhead coiling grilles] [and] [automatic entrance doors].
- B. Equipment, including [stage equipment] [projection screens] [loading dock equipment] [waste compactors] [food-service equipment] [residential appliances] [and] [laboratory fume hoods] <Insert any other specified equipment>.
- C. Fire-protection systems, including [fire alarm] [fire pumps] [and] [fire-extinguishing systems].
- D. Intrusion detection systems.
- E. Conveying systems, including [elevators] [wheelchair lifts] [escalators] [and] [cranes].
- F. Medical equipment, including medical gas equipment and piping.
- G. Laboratory equipment, including laboratory [air] [and] [vacuum] equipment and piping.
- H. Heat generation, including [boilers] [feedwater equipment] [pumps] [steam distribution piping] [and] [water distribution piping].

- I. Refrigeration systems, including [chillers] [cooling towers] [condensers] [pumps] [and] [distribution piping].
- J. HVAC systems, including [air-handling equipment] [air distribution systems] [and] [terminal equipment and devices].
- K. HVAC instrumentation and controls.
- L. Electrical service and distribution, including [transformers] [switchboards] [panelboards] [uninterruptible power supplies] [and] [motor controls].
- M. Packaged engine generators, including transfer switches.
- N. Lighting equipment and controls.
- O. Communication systems, including [intercommunication] [surveillance] [clocks and programming] [voice and data] [and] [television] equipment.
- P. [Insert other systems and equipment.]

3.02 INSTRUCTION CONTENT

- A. Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 - 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.

- f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 4 - EXECUTION

4.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by AIS.
- B. Demonstration may be combined with AIS personnel training if applicable.
- C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

4.02 TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.

- B. AIS will provide classroom and seating at no cost to Contractor.
 - 1. Contractor to set up instructional equipment at instruction location.
- C. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- D. Provide instruction at mutually agreed on times as approved in the training schedule matrix. For equipment that requires seasonal operation, provide similar instruction at start of each season.
- E. Create and provide training video. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module video, record each chart containing learning objective and lesson outline.
- F. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.
- G. At the conclusion of each training module obtain sign-offs using the approved sign-off sheets. Executed sign-off sheets are to be submitted as part of the closeout documentation evidencing compliance with training requirements.
- H. Collect used and leftover educational materials and return to AIS. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 01 79 00

SECTION 01 79 00.1

DEMONSTRATION AND TRAINING - COMMISSIONING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing the Board's personnel in the operation and maintenance of systems, subsystems, and equipment.

1.2 SUBMITTALS

- A. The Contractor shall be responsible to submit a formal training program to be utilized for each respective system at 50% of construction completion milestone to the Architect, Owner, and CxA. It is the Contractor's responsibility to work with Owner and other contractors to develop a cohesive training session schedule that complies with Owner's personnel availability, scheduling requirements of other contractor's sessions, and specifies completion of all training sessions prior to substantial completion. The training program shall include at a minimum the following:

1. Training Outline that summarizes all training sessions and their proposed dates, times, length of instruction, names of instructors, along with a summary learning objective for each training session.
2. Detailed Agenda for each training session that includes the following:
 - a. Session title
 - b. Proposed date of the session
 - c. Intended audience
 - d. List of systems and equipment to be reviewed
 - e. Training objectives and topics by system and equipment
 - f. Listed durations for each objective and topic
 - g. Instructor, including name and affiliation, for each objective and topic
3. Instructor qualifications for each instructor listed. The Contractor is responsible to ensure each instructor has an intimate knowledge of the system or equipment and the installation for this project. The Owner shall have the right of refusal to reject any proposed instructor that is not deemed qualified for provision of training. Instructor qualifications for each instructor listed. The Contractor is responsible to ensure each instructor has an intimate knowledge of the system or equipment and the installation for this project. The Owner shall have the right of refusal to reject any proposed instructor that is not deemed qualified for provision of training.
4. Contractor contact sheet, including address, phone number, fax number and e-mail.
5. Additional materials to be utilized including copies of any materials and/or video to be utilized during the session.

- B. Sign-off sheets: Submit copies of proposed sign-off sheets for each training session a minimum of 14 days prior to the scheduled training. Sign-off sheets are to include the following information:

1. Name of training session
2. Date of training
3. Beginning/Ending time
4. Detailed, itemized summary listing all areas of training for that session.

5. Listing of hand-out materials distributed at the session.
6. Signature lines for Trainer, Contractor, and CPS personnel being trained.
 - a. Signature by CPS personnel evidences training received only to the extent listed on the sign-off sheet summary.

C. Provide videographer qualifications.

D. Compiled training schedule: To be submitted to A/E, CxA, and Owner 60 days after approval of draft training program.

E. Demonstration and Training DVD: Submit three (3) copies within seven days of end of each training module. Copies shall be of professional audio and video quality, including provision of DVD menu structure and labeling.

1.3 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.4 COORDINATION

A. Coordinate instruction schedule with the Board's operations and schedule through the Board's Authorized Representative. Adjust schedule as required to minimize disrupting the Board's operations and to ensure attendance by designated CPS representatives as determined in training coordination meeting noted in section 3.2.

B. Coordinate content of training modules with content of emergency, operation, and maintenance manuals. Provide copies of this coordinated material at each training session.

C. Completion of all training sessions must occur prior to substantial completion.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Refrigeration systems, including chillers, pumps and distribution piping.
2. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
3. HVAC instrumentation and controls.
4. Lighting equipment and controls.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.

- b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.

7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.

8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct the Board's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 1. The Boards Authorized Representative. will furnish Contractor with names and positions of participants.
- B. Schedule a coordination meeting with the Owner to discuss training program, attendees, and schedule. This meeting must occur before submission of draft training program.
- C. Scheduling: Provide instruction at mutually agreed on times as approved in the training program. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 1. The training schedule will be coordinated through the Boards Authorized Representative.
- D. (Two) 2 days prior to the scheduled training session, Contractor shall notify CxA and participants of confirmation for training session.
- E. All training sessions shall follow the approved agenda and shall be provided in the following format:
 1. Classroom session
 2. Site walk-through. Facility walkthrough shall identify general layout of system and equipment and provide visual reference to typical equipment of system.

- F. Signoff Sheets: At the conclusion of each training module obtain sign-offs using the approved sign-off sheets. Executed sign-off sheets are to be submitted as part of the closeout documentation evidencing compliance with training requirements.
- G. Demonstration and Training Videotape: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. All sessions must be recorded by the approved videographer.
 - 2. At beginning of each training module, record each chart containing learning objective and lesson outline.
 - 3. All audio must be professionally recorded so that background noise can be minimized.
 - 4. Videotaping must have clear view of instructor and activities being conducted.
 - 5. Use of non-commercial video recording devices is not permitted (i.e. cell phone cameras, Handi-cams, etc.).
- H. Cleanup: Collect used and leftover educational materials and give to the Board. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.
- I. Re-training: The contractor is responsible for all expenses and time for all participants and consultants (Owner, Architect, CxA, etc.) in attendance if one of the following occurs:
 - 1. If confirmation is received as required in 3.2-D (2 days before training session) and the training session is subsequently cancelled or the specified instructor does not show up.
 - 2. If the Owner does not sign-off that the training meets the requirements previously submitted in the training outline and agenda.

END OF SECTION

SECTION 21 05 53

IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Equipment labels.
- B. Valve tags.
- C. Warning signs and labels.
- D. Warning tags
- E. Pipe labels.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.

1.03 SUBMITTALS

- A. Product Data: Provide manufacturers catalog literature for each product required.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Store materials in a dry and secure area on-site and protect against dirt and moisture damage.
- B. Do not apply or install damaged materials.

PART 2 - PRODUCTS

2.01 EQUIPMENT LABELS

- A. Manufacturers:
 - 1. Kolbi Pipe Marker Company: www.kolbipipemarkers.com.
 - 2. Seton Identification Products, a Tricor Direct Company: www.seton.com.
 - 3. LEM Products Inc.: www.lemproductsinc.com.
- B. Description: Brass, 0.032-inch thick, or stainless steel, 0.025-inch thick, and having predrilled holes for attachment hardware.
 - 1. Letter Color: White.

2. Letter Height: 1/4 inch.
3. Background Color: Red.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionally larger lettering for greater viewing distances. Include secondary lettering 2/3 to 3/4 the size of primary lettering.
6. Fasteners: Stainless-steel self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include Project number, equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.02 VALVE TAGS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.
2. Kolbi Pipe Marker Company: www.kolbipipemarkers.com.
3. Seton Identification Products, a Tricor Direct Company: www.seton.com.

B. Metal Tags: Brass (0.032" thick) or Stainless Steel (0.025" thick) with stamped letters; tag size minimum 2" diameter with smooth edges.

C. Fasteners: Brass beaded chain.

D. Valve-Tag Color: Safety Red.

E. Letter Color: White.

F. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.03 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions. Provide additional information as required by Board Representative.

2.04 WARNING TAGS

- A. Description: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 - 1. Size: Approximately 4 by 7 inches.
 - 2. Fasteners: Reinforced grommet and wire.
 - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Color: Safety Yellow background with black lettering.

2.05 PIPE LABELS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com.
 - 2. Kolbi Pipe Marker Company: www.kolbipipemarkers.com.
 - 3. Seton Identification Products, a Tricor Company: www.seton.com.
- B. Plastic Tape Pipe Markers: Pre-printed, color-coded, flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings with lettering indicating service and flow direction according to ASME A13.1.
- C. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.
- D. Pipe-Label Colors:
- E. Color code as follows:
 - 1. Fire Quenching Fluids: Red with white letters.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.02 INSTALLATION

A. GENERAL INSTALLATION REQUIREMENTS

1. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
2. Coordinate installation of identifying devices with locations of access panels and doors.
3. Install identifying devices before installing acoustical ceilings and similar concealment.

B. EQUIPMENT LABEL INSTALLATION

1. Install or permanently fasten labels on each major item of mechanical equipment.
2. Locate equipment labels where accessible and visible.

C. PIPE LABEL INSTALLATION

1. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - a. Near each valve and control device.
 - b. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
 - c. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - d. At access doors, manholes, and similar access points that permit a view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
 - f. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 15 feet in areas of congested piping and equipment.
 - g. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
2. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes including pipes where flow is allowed in both directions. Arrows should wrap completely around piping.

D. VALVE-TAG INSTALLATION

1. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule.
 - a. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:
 - 1) Valve-Tag Size and Shape:
 - a) Fire-Suppression Standpipe: 2 inches, round.
 - b) Wet-Pipe Sprinkler System: 2 inches, round.
 - c) Dry-Pipe Sprinkler System: 2 inches, round.
 - d) Clean-Agent Fire-Extinguishing System: 2 inches, round.

E. WARNING-TAG INSTALLATION

1. Write required message on, and attach warning tags to, equipment and other items where required.

3.03 SCHEDULES

A. SAMPLE SCHEDULES

The following tables are examples of schedules required to be submitted by the Contractor. Example information has been included in the first row of the tables for reference only.

VALVE TAG SCHEDULE - FIRE SUPPRESSION PIPING					REMARKS
VALVE NUMBER	VALVE TYPE	VALVE SIZE	VALVE LOCATION	NORMAL OPERATING POSITION	
FS-GV-01	GATE	NPS 2	ROOM 101	OPEN	

END OF SECTION 21 05 53

SECTION 21 12 00

FIRE-SUPPRESSION STANDPIPES

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. Pipes, Fittings, and Specialties
2. Fire-protection Specialty Valves
3. Hose Connections
4. Alarm Devices
5. Manual Control Stations
6. ~~Control Panels~~
7. Pressure Gages

- B. Related Requirements:

1. Section 21 05 23 "General-Duty Valves for Water-Based Fire-Suppression Piping"
2. Section 21 11 19 "Fire-Department Connections", for exposed wall-mounted and yard fire hydrants.
3. Section 21 13 13 "Wet-Pipe Sprinkler Systems", for wet-pipe sprinkler piping.
4. Section 21 13 16 "Dry-Pipe Sprinkler Systems", for dry-pipe sprinkler piping.
5. Section 28 31 11 "Digital Addressable Fire-Alarm System, Chicago Class I (Mid Rise)" for connections to alarm devices.

1.03 DEFINITIONS

- A. High-Pressure Standpipe Piping: Fire-suppression standpipe piping designed to operate at working pressure higher than standard 175 psig, but not higher than 250 psig.
- B. Standard-Pressure Standpipe Piping: Fire-suppression standpipe piping designed to operate at working pressure 175 psig maximum.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For fire-suppression standpipes.
 1. Include plans, elevations, sections, and attachment details.

2. Include diagrams for power, signal, and control wiring.

- C. Delegated-Design Submittal: For standpipe systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 INFORMATIONAL SUBMITTALS

- A. Approved Standpipe Drawings: Working plans, prepared according to NFPA 14, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- B. Fire-hydrant flow test report.
- C. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-suppression standpipes specialties to include in emergency, operation, and maintenance manuals.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications:
1. Installer's responsibilities include designing, fabricating, and installing fire-suppression standpipes and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- 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. NFPA Standards: Fire-suppression standpipe equipment, specialties, accessories, installation, and testing shall comply with NFPA 14.

1.08 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Suppression Standpipe Service: Do not interrupt fire-suppression standpipe service to facilities occupied by the CHA or others unless permitted under the following conditions and then only after arranging to provide temporary fire-suppression standpipe service according to requirements indicated:
1. Notify the CHA no fewer than two days in advance of proposed interruption of fire-suppression standpipe service.
 2. Do not proceed with interruption of fire-suppression standpipe service without the CHA's written permission.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTIONS

- A. Automatic Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.
- B. Manual Dry-Type, Class I Standpipe System: Includes NPS 2-1/2 hose connections. Does not have permanent water supply. Piping is dry. Water must be pumped into standpipes to satisfy demand.

2.02 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure, Fire-Suppression Standpipe System Component: Listed for 175-psig minimum working pressure.
- B. High-Pressure, Fire-Suppression Standpipe System Component: Listed for 250-psig minimum working pressure.
- C. Delegated Design: Design fire-suppression standpipes, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- D. Fire-suppression standpipe design shall be approved by authorities having jurisdiction.
 - 1. Minimum residual pressure at each hose-connection outlet is as follows:
 - a. NPS 2-1/2 Hose Connections: 100 psig.
- E. Seismic Performance: Fire-suppression standpipes shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.03 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials and for joining methods for specific services, service locations, and pipe sizes.

2.04 BLACK STEEL PIPE AND ASSOCIATED FITTINGS

- A. Schedule 10: ASTM A 135/A 135M or ASTM A 795/A 795M, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.
- B. Uncoated, Steel Couplings: ASTM A 865/A 865M, threaded.
- C. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- D. Malleable- or Ductile-Iron Unions: UL 860.
- E. Cast-Iron Flanges: ASME B16.1, Class 125.
- F. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

- G. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.
- H. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International
 - b. Shurjoint-Apollo Piping Products USA Inc.
 - c. Smith-Cooper International
 - d. Tyco by Johnson Controls Company
 - e. Victaulic Company
 - 2. Pressure Rating: 300 **psig** minimum.
 - 3. Painted, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
 - 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.05 GALVANIZED-STEEL PIPE AND ASSOCIATED FITTINGS

- A. Schedule 40: ASTM A 53/A 53M, Type E, Grade B; with factory- or field-formed ends to accommodate joining method.
- B. Schedule 40: ASTM A 135/A 135M, Grade A; with factory- or field-formed ends to accommodate joining method.
- C. Schedule 40: ASTM A 795/A 795M, Type E, Grade A; with factory- or field-formed ends to accommodate joining method.
- D. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Standard Weight, seamless steel pipe with threaded ends.
- E. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- F. Malleable-Iron Unions:
 - 1. ASME B16.39, Class 150.
 - 2. Hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal, bronze seating surface.
 - 4. Threaded ends.
- G. Flanges: ASME B16.1, Class 125, cast iron.
- H. Appurtenances for Grooved-End, Galvanized-Steel Pipe:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International
 - b. Grinnell G-Fire by Johnson Controls Company.
 - c. Shurjoint-Apollo Piping Products USA Inc
 - d. Victaulic Company

2. Fittings for Grooved-End, Galvanized-Steel Pipe: Galvanized, ASTM A 47/A 47M, malleable-iron casting; ASTM A 106/A 106M, steel pipe; or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.

2.06 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.
 1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
 2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.07 SPECIALTY VALVES

- A. General Requirements:
 1. Standard: UL's "Fire Protection Equipment Directory" listing or FM Global's "Approval Guide."
 2. Pressure Rating:
 - a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.
 - b. High-Pressure Piping Specialty Valves: 300 psig.
 3. Body Material: Cast or ductile iron.
 4. Size: Same as connected piping.
 5. End Connections: Flanged or grooved.
- B. Automatic (Ball Drip) Drain Valves:
 1. Standard: UL 1726.
 2. Pressure Rating: 175 psig minimum.
 3. Type: Automatic draining, ball check.
 4. Size: NPS 3/4.
 5. End Connections: Threaded.

2.08 HOSE CONNECTIONS

- A. Nonadjustable-Valve Hose Connections:
 1. Standard: UL 668 hose valve for connecting fire hose.
 2. Pressure Rating: 300 psig minimum.
 3. Material: Brass or bronze.
 4. Size: NPS 1-1/2 or NPS 2-1/2, as indicated.
 5. Inlet: Female pipe threads.

6. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads.
7. Pattern: Angle.
8. Finish: Polished chrome-plated.

2.09 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Electrically Operated Alarm Bell:
 1. Standard: UL 464.
 2. Type: Vibrating, metal alarm bell.
 3. Size: 10-inch diameter.
 4. Finish: Red-enamel factory finish, suitable for outdoor use.
- C. Water-Flow Indicators:
 1. Standard: UL 346.
 2. Water-Flow Detector: Electrically supervised.
 3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
 4. Type: Paddle operated.
 5. Pressure Rating: 250 psig.
 6. Design Installation: Horizontal or vertical.
- D. Valve Supervisory Switches:
 1. Standard: UL 346.
 2. Type: Electrically supervised.
 3. Components: Single-pole, double-throw switch with normally closed contacts.
 4. Design: Signals that controlled valve is in other than fully open position.

2.10 PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- C. Pressure Gage Range: Zero to 300 psig.
- D. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 14 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

- B. Report test results promptly and in writing.

3.02 EXAMINATION

- A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.
- B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements in NFPA 14 for installation of fire-suppression standpipe piping.
- C. Install seismic restraints on piping. Comply with requirements in NFPA 13 for seismic-restraint device materials and installation.
- D. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install drain valves on standpipes. Extend drain piping to outside of building.
- F. Install automatic (ball drip) drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or outside building.
- G. Install alarm devices in piping systems.
- H. Install hangers and supports for standpipe system piping according to NFPA 14. Comply with requirements in NFPA 13 for hanger materials.
- I. Install pressure gages on riser or feed main and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- J. Drain dry-type standpipe system piping.
- K. Fill wet-type standpipe system piping with water.
- L. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 21 05 17 "Sleeves and Sleeve Seals for Fire-Suppression Piping".

- M. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 21 05 17 "Sleeves and Sleeve Seals for Fire-Suppression Piping".
- N. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 21 05 18 "Escutcheons for Fire-Suppression Piping".

3.04 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- J. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.05 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 14 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

3.06 HOSE-CONNECTION INSTALLATION

- A. Install hose connections adjacent to standpipes.
- B. Install freestanding hose connections for access and minimum passage restriction.
- C. Install NPS 1-1/2 hose-connection valves with flow-restricting device.
- D. Install wall-mounted-type hose connections in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose. Comply with requirements for cabinets in Section 10 44 13 Fire Protection Cabinets.
- E. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Coordinate with fire-alarm tests. Operate as required.
 - 6. Coordinate with fire-pump tests. Operate as required.
 - 7. Verify that equipment hose threads are same as local fire-department equipment.
- F. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

3.07 DEMONSTRATION

- A. Train the CHA's maintenance personnel to adjust, operate, and maintain specialty valves.

3.08 PIPING SCHEDULE

- A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

- B. Standard-pressure, wet-type fire-suppression standpipe piping, shall be one of the following:
 - 1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Schedule 40, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 3. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.
 - 4. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 5. Schedule 10, black-steel pipe with plain ends; welding fittings; and welded joints.
 - 6.

- C. High-pressure, wet-type fire-suppression standpipe piping, shall be one of the following:
 - 1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Schedule 40, black-steel pipe with cut- or roll roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
 - 3. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.

- D. Standard-pressure, dry-type fire-suppression standpipe piping, shall be one of the following:
 - 1. Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - 2. Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

END OF SECTION 21 12 00

SECTION 21 13 00

FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. Dry-pipe sprinkler system.

1.02 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- C. ASME B16.11 - Forged Fittings, Socket-welding and Threaded; 2016 (Errata 2017).
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- E. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- F. ASME B16.24 - Cast Copper Alloy Pipe Flanges and Flanged Fittings Classes 150, 300, 600, 900, 1500, and 2500; 2016.
- G. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- H. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2016.
- I. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.
- J. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2012.
- K. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; 2015.
- L. ASME BPVC - Boiler and Pressure Vessel Code; 2017.
- M. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2015.
- N. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2009 (Reapproved 2014).
- O. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2017.
- P. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- Q. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).

- R. ASTM A674 - Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids; 2010 (Reapproved 2014).
- S. ASTM A733 - Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples; 2016.
- T. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2013.
- U. ASTM A865/A865M - Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints; 2006 (Reapproved 2017).
- V. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.
- W. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016.
- X. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; 2011 and errata.
- Y. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.
- Z. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.
- AA. AAWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.
- BB. AAWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017.
- CC. AAWWA C606 - Grooved and Shouldered Joints; 2015.
- DD. A City of Chicago Building Code - Municipal Code of Chicago for the Building Industry; 2017.
- EE. AMSS SP-123 - Non-Ferrous Threaded and Solder-Joint Unions for Use with Copper Water Tube; 2013.
- FF. ANFPA 13 - Standard for the Installation of Sprinkler Systems; 2015, with Errata (2017).
- GG. ANFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2016.
- HH. ANFPA 1963 - Standard for Fire Hose Connections; 2014.
- II. ANFPA 20 - Standard for the Installation of Stationary Pumps for Fire Protection; 2016.
- JJ. ANFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances; 2016.
- KK. ANFPA 291 - Recommended Practice for Fire Flow Testing and Marking of Hydrants; 2016.
- LL. AUL 1091 - Standard for Butterfly Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- MM. AUL 1474 - UL Standard for Safety Adjustable Drop Nipples for Sprinkler Systems; 2004.
- NN. AUL 1486 - UL Standard for Safety Quick Opening Devices for Dry Pipe Valves for Fire Protection Service; 2013.

- OO. AUL 193 - UL Standard for Safety Alarm Valves for Fire-Protection Service; 2016.
- PP. AUL 199 - UL Standard for Safety Automatic Sprinklers for Fire-Protection Service; 2017.
- QQ. AUL 213 - Standard for Safety Rubber Gasketed Fittings for Fire- Protection Service; 2009.
- RR. AUL 260 - UL Standard for Safety Dry Pipe and Deluge Valves for Fire-Protection Service; 2008.
- SS. AUL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- TT. AUL 312 - Check Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- UU. AUL 346 - UL Standard for Safety Waterflow Indicators for Fire Protective Signaling Systems; 2014.
- VV. AUL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.
- WW. AUL 405 - Fire Department Connection Devices; Current Edition; Including All Revisions.
- XX. AUL 464 - UL Standard for Safety Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories; 2017.
- YY. AUL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- ZZ. AUL 753 - UL Standard for Safety Alarm Accessories for Automatic Water-Supply Control Valves for Fire Protection Service; 2013.
- AAA. BUL 789 - Indicator Posts for Fire-Protection Service; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Ensure required submittals have been provided with sufficient time for review prior to scheduling the Preinstallation Meeting.
 - 2. Review the detailed requirements for the work of this section and to review the drawings and specifications for this work
 - a. Require attendance by all affected installers including but not limited to
 - 1) Contractor's Superintendent
 - 2) Installer
 - 3) Manufacturer/Fabricator Representative
 - 4) Other affected Subcontractors
 - 5) Architect/Engineer of Record
 - 6) Board's Representative
 - 3. Record minutes and distribute copies within 5 days after meeting to participants as well as Architect/Engineer of Record, Board and those affected by decisions made.

1.04 SUMMARY

- A. Section includes the following fire-suppression piping inside the building:
 - 1. Wet-pipe sprinkler systems.
 - 2. Dry-pipe sprinkler systems.

- B. The work under this heading shall include the furnishing of all labor, materials, equipment and services necessary for and reasonably incidental to the satisfactory completion of the Fire Protection System, which in general shall include but not be limited to pipe sleeves, pipe and equipment hangers and supports, piping, fittings, flanges, valves, test connections, drains, etc. all as indicated on the Drawings and/or as specified.
 - 1. Each sprinkler system shall be on a separate zone for each floor as a minimum. Each zone shall be provided with all necessary valves, valve supervisory switches, water flow indicators and drains to make it a separate sprinkler system.
 - a. Each sprinkler zone shall have an inspector's test connection at the hydraulically most remote location.
 - 2. The drawings are schematic in nature and are for information only, intended to show potential arrangement. Contractor shall field verify all information contained on the Drawings and shall be solely responsible for design and installation of the systems in accordance with the specifications. All notes, and specifications on the drawings and herein specified shall be complied with.
 - 3. Provide shields/baffle plates necessary to protect electrical equipment from sprinkler discharge.
 - 4. Provide temporary or permanent standpipes in accordance with requirements of authority having jurisdiction to furnish fire protection on all floors during construction. The work performed shall be complete in every respect, resulting in a system(s) installed entirely in accordance with the applicable code, standards, local code amendments, and these specifications.
 - 5. Existing Fire Protection system(s) may not be taken out of service without prior written approval from the Board and the Fire Department. If such systems are taken out of service, the Contractor shall provide alternate protection, acceptable to the Board and the Fire Department, until those systems are restored to service.

1.05 SUBMITTALS

- A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rated capacities, operating characteristics, furnished specialties, rough-in details, weights, support requirements, and piping connections.
- B. Shop Drawings:
 - 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
 - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
 - 3. Diagram power, signal, and control wiring.
 - 4. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect/Engineer of Record.
- C. Fire Hydrant flow test report completed within the last 12 months.
- D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.
- E. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by Chicago Bureau of Fire Prevention, including hydraulic calculations, if applicable.
 - 1. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping." Submit written reports documenting the activities required by Part 3.0. These reports are to be submitted within two weeks after the activity is completed.

2. Training Reports: Submit reports on training documenting dates and attendance.

F. Welding certificates.

G. Field quality-control test reports.

H. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

I. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.06 QUALITY ASSURANCE

A. Installer Qualifications

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test completed within last 12 months.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified fire protection professional in accordance with the requirements of the Chicago Bureau of Fire Prevention.

B. Welding: Qualify processes and operators according to ASME BPVC, Section IX.

C. NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13
2. NFPA 14
3. NFPA 20
4. NFPA 24

1.07 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Division 01 requirements.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.08 WARRANTY

A. Provide manufacturer's standard 1-year warranty for materials and labor, commencing on date of substantial completion.

1.09 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

- B. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.

1.10 PERFORMANCE REQUIREMENTS

- A. Standard Piping System Component Working Pressure: Listed for at least 175 psig.
- B. Fire-suppression sprinkler system design shall be approved by Chicago Bureau of Fire Prevention.
- C. Fire-suppression sprinkler system design and installation shall be in accordance with Chicago Building Code.
 - 1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers. Minimum of 10 psi shall be provided.
 - 2. Sprinkler Occupancy Hazard Classifications:
 - a. Building Service Areas: Ordinary Hazard, Group 1.
 - b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
 - c. General Storage Areas: Ordinary Hazard, Group 1.
 - d. Libraries, Except Stack Areas: Light Hazard.
 - e. Library Stack Areas: Ordinary Hazard, Group 2.
 - f. Machine Shops: Ordinary Hazard, Group 2.
 - g. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
 - h. Office and Public Areas: Light Hazard.
 - i. Repair Garages: Ordinary Hazard, Group 2.
 - 3. Minimum Density for Automatic-Sprinkler Piping Design:
 - a. Light-Hazard Occupancy: 0.12 gpm over 1500-sq. ft. area.
 - b. Ordinary-Hazard, Group 1 Occupancy (14 foot or lower ceiling height): 0.2 gpm over 2000-sq. ft. area.
 - c. Ordinary-Hazard, Group 1 Occupancy (over 14 foot ceiling height): 0.25 gpm over 2500-sq. ft. area
 - d. Rooms utilized for HVAC equipment and Gymnasiums: 0.15 gpm over 1500-sq. ft. area.
 - e. Special Occupancy Hazard: As determined by authorities having jurisdiction.
 - 4. Maximum Protection Area per Sprinkler:
 - a. Office Spaces: 225 sq. ft.
 - b. Storage Areas: 130 sq. ft.
 - c. Mechanical Equipment Rooms: 130 sq. ft.
 - d. Electrical Equipment Rooms: 130 sq. ft.
 - e. Other Areas: According to NFPA 13 recommendations, unless otherwise indicated.
 - 5. Total Combined Hose-Stream Demand Requirement: According to NFPA 13, unless otherwise indicated:
 - a. Light-Hazard Occupancies: 250 gpm for 30 minutes.
 - b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

1.11 COORDINATION

- A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.12 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. For buildings with under 300 sprinklers: Minimum of (6) six spare sprinklers, with a minimum of two sprinklers of each type and temperature rating that are installed in the building.
2. For buildings with 300-1000 sprinklers: Minimum of (12) twelve sprinklers with a minimum of two sprinklers of each type and temperature rating that are installed in the building.
3. For buildings with more than 1000 sprinklers: Minimum of (24) twenty four sprinklers with a minimum of two sprinklers of each type and temperature rating that are installed in the building.
4. A sprinkler wrench shall be provided in the spare sprinkler cabinet for each type of sprinkler installed in the building.
5. A list of the sprinklers installed in the building shall be posted in the sprinkler cabinet, and shall identify the following:
 - a. Sprinkler Identification Number (SIN) if equipped, or the manufacturer, model, orifice, deflector type, thermal sensitivity, and pressure rating.
 - b. General description
 - c. Quantity of each type to be contained in the cabinet
 - d. Issue or revision date of the list.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements in other articles, provide products by one of the manufacturers specified.
1. Grooved-End, Ductile-Iron Pipe
 - a. Grooved-Joint Piping Systems:
 - b. Victaulic Co. of America.
 - c. Tyco Fire Products
 2. Grooved-End, Schedule 40 Steel Pipe
 - a. Grooved-Joint Piping Systems:
 - 1) Anvil International, Inc.
 - 2) Tyco Fire Products
 - 3) Victaulic Co. of America.
 3. Grooved-End, Schedule 30 Steel Pipe
 - a. Grooved-Joint Piping Systems:
 - 1) Anvil International, Inc.
 - 2) Tyco Fire Products
 - 3) Victaulic Co. of America.
 4. Grooved-End, Threadable, Thinwall Steel Pipe
 - a. Grooved-Joint Piping Systems:
 - 1) Anvil International, Inc.
 - 2) Tyco Fire Products
 - 3) Victaulic Co. of America.
 5. Grooved-End, Schedule 10 Steel Pipe
 - a. Grooved-Joint Piping Systems:
 - 1) Anvil International, Inc.
 - 2) Tyco Fire Products
 - 3) Victaulic Co. of America.
 6. Dielectric Unions
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.
 - c. Watts Industries, Inc.; Water Products Div.
 - d. Zurn Industries, Inc.; Wilkins Div.
 7. Dielectric Flanges
 - a. Capitol Manufacturing Co.

- b. Central Plastics Company.
- c. Watts Industries, Inc.; Water Products Div.
- 8. Dielectric Flange Insulation Kits
 - a. Advance Products and Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
- 9. Dielectric Nipples
 - a. Perfection Corporation.
 - b. Precision Plumbing Products, Inc.
 - c. Victaulic Co. of America.
- 10. Sprinkler Drain and Alarm Test Fittings
 - a. Tyco Fire Products
 - b. Fire-End and Croker Corp.
 - c. Viking Corp.
 - d. Victaulic Co. of America.
- 11. Sprinkler Branch-Line Test Fittings
 - a. Elkhart Brass Mfg. Co., Inc.
 - b. Fire-End and Croker Corp.
 - c. Potter-Roemer; Fire-Protection Div.
- 12. Sprinkler Inspector's Test Fitting
 - a. AGF Manufacturing Co.
 - b. Tyco Fire Products
 - c. G/J Innovations, Inc.
 - d. Triple R Specialty of Ajax, Inc.
- 13. Ball Valves
 - a. NIBCO.
 - b. Victaulic Co. of America.
 - c. Milwaukee.
- 14. Butterfly Valves
 - a. NPS 2 (DN 50) and Smaller
 - 1) Global Safety Products, Inc.
 - 2) Milwaukee Valve Company.
 - 3) Nibco.
 - 4) Watts Industries, Inc.; Water Products Div.
 - b. NPS 2-1/2 (DN 65) and Larger
 - 1) Tyco Fire Products
 - 2) Global Safety Products, Inc.
 - 3) McWane, Inc.; Kennedy Valve Div.
 - 4) Mueller Company.
 - 5) NIBCO.
 - 6) Victaulic Co. of America.
- 15. Check Valves NPS 2 (DN 50) and Larger
 - a. American Cast Iron Pipe Co.; Waterous Co.
 - b. Tyco Fire Products
 - c. Clow Valve Co.
 - d. Crane Co.; Crane Valve Group; Crane Valves.
 - e. Globe Fire Sprinkler Corporation.
 - f. Hammond Valve.
 - g. McWane, Inc.; Kennedy Valve Div.
 - h. Mueller Company.
 - i. NIBCO.
 - j. Stockham.
 - k. Watts Industries, Inc.; Water Products Div.
- 16. Gate Valves
 - a. NPS 2 (DN 50) and Smaller

- 1) Crane Co.; Crane Valve Group; Crane Valves.
 - 2) Hammond Valve.
 - 3) NIBCO.
 - b. NPS 2-1/2 (DN 65) and Larger
 - 1) Clow Valve Co.
 - 2) Crane Co.; Crane Valve Group; Crane Valves.
 - 3) Hammond Valve.
 - 4) Milwaukee Valve Company.
 - 5) Mueller Company.
 - 6) NIBCO.
 - 7) Red-White Valve Corp.
- 17. Indicating Valves
 - a. NPS 2 (DN 50) and Smaller
 - 1) Milwaukee Valve Company.
 - 2) NIBCO.
 - 3) Victaulic Co. of America.
 - b. NPS 2-1/2 (DN 65) and Larger
 - 1) Tyco Fire Products
 - 2) McWane, Inc.; Kennedy Valve Div.
 - 3) Milwaukee Valve Company.
 - 4) NIBCO.
 - 5) Victaulic Co. of America.
- 18. Sprinkler System Control Valves
 - a. Tyco Fire Products
 - b. Firematic Sprinkler Devices, Inc.
 - c. Globe Fire Sprinkler Corporation.
 - d. Reliable Automatic Sprinkler Co., Inc.
 - e. Star Sprinkler Inc.
 - f. Victaulic Co. of America.
 - g. Viking Corp.
- 19. Dry-Pipe Valves
 - a. Gast Manufacturing, Inc.
 - b. Tyco Fire Products
 - c. Reliable Automatic Sprinkler Co., Inc.
 - d. Viking Corp.
- 20. Sprinklers
 - a. Tyco Fire Products
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Star Sprinkler Inc.
 - d. Viking Corp.
- 21. Fire Department Connections
 - a. Elkhart Brass Mfg. Co., Inc.
 - b. Fire-End and Croker Corp.
 - c. Guardian Fire Equipment Incorporated.
 - d. Potter-Roemer; Fire-Protection Div.
 - e. Larsens, Inc.
- 22. Water-Motor-Operated Alarm
 - a. Tyco Fire Products
 - b. Firematic Sprinkler Devices, Inc.
 - c. Globe Fire Sprinkler Corporation.
 - d. Reliable Automatic Sprinkler Co., Inc.
 - e. Star Sprinkler Inc.
 - f. Viking Corp.
- 23. Electrically Operated Alarm
 - a. Potter Electric Signal Company.
 - b. System Sensor.

- c. ITT McDonnell & Miller.
- 24. Water-Flow Indicator
 - a. Tyco Fire Products
 - b. ITT McDonnell & Miller.
 - c. Potter Electric Signal Company.
 - d. System Sensor.
 - e. Viking Corp.
- 25. Pressure Switch
 - a. Tyco Fire Products
 - b. Potter Electric Signal Company.
 - c. System Sensor.
 - d. Viking Corp.
- 26. Valve Supervisory Switch
 - a. McWane, Inc.; Kennedy Valve Div.
 - b. Potter Electric Signal Company.
 - c. System Sensor.
- 27. Pressure Gages
 - a. AGF Manufacturing Co.
 - b. AMETEK, Inc.; U.S. Gauge.
 - c. Dresser Equipment Group; Instrument Div.
 - d. WIKA Instrument Corporation.

2.02 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell end and plain end.
 - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110/A21.10, ductile- or gray-iron standard pattern.
 - 2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron gland, rubber gasket, and steel bolts and nuts.

2.03 STEEL PIPE AND FITTINGS

- A. Threaded-End, Schedule 40 Steel Pipe: ASTM A53/A53M, ASTM A135/A135M, or ASTM A795/A795M, hot-dip galvanized where indicated and with factory- or field-formed threaded ends.
 - 1. Cast-Iron Threaded Flanges: ASME B16.1
 - 2. Malleable-Iron Threaded Fittings: ASME B16.3
 - 3. Gray-Iron Threaded Fittings: ASME B16.4
 - 4. Steel Threaded Pipe Nipples: ASTM A733, made of ASTM A53/A53M or ASTM A106/A106M, Schedule 40, seamless steel pipe hot-dip galvanized where indicated. Include ends matching joining method.
 - 5. Steel Threaded Couplings: ASTM A865/A865M hot-dip galvanized-steel pipe where indicated.
- B. Plain-End, Schedule 40 Steel Pipe: ASTM A53/A53M, ASTM A135/A135M, or ASTM A795/A795M hot-dip galvanized-steel pipe where indicated.
 - 1. Steel Welding Fittings: ASTM A234/A234M, and ASME B16.9 or ASME B16.11.
 - 2. Steel Flanges and Flanged Fittings: ASME B16.5
- C. Grooved-End, Schedule 40 Steel Pipe: ASTM A53/A53M, ASTM A135/A135M, or ASTM A795/A795M, hot-dip galvanized where indicated and with factory- or field-formed, square-cut- or roll-grooved ends.
 - 1. Grooved-End Fittings: UL-listed, ASTM A536, ductile-iron casting with OD matching steel-pipe OD.

2. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.
- D. Threaded-End, Schedule 30 Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, with wall thickness less than Schedule 40 and equal to or greater than Schedule 30; or ASTM A795/A795M and ASME B36.10M, Schedule 30 wrought-steel pipe; hot-dip galvanized where indicated and with factory- or field-threaded ends.
1. Cast-Iron Threaded Flanges: ASME B16.1
 2. Malleable-Iron Threaded Fittings: ASME B16.3
 3. Gray-Iron Threaded Fittings: ASME B16.4
 4. Steel Threaded Pipe Nipples: ASTM A733, made of ASTM A53/A53M or ASTM A106/A106M, Schedule 40, seamless steel pipe hot-dip galvanized where indicated. Include ends matching joining method.
 5. Steel Threaded Couplings: ASTM A865/A865M hot-dip galvanized-steel pipe where indicated.
- E. Plain-End, Schedule 30 Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, with wall thickness less than Schedule 40 and equal to or greater than Schedule 30; or ASTM A795/A795M and ASME B36.10M, Schedule 30 wrought-steel pipe hot-dip galvanized where indicated.
1. Steel Welding Fittings: ASTM A234/A234M, and ASME B16.9 or ASME B16.11.
 2. Steel Flanges and Flanged Fittings: ASME B16.5.
- F. Grooved-End, Schedule 30 Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, with wall thickness less than Schedule 40 and equal to or greater than Schedule 30; or ASTM A795/A795M and ASME B36.10M, Schedule 30 wrought-steel pipe hot-dip galvanized where indicated; with factory- or field-formed, roll-grooved ends.
1. Grooved-Joint Piping Systems:
 - a. Grooved-End Fittings: UL-listed, ASTM A536, ductile-iron casting with OD matching steel-pipe OD.
 - b. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.
- G. Plain-End, Threadable, Thinwall Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, with wall thickness less than Schedule 40 and greater than Schedule 10.
1. Steel Welding Fittings: ASTM A234/A234M, and ASME B16.9 or ASME B16.11.
 2. Steel Flanges and Flanged Fittings: ASME B16.5.
- H. Grooved-End, Threadable, Thinwall Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, with wall thickness less than Schedule 40 and greater than Schedule 10, and with factory- or field-formed, roll-grooved ends.
1. Grooved-Joint Piping Systems:
 - a. Grooved-End Fittings: UL-listed, ASTM A536, ductile-iron casting with OD matching steel-pipe OD.
 - b. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.
- I. Plain-End, Schedule 10 Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, Schedule 10 in NPS 5 (DN 125) and smaller; and NFPA 13 specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250).

1. Steel Welding Fittings: ASTM A234/A234M, and ASME B16.9 or ASME B16.11 .
2. Steel Flanges and Flanged Fittings: ASME B16.5.

J. Grooved-End, Schedule 10 Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, Schedule 10 in NPS 5 (DN 125) and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250); with factory- or field-formed, roll-grooved ends.

1. Grooved-Joint Piping Systems:
 - a. Grooved-End Fittings: UL-listed, ASTM A536, ductile-iron casting with OD matching steel-pipe OD.
 - b. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.

2.04 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: ASTM B88, Type L (ASTM B88M, Type B), water tube, annealed temper; with plain ends.

1. Copper fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
2. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP-3 or BCuP-4.

B. Plain-End, Hard Copper Tube: ASTM B88, Type L (ASTM B88M, Type B), water tube, drawn temper.

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match tubing system.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket metal-to-metal seating surfaces, and solder-joint or threaded ends.
4. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP-3 or BCuP-4.

2.05 DIELECTRIC FITTINGS

A. Assembly shall be copper alloy, ferrous, and insulating materials with ends matching piping system.

B. Dielectric Unions: Factory-fabricated assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material that isolates dissimilar materials and ends with inside threads according to ASME B1.20.1.

C. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 175-psig minimum working-pressure rating as required for piping system.

D. Dielectric Flange Insulation Kits: Components for field assembly shall include CR or phenolic gasket, PE or phenolic bolt sleeves, phenolic washers, and steel backing washers.

E. Dielectric Nipples: Electroplated steel with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved ends and 300-psig working-pressure rating at 225 deg F.

2.06 CORROSION-PROTECTIVE ENCASEMENT FOR PIPING

A. Encasement for Underground Metal Piping: ASTM A674 or AWWA C105/A21.5, PE film, 0.008-inch minimum thickness, tube or sheet.

2.07 SPRINKLER SPECIALTY FITTINGS

- A. Sprinkler specialty fittings shall be UL listed or FM approved, with 175-psig minimum working-pressure rating, and made of materials compatible with piping. Sprinkler specialty fittings shall have 250-psig minimum working-pressure rating if fittings are components of high-pressure piping system.
- B. Outlet Specialty Fittings:
 - 1. Mechanical-T and -Cross Fittings: Not Allowed.
 - 2. Snap-On and Strapless Outlet Fittings: Not Allowed.
- C. Sprinkler Drain and Alarm Test Fittings: Cast- or ductile-iron body; with threaded inlet and outlet, test valve, and orifice and sight glass.
- D. Sprinkler Branch-Line Test Fittings: Brass body with threaded inlet, capped drain outlet, and threaded outlet for sprinkler.
- E. Sprinkler Inspector's Test Fitting: Cast- or ductile-iron housing with threaded inlet and drain outlet and sight glass.
- F. Drop-Nipple Fittings: UL 1474, adjustable with threaded inlet and outlet, and seals.
- G. Dry-Pipe-System Fittings: UL listed for dry-pipe service.

2.08 LISTED FIRE-PROTECTION VALVES

- A. Valves shall be UL listed or FM approved, with 175-psig minimum pressure rating. Valves shall have 250-psig minimum pressure rating if valves are components of high-pressure piping system.
- B. Gate Valves with Wall Indicator Posts:
 - 1. Gate Valves: UL 262, cast-iron body, bronze mounted, with solid disc, nonrising stem, operating nut, and flanged ends.
 - 2. Indicator Posts: UL 789, horizontal-wall type, cast-iron body, with operating wrench, extension rod, locking device, and cast-iron barrel.
- C. Ball Valves: Comply with UL 1091, except with ball instead of disc.
 - 1. NPS 1-1/2 (DN 40) and Smaller: Bronze body with threaded ends.
 - 2. NPS 2 and NPS 2-1/2 (DN 50 and DN 65): Bronze body with threaded ends or ductile-iron body with grooved ends.
 - 3. NPS 3 (DN 80): Ductile-iron body with grooved ends.
- D. Butterfly Valves: UL 1091.
 - 1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.
 - 2. NPS 2-1/2 (DN 65) and Larger: Bronze, cast-iron, or ductile-iron body; wafer type or with flanged or grooved ends.
- E. Check Valves NPS 2 (DN 50) and Larger: UL 312, swing type, cast-iron body with flanged or grooved ends.
- F. Gate Valves: UL 262, OS&Y type.
 - 1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.
 - 2. NPS 2-1/2 (DN 65) and Larger: Cast-iron body with flanged ends.

- G. Indicating Valves: UL 1091, with integral indicating device and ends matching connecting piping.
 - 1. Indicator: Electrical, 115-V ac, prewired, single-circuit, supervisory switch.
 - 2. NPS 2 (DN 50) and Smaller: Ball or butterfly valve with bronze body and threaded ends.
 - 3. NPS 2-1/2 (DN 65) and Larger: Butterfly valve with cast- or ductile-iron body; wafer type or with flanged or grooved ends.

2.09 SPECIALTY VALVES

- A. Sprinkler System Control Valves: UL listed or FM approved, cast- or ductile-iron body with flanged or grooved ends, and 175-psig minimum pressure rating. Control valves shall have 250-psig minimum pressure rating if valves are components of high-pressure piping system.
 - 1. Alarm Check Valves: UL 193, designed for horizontal or vertical installation, with bronze grooved seat with O-ring seals, single-hinge pin, and latch design. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
 - a. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping. Spill to exterior where possible.
 - 2. Dry-Pipe Valves: UL 260, differential type; with bronze seat with O-ring seals, single-hinge pin, and latch design. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - 3. Air Compressor: UL 753, fractional horsepower, 120-V ac, 60 Hz, single phase.

2.10 SPRINKLERS

- A. Sprinklers shall be UL listed or FM approved, with 175-psig minimum pressure rating. Sprinklers shall have 250-psig minimum pressure rating if sprinklers are components of high-pressure piping system.
- B. Automatic Sprinklers: With heat-responsive element complying with the following:
 - 1. UL 199, for nonresidential applications.
- C. Sprinkler Types and Categories: Nominal 1/2-inch orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.
- D. Sprinkler types, features, and options as follows:
 - 1. Concealed ceiling sprinklers, including cover plate.
 - 2. Flush ceiling sprinklers, including escutcheon.
 - 3. High-pressure sprinklers.
 - 4. Pendent sprinklers.
 - 5. Pendent, dry-type sprinklers.
 - 6. Quick-response sprinklers.
 - 7. Sidewall sprinklers.
 - 8. Sidewall, dry-type sprinklers.
 - 9. Upright sprinklers.
- E. Sprinkler Finishes: Chrome plated, or bronze.
- F. Special Coatings: Nickel teflon, and corrosion-resistant paint.
- G. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed and flush sprinklers are specified with sprinklers.
 - 1. Ceiling Mounting: Chrome-plated steel, 2 piece, with 1-inch vertical adjustment.
 - 2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

- H. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

2.11 FIRE DEPARTMENT CONNECTIONS

- A. Wall-Type, Fire Department Connection: UL 405, 175-psig minimum pressure rating; with corrosion-resistant-metal body with brass inlets, brass wall escutcheon plate, brass lugged caps with gaskets and brass chains, and brass lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking similar to ["AUTO SPKR"] ["AUTO SPKR & STANDPIPE."]
 - 1. Type: Flush, with two inlets and square or rectangular escutcheon plate, or Exposed, projecting, with two inlets and round escutcheon plate.
 - 2. Finish: Polished chrome-plated.
- B. Exposed, Freestanding-Type, Fire Department Connection: UL 405, B pressure rating; with corrosion-resistant-metal body, brass inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, and bottom outlet with pipe threads. Include brass lugged caps, gaskets, and brass chains; brass lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch- high, brass sleeve; and round, floor, brass escutcheon plate with marking ["AUTO SPKR"] ["AUTO SPKR & STANDPIPE."]
 - 1. Finish Including Sleeve: Polished chrome-plated.

2.12 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. See Section 28 46 00 - Fire Detection and Alarm for devices not listed here.
- C. Water-Motor-Operated Alarm: UL 753, mechanical-operation type with pelton-wheel operator with shaft length, bearings, and sleeve to suit wall construction and 10-inch- diameter, cast-aluminum alarm gong with red-enamel factory finish. Include NPS 3/4 (DN 20) inlet and NPS 1 (DN 25) drain connections.
- D. Electrically Operated Alarm: UL 464, with 10-inch- diameter, vibrating-type, metal alarm bell with red-enamel factory finish and suitable for outdoor use.
- E. Water-Flow Indicator: UL 346, electrical-supervision, paddle-operated-type, water-flow detector with 250-psig pressure rating and designed for horizontal or vertical installation. Include two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
- F. Pressure Switch: UL 753, electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.
- G. Valve Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

2.13 PRESSURE GAGES

- A. Description: UL 393, 3-1/2- to 4-1/2-inch- diameter, dial pressure gage with range of 0 to 250 psig minimum.
 - 1. Water System Piping: Include caption "WATER" or "AIR/WATER" on dial face.
 - 2. Air System Piping: Include caption "AIR" or "AIR/WATER" on dial face.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.02 EXAMINATION

- A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.
- B. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 PIPING APPLICATIONS, GENERAL

- A. Shop weld pipe joints where welded piping is indicated.
- B. Do not use welded joints for galvanized-steel pipe.
- C. Flanges, flanged fittings, unions, nipples, and transition and special fittings with finish and pressure ratings same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.
- D. Piping between Fire Department Connections and Check Valves: Galvanized, Schedule 40 steel pipe with grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

3.04 SPRINKLER SYSTEM PIPING APPLICATIONS

- A. Standard-Pressure, Wet-Pipe Sprinkler System, 175-psig Maximum Working Pressure:
 - 1. NPS 2 and smaller (DN 50 and smaller): Threaded-end, black or galvanized, Schedule 40 steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
 - 2. NPS 2-1/2 and larger (DN 65 and larger): Threaded-end, black or galvanized, Schedule 40 steel pipe; cast- or malleable-iron threaded fittings; and threaded joints.
 - 3. NPS 2-1/2 and larger (DN 65 and larger): Grooved-end, black or galvanized, Schedule 40 steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
 - 4. NPS 2-1/2 and larger (DN 65 and larger): Grooved-end, Schedule 10 steel pipe; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
- B. Standard-Pressure, Dry-Pipe Sprinkler System, 175-psig Maximum Working Pressure:
 - 1. NPS 2 and smaller (DN 50 and smaller): Threaded-end, galvanized, Schedule 40 steel pipe; galvanized cast- or malleable-iron threaded fittings; and threaded joints.
 - 2. NPS 2-1/2 and larger (DN 65 and larger): Threaded-end, galvanized, Schedule 40 steel pipe; galvanized cast- or malleable-iron threaded fittings; and threaded joints.
 - 3. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Grooved-end, galvanized, Schedule 40 steel pipe; galvanized grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

3.05 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Listed Fire-Protection Valves: UL listed and FMG approved for applications where required by NFPA 13.
 - a. Shutoff Duty: Use ball, butterfly, or gate valves.
 - 2. Unlisted General-Duty Valves: For applications where UL-listed and FMG-approved valves are not required by NFPA 13.
 - a. Shutoff Duty: Use ball, butterfly, or gate valves.
 - b. Throttling Duty: Use ball or globe valves.

3.06 JOINT CONSTRUCTION

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- F. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe smaller than NPS 8 (DN 200) with wall thickness less than Schedule 40 unless approved by authorities having jurisdiction and threads are checked by a ring gage and comply with ASME B1.20.1.
- G. Grooved Joints: Assemble joints with listed coupling and gasket, lubricant, and bolts.
 - 1. Steel Pipe: Square-cut or roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings, unless otherwise indicated..
 - 2. Dry-Pipe Systems: Use fittings and gaskets listed for dry-pipe service.
- H. Dissimilar-Metal Piping Joints: Construct joints using dielectric fittings compatible with both piping materials.
 - 1. NPS 2 (DN 50) and Smaller: Use dielectric unions, couplings, or nipples.
 - 2. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.
 - 3. NPS 5 (DN 125) and Larger: Use dielectric flange insulation kits.

3.07 SERVICE-ENTRANCE PIPING

- A. Connect fire-suppression piping to water-service piping of size and in location indicated for service entrance to building. Refer to Section 33 10 13 - Water Service for exterior piping.

- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping. Refer to Section 33 10 13 - Water Service for backflow preventers.
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.08 WATER-SUPPLY CONNECTION

- A. Connect fire-suppression piping to building's interior water distribution piping. Refer to Section 22 11 16 - Domestic Water Piping for interior piping.
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water distribution piping. Refer to Section 22 11 19 - Domestic Water Piping Specialties for backflow preventers.
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.09 PIPING INSTALLATION

- A. Refer to Division 22 Sections for basic piping installation.
- B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect/Engineer of Record before deviating from approved working plans.
- C. Install underground ductile-iron service-entrance piping according to NFPA 24 and with restrained joints. Encase piping in corrosion-protective encasement.
- D. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.
- F. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger connections.
- G. Install "Inspector's Test Connections" in sprinkler system piping at hydraulically most remote location of each system, complete with shutoff valve, sized and located according to NFPA 13 and Chicago Building Code 15-16-450.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler zone control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install drain valves on standpipes.
- K. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.
- L. Install alarm devices in piping systems.

- M. Hangers and Supports: Comply with NFPA 13 for hanger materials.
 - 1. Install sprinkler system piping according to NFPA 13.
- N. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- O. Drain dry-pipe sprinkler piping.
- P. Pressurize and check dry-pipe sprinkler system piping and air compressors.
- Q. Fill wet-pipe sprinkler system piping with water.

3.10 VALVE INSTALLATION

- A. Install listed fire-protection valves, unlisted general-duty valves, specialty valves and trim, controls, and specialties according to NFPA 13 and City of Chicago Building Code & Chicago Bureau of Fire Prevention requirements.
- B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water supply sources.
- D. Specialty Valves:
 - 1. Alarm Check Valves: Install in vertical position for proper direction of flow, including bypass check valve and retarding chamber drain-line connection.
 - 2. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - a. Install air compressor and compressed-air supply piping.

3.11 SPRINKLER APPLICATIONS

- A. Drawings indicate sprinkler types to be used. Where specific types are not indicated, use the following sprinkler types:
 - 1. Rooms without Ceilings: Upright sprinklers.
 - 2. Rooms with Suspended Ceilings: Recessed or concealed sprinklers.
 - 3. Wall Mounting: Sidewall sprinklers.
 - 4. Spaces Subject to Freezing: Upright for dry systems, pendent, dry sprinklers; or sidewall, dry sprinklers for wet systems as required.
 - 5. Special Applications: Extended-coverage, and quick-response sprinklers where indicated or required.
 - 6. Sprinkler Finishes:
 - a. Upright, Pendent, and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.
 - b. Concealed Sprinklers: Rough brass, with chrome or brass cover plate.
 - c. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.

3.12 SPRINKLER INSTALLATION

- A. Unless otherwise indicated, all sprinklers shall be arranged symmetrically within each room or space. All sprinkler heads to be installed in suspended/acoustical tile ceilings of any type shall be located as indicated on the architectural reflected ceiling plans or fire protection plans where sprinkler locations are shown. Sprinklers shall be placed in the center of ceiling tile in both directions.
- B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space.

3.13 FIRE DEPARTMENT CONNECTION INSTALLATION

- A. Install wall-type, fire department connections in vertical wall.
- B. Install freestanding-type, fire department connections in level surface.
 - 1. Install protective pipe bollards on two sides of each fire department connection. Refer to Section 05 50 00 - Metal Fabrications for pipe bollards.
- C. Install ball drip valve at each check valve for fire department connection.

3.14 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect water-supply piping to fire-suppression piping. Include backflow preventer between potable-water piping and fire-suppression piping. Refer to Section 22 11 19 - Domestic Water Piping Specialties for backflow preventers.
- D. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.
- E. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.
- F. Connect compressed-air supply to dry-pipe sprinkler piping.
- G. Connect air compressor to the following piping and wiring:
 - 1. Pressure gages and controls.
 - 2. Electrical power system.
 - 3. Fire alarm devices, including low-pressure alarm.
- H. Electrical Connections: Power wiring is specified in Division 26.
- I. Connect alarm devices to fire alarm.
- J. Ground equipment according to Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- K. Connect wiring according to Division 26.

- L. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B

3.15 LABELING AND IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and in Section 22 05 53 - Identification for Plumbing Piping and Equipment.

3.16 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 3. Energize circuits to electrical equipment and devices.
 4. Start and run excess-pressure pumps.
 5. Start and run air compressors.
 6. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 7. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
 8. Coordinate with fire alarm tests. Operate as required.
 9. Coordinate with fire-pump tests. Operate as required.
 10. Verify that equipment hose threads are same as local fire department equipment.
- B. Report test results promptly and in writing to Architect/Engineer of Record and authorities having jurisdiction.

3.17 CLEANING AND ADJUSTING

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.
- C. Protect sprinklers from damage until Substantial Completion.

3.18 CONTRACTOR STARTUP AND REPORTING

- A. Engage a factory-authorized service representative to train Board's maintenance personnel to adjust, operate, and maintain specialty valves.

3.19 DEMONSTRATION AND COMMISSIONING - TRAINING

- A. Train Board's maintenance personnel on procedures and schedules for starting up and shutting down, troubleshooting, servicing, and maintaining the system. The training will occur after the startup report has been provided to the Board and the trainer will provide two (2) Installation and Operations manuals for the use of the Board's personnel during training.
- B. Review data in maintenance manuals. All required and recommended maintenance will be reviewed as well as operational troubleshooting. If the IOM does not include a written troubleshooting guide one will be provided.

- C. Schedule training with the Board, through the Architect/Engineer of Record, with at least seven days advance notice.
- D. Demonstrate proper operation of equipment to commissioning agent or designated Board personnel. The scope of the demonstration will include functional performance requirements under both local and building automation control as well as any commissioning requirements in Divisions 01 or 23.

END OF SECTION 21 13 00

SECTION 21 13 16

DRY-PIPE SPRINKLER SYSTEMS

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. Pipes, Fittings, and Specialties
 - 2. Specialty Valves
 - 3. Sprinkler Specialty Pipe Fittings
 - 4. Sprinklers
 - 5. Alarm Devices
 - 6. Manual Control Stations
 - 7. Control Panels
 - 8. Pressure Gages

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For dry-pipe sprinkler systems.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include diagrams for power, signal, and control wiring.
- C. Delegated-Design Submittal: For dry-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

- A. Design Data:
 - 1. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- B. Fire-hydrant flow test report.

C. Field Test Reports:

1. Fire-hydrant flow test report.
2. Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For dry-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.06 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications:
1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

1.08 FIELD CONDITIONS

- A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by the CHA or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
1. Notify the CHA no fewer than two days in advance of proposed interruption of sprinkler service.
 2. Do not proceed with interruption of sprinkler service without the Owner's written permission.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTIONS

- A. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers.

2.02 PERFORMANCE REQUIREMENTS

- A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13.
- B. Standard-Pressure Piping System Component: Listed for 300-psig minimum working pressure.
- C. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design dry-pipe sprinkler systems.
- D. Sprinkler system design shall be approved by authorities having jurisdiction.
 - 1. Margin of Safety for Available Water Flow and Pressure: 5 psi, including losses through water-service piping, valves, and backflow preventers.
 - 2. Sprinkler Occupancy Hazard Classifications:
 - a. Automobile Parking Areas: Ordinary Hazard, Group 1.
 - 3. Minimum Density for Automatic-Sprinkler Piping Design, areas shall be increased 30% for dry and preaction systems:
 - a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
 - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
 - c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
 - d. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over 2500-sq. ft. area.
 - e. Extra-Hazard, Group 2 Occupancy: [0.40 gpm over 2500-sq. ft.] area.
 - 4. Maximum Protection Area per Sprinkler:
 - a. Storage Areas: 130 sq. ft.
 - b. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.
 - 5. Total Combined Hose-Stream Demand Requirement: According to NFPA 13
- E. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.03 STEEL PIPE AND FITTINGS

- A. Standard-Weight, Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.
- B. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- C. Galvanized-Steel Couplings: ASTM A 865/A 865M, threaded.
- D. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- E. Malleable- or Ductile-Iron Unions: UL 860.
- F. Cast-Iron Flanges: ASME B16.1, Class 125.

G. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International
 - b. Smith-Cooper International
 - c. Tyco by Johnson Controls Company
 - d. Victaulic Company
2. Pressure Rating: 300-psig minimum.
3. Galvanized, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.04 SPECIALTY VALVES

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- B. Pressure Rating:
 1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.
- C. Body Material: Cast or ductile iron.
- D. Size: Same as connected piping.
- E. End Connections: Flanged or grooved.
- F. Dry-Pipe Valves:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Globe Fire Sprinkler Corporation
 - b. Reliable Automatic Sprinkler Co., Inc. (The)
 - c. Tyco by Johnson Controls Company
 - d. Victaulic Company
 - e. Viking Corporation
 2. Standard: UL 260.
 3. Design: Differential-pressure type.
 4. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 5. Air Compressor:
 - a. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 - b. Motor Horsepower: Fractional.
 - c. Power: 120-V ac, 60 Hz, single phase.

2.05 SPRINKLER PIPING SPECIALTIES

- A. General Requirements for Dry-Pipe System Fittings: UL listed for dry-pipe service.
- B. Branch Outlet Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGF Manufacturing, Inc.
 - b. Anvil International
 - c. Tyco by Johnson Controls Company
 - d. Victaulic Company
 - 2. Standard: UL 213.
 - 3. Pressure Rating: 300 psig.
 - 4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
 - 5. Type: Mechanical-tee and -cross fittings.
 - 6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
 - 7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
 - 8. Branch Outlets: Grooved, plain-end pipe, or threaded.
- C. Flow Detection and Test Assemblies:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGF Manufacturing, Inc.
 - b. Reliable Automatic Sprinkler Co., Inc. (The)
 - c. Tyco by Johnson Controls Company
 - d. Victaulic Company
 - 2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 - 3. Pressure Rating: 300 psig.
 - 4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
 - 5. Size: Same as connected piping.
 - 6. Inlet and Outlet: Threaded.
- D. Sprinkler Inspector's Test Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGF Manufacturing, Inc.
 - b. Tyco by Johnson Controls Company
 - c. Victaulic Company
 - d. Viking Corporation
 - 2. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
 - 3. Pressure Rating: 300 psig.
 - 4. Body Material: Cast- or ductile-iron housing with sight glass.
 - 5. Size: Same as connected piping.
 - 6. Inlet and Outlet: Threaded.

2.06 SPRINKLERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Globe Fire Sprinkler Corporation
 - 2. Reliable Automatic Sprinkler Co., Inc. (The).
 - 3. Tyco by Johnson Controls Company
 - 4. Victaulic Company
 - 5. Viking Corporation
- B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- C. Pressure Rating for Residential Sprinklers: 175-psig maximum.
- D. Pressure Rating for Automatic Sprinklers: 175-psig minimum.
- E. Pressure Rating for High-Pressure Automatic Sprinklers: 300 psig.
- F. Automatic Sprinklers with Heat-Responsive Element:
 - 1. UL 199.
 - 2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
- G. Sprinkler Finishes: Chrome plated, bronze and painted.
- H. Special Coatings: Nickel-teflon corrosion resistant
- I. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
 - 1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
 - 2. Sidewall Mounting: Chrome-plated steel, one piece, flat.
- J. Sprinkler Guards:
 - 1. Standard: UL 199.
 - 2. Type: Wire cage with fastening device for attaching to sprinkler.

2.07 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Electrically Operated Alarm Bell:
 - 1. Standard: UL 464.
 - 2. Type: Vibrating, metal alarm bell.
 - 3. Size: 6-inch minimum diameter (interior) 10-inch diameter (exterior).
 - 4. Finish: Red-enamel factory finish, suitable for outdoor use.

5. 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.

C. Pressure Switches:

1. Standard: UL 346.
2. Type: Electrically supervised water-flow switch with retard feature.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design Operation: Rising pressure signals water flow.

D. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled valve is in other than fully open position.
5. 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

2.08 MANUAL CONTROL STATIONS

- A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" for hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve.
- B. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.09 CONTROL PANELS

- A. Description: Single-area, two-area, or single-area cross-zoned type control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves.
 1. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide" when used with thermal detectors and Class A detector circuit wiring.
 2. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.
 3. 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
- B. Manual Control Stations: Electric operation, metal enclosure, labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- C. Manual Control Stations: Hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION," with operating instructions and cover held closed by breakable strut to prevent accidental opening.
- D. Panels Components:
 1. Power supply.
 2. Battery charger.
 3. Standby batteries.

4. Field-wiring terminal strip.
5. Electrically supervised solenoid valves and polarized fire-alarm bell.
6. Lamp test facility.
7. Single-pole, double-throw auxiliary alarm contacts.
8. Rectifier.

2.10 PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- C. Pressure Gage Range: 0 to 300 psig.
- D. Label: Include "WATER" or "AIR/WATER" label on dial face.
- E. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.02 WATER-SUPPLY CONNECTIONS

- A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Section 22 11 16 "Domestic Water Piping".
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping. Comply with requirements in Section 22 11 19 "Domestic Water Piping Specialties", for backflow preventers.

3.03 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
- B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

- C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.
- D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- H. Install sprinkler piping with drains for complete system drainage.
- I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- J. Install automatic (ball drip) drain valves to drain piping between fire department connections and check valves. Drain to floor drain or to outside building.
- K. Connect air compressor to the following piping and wiring:
 - 1. Pressure gages and controls.
 - 2. Electrical power system.
 - 3. Fire-alarm devices, including low-pressure alarm.
- L. Install alarm devices in piping systems.
- M. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in NFPA 13.
- N. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- O. Drain dry-pipe sprinkler piping.
- P. Pressurize and check dry-pipe sprinkler system piping and air compressors.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 21 05 17 "Sleeves and Sleeve Seals for Fire-Suppression Piping".
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 21 05 17 "Sleeves and Sleeve Seals for Fire-Suppression Piping".
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 21 05 18 "Escutcheons for Fire-Suppression Piping".

3.04 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.05 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. Install valves in vertical position for proper direction of flow, in main supply to system.
 - 2. Install dry-pipe valves with trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - a. Install air compressor and compressed-air-supply piping.

3.06 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of both dimensions of acoustical ceiling panels.
- B. Install sprinklers with water supply from heated space. Do not install pendent or sidewall sprinklers in areas subject to freezing.

3.07 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems".

3.08 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Start and run air compressors.
 - 6. Coordinate with fire-alarm tests. Operate as required.
 - 7. Coordinate with fire-pump tests. Operate as required.
 - 8. Verify that equipment hose threads are same as local fire department equipment.
- B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.09 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.10 DEMONSTRATION

- A. Train the CHA's maintenance personnel to adjust, operate, and maintain specialty valves.

3.11 PIPING SCHEDULE

- A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints.
- B. Standard-pressure, dry-pipe sprinkler system, shall be one of the following:
 - 1. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - 2. Standard-weight, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.12 SPRINKLER SCHEDULE

- A. Use sprinkler types in subparagraphs below for the following applications:
 - 1. Rooms without Ceilings: Upright sprinklers.
 - 2. Rooms with Suspended Ceilings: Dry pendent, recessed, flush, and concealed sprinklers as indicated.
 - 3. Wall Mounting: Dry sidewall sprinklers.
 - 4. Spaces Subject to Freezing: Upright, dry pendent sprinklers; and dry sidewall sprinklers as indicated.
- B. Provide sprinkler types in subparagraphs below with finishes indicated.
 - 1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
 - 2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
 - 3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
 - 4. Upright Pendent and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; nickel-teflon coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 21 13 16

SECTION 21 30 00

FIRE PUMPS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Centrifugal Fire Pumps
- B. Jockey Pumps
- C. Fire Pump Controllers
- D. Fire Pump Accessories and Specialties
- E. Alarm Panels
- F. Pressure Gauges
- G. Grout

1.02 REFERENCE STANDARDS

- A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- B. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014a.
- C. NEMA MG 1 - Motors and Generators; 2017.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- E. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2015, with Errata (2017).
- F. NFPA 1963 - Standard for Fire Hose Connections; 2014.
- G. NFPA 20 - Standard for the Installation of Stationary Pumps for Fire Protection; 2016.
- H. NFPA 70 - National Electrical Code; 2017.
- I. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.
- J. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.
- K. UL 1726 - UL Standard for Safety Automatic Drain Valves for Standpipe Systems; 2001.
- L. UL 218 - UL Standard for Safety Fire Pump Controllers; 2015.
- M. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.
- N. UL 448 - Centrifugal Stationary Pumps for Fire-Protection Service; Current Edition, Including All Revisions.

- O. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- P. UL 508 - Industrial Control Equipment; Underwriters Laboratories Inc; Current Edition, Including All Revisions.
- Q. UL 668 - UL Standard for Safety Hose Valves for Fire-Protection Service; 2004.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers literature including general assembly, pump curves showing performance characteristics with pump and system, operating point indicated, NPSH curve, controls, wiring diagrams, and service connections. Include furnished accessories and specialties for each fire pump and jockey pump in submittal.
- C. Shop Drawings: For fire pumps and drivers, fire-pump controllers, fire-pump accessories and specialties, jockey pumps, controllers, and accessories and specialties. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Shop Drawings: Indicate layout, general assembly, components, dimensions, weights, clearances, and methods of assembly.
- E. Certificates: Certify that fire pumps meet or exceed specified requirements at specified operating conditions and that the installation complies with regulatory requirements. Submit summary and results of shop tests performed in accordance with NFPA 20.
- F. Test Reports: Indicate results of hydrostatic test and field acceptance tests.
- G. Manufacturer's Instructions: Indicate support details, connection requirements, for fire pump system.
- H. Operation Data: Include manufacturer's instructions, start-up data, trouble-shooting check lists, for pumps, drivers, and controllers.
- I. Maintenance Data: Include manufacturers literature, cleaning procedures, replacement parts lists, and repair data for pumps, drivers and controllers.

1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire pumps, pressure-maintenance pumps, and controllers through one source from a single manufacturer for each type of equipment.
- B. Comply with NFPA 13 and NFPA 20 - 2016 editions; where requirements differ comply with the most stringent.
- C. Design fire pump system under direct supervision of a Professional Engineer experienced in design of this Work and licensed in Illinois.

- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- F. Comply with standards of Chicago Bureau of Fire Prevention pertaining to materials, hose threads, and installation.
- G. Comply with NFPA 20, "Stationary Pumps for Fire Protection," for fire pumps, drivers, controllers, accessories, and their installation.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire pumps and components in factory packing. Comply with manufacturer's rigging and installation instructions.
- B. Protect fire pumps and components from physical damage including effects of weather, water, and construction debris.
- C. Provide temporary inlet and outlet caps, and maintain in place until installation.

1.06 WARRANTY

- A. Provide manufacturer's standard 1-year warranty for materials and labor, commencing on date of substantial completion.

1.07 PERFORMANCE REQUIREMENTS

- A. Pump, Equipment, Accessory, Specialty, and Piping Pressure Rating: 175-psig minimum working-pressure rating, unless otherwise indicated.

1.08 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Single-Stage, Horizontally Mounted, Split-Case Fire Pumps
 1. A-C Pump; ITT Industries.
 2. Aurora Pump; Pentair Pump Group.
 3. Patterson Pump Company.
 4. Sterling Peerless Pump; Sterling Fluid Systems Group.
- B. Single-Stage, Vertically Mounted, Split-Case Fire Pumps
 1. A-C Pump; ITT Industries.
 2. Aurora Pump; Pentair Pump Group.
 3. Patterson Pump Company.
- C. End-Suction Fire Pumps
 1. A-C Pump; ITT Industries.
 2. Aurora Pump; Pentair Pump Group.

3. Patterson Pump Company.
 4. Sterling Peerless Pump; Sterling Fluid Systems Group.
- D. In-Line Fire Pumps
1. A-C Pump; ITT Industries.
 2. Aurora Pump; Pentair Pump Group.
 3. Patterson Pump Company.
 4. Sterling Peerless Pump; Sterling Fluid Systems Group.
- E. Fire-Pump Controllers, General
1. Firetrol, Inc.
 2. Hubbell Industrial Controls, Inc.
 3. Joslyn Clark.
 4. Master Control Systems, Inc.
 5. Metron, Inc.
- F. Multistage, Pressure-Maintenance Pumps
1. A-C Pump; ITT Industries.
 2. Grundfos Pumps Corp.
 3. Jacuzzi Brothers.
 4. Patterson Pump Company.
 5. Sterling Peerless Pump; Sterling Fluid Systems Group.
- G. Controllers, Pressure-Maintenance Pumps
1. Firetrol, Inc.
 2. Hubbell Industrial Controls, Inc.
 3. Joslyn Clark.
 4. Master Control Systems, Inc.
 5. Metron, Inc.
- H. Alarm Panels
1. Firetrol, Inc.
 2. Hubbell Industrial Controls, Inc.
 3. Joslyn Clark.
 4. Master Control Systems, Inc.
 5. Metron, Inc.
- I. Pressure Gages
1. AGF Manufacturing Co.
 2. AMETEK, Inc.; U.S. Gauge.
 3. Dresser Equipment Group; Instruments Div.
 4. WIKA Instrument Corporation.
- 2.02 CENTRIFUGAL FIRE PUMPS
- A. Description, General: UL 448, factory-assembled and -tested, electric-drive, centrifugal fire pumps capable of furnishing not less than 150 percent of rated capacity at not less than 65 percent of total rated head and with shutoff head limited to 135 percent of total rated head.
1. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.
 2. Nameplate: Complete with capacities, characteristics, and other pertinent data.
- B. Single-Stage, Horizontally Mounted, Split-Case Fire Pumps: Double-suction type with pump and driver mounted on same base and connected with coupling.

1. Pump: Axially split cast-iron casing with suction and discharge flanges machined to ASME B16.1, Class 125 dimensions, unless otherwise indicated.
 - a. Impeller: Cast bronze of construction to match fire pump, statically and dynamically balanced, and keyed to shaft.
 - b. Wear Rings: Replaceable, bronze.
 - c. Shaft and Sleeve: Steel shaft with bronze sleeve.
 - 1) Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
 - 2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
 2. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.
 3. Driver: UL-listed, NEMA MG 1, open-dripproof, squirrel-cage, induction motor complying with NFPA 20 and NFPA 70. Include wiring compatible with controller used.
- C. Single-Stage, Vertically Mounted, Split-Case Fire Pumps: Double-suction type with pump mounted on baseplate and connected to driver with coupling.
1. Pump: Axially split cast-iron casing with suction and discharge flanges machined to ASME B16.1, Class 125 dimensions, unless otherwise indicated.
 - a. Impeller: Cast bronze of construction to match fire pump, statically and dynamically balanced, and keyed to shaft.
 - b. Wear Rings: Replaceable, bronze.
 - c. Shaft and Sleeve: Steel shaft with bronze sleeve.
 - 1) Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
 - 2) Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
 2. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.
 3. Driver: UL-listed, NEMA MG 1, open-dripproof, squirrel-cage, induction motor complying with NFPA 20 and NFPA 70. Include wiring compatible with controller used.

2.03 JOCKEY PUMPS

- A. Jockey Pumps, General: Factory-assembled and -tested pumps with electric-motor driver, controller, and accessories and specialties. Include cast-iron or stainless-steel casing and bronze or stainless-steel impellers, mechanical seals, and suction and discharge flanges machined to ASME B16.1, Class 125 dimensions unless Class 250 flanges are indicated and except that connections may be threaded in sizes where flanges are not available.
1. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.
 2. Nameplate: Complete with capacity, characteristics, and other pertinent data.
 3. Multistage, Pressure-Maintenance Pumps: Multiple-impeller type complying with HI 1.1-1.2 and HI 1.3 requirements for multistage centrifugal pumps. Include base.
 - a. Driver: UL-listed, NEMA MG 1, open-dripproof, squirrel-cage, induction motor complying with NFPA 20 and NFPA 70. Include wiring compatible with controller used.
 4. Controllers: UL 508; factory-assembled, -wired, and -tested, across-the-line type for combined automatic and manual operation.
 - a. Enclosure: UL 508 and NEMA 250, Type 2, wall-mounting type for field electrical wiring.
 - 1) Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.
 - b. Rate controller for scheduled horsepower and include the following:
 - 1) Fusible disconnect switch.
 - 2) Pressure switch.
 - 3) Hand-off-auto selector switch.

- 4) Pilot light.
 - 5) Running period timer.
5. Accessories and Specialties: Match pressure-maintenance-pump suction and discharge ratings as required for pump capacity rating. Include the following:
- a. Circulation relief valve.
 - b. Suction and discharge pressure gages.

2.04 FIRE PUMP CONTROLLERS

- A. Fire-Pump Controllers, General: UL 218 and NFPA 20; listed for electric-drive, fire-pump service and service entrance; combined automatic and manual operation; factory assembled and wired; and factory tested for capacities and electrical characteristics.
- B. Rate controllers for scheduled fire-pump horsepower and short-circuit withstand rating at least equal to short-circuit current available at controller location. Take into account cable size and distance from substation or supply transformers.
- C. Enclosure: UL 50, Type 2, dripproof, indoor, unless special-purpose enclosure is indicated. Include manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.
- D. Controls, devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used, and specific items listed.
1. Isolating means and circuit breaker.
 2. "Power on" pilot lamp.
 3. Fire-alarm system connections for indicating motor running condition, loss-of-line power, and line-power phase reversal.
 4. Automatic and manual operation, and minimum run-time relay to prevent short cycling.
 5. Water-pressure-actuated switch with independent high and low calibrated adjustments responsive to water pressure in fire-suppression piping.
 6. Automatic and manual shutdown.
 7. System pressure recorder, electric ac driven with spring backup.
- E. Nameplate: Complete with capacity, characteristics, approvals and listings, and other pertinent data.
- F. Controller Sensing Pipes: Fabricate pipe and fittings according to NFPA 20 with nonferrous-metal sensing piping, NPS 1/2 (DN 15), with globe valves for testing controller mechanism from system to pump controller as indicated. Include bronze check valve with 3/32-inch orifice in clapper or ground-face union with noncorrosive diaphragm having 3/32-inch orifice.
- G. Full-Service Fire-Pump Controllers:
1. Type Starting (for new pumps): Wye delta, closed transition.
 2. Type Starting (for existing pumps): Match existing controller where replacing controller for existing pumps. Choices may be Across the line, Primary resistance, closed transition, Part winding, closed transition, Wye delta, closed transition, Wye delta, open transition, Autotransformer, closed transition, Solid state, closed transition.
 3. Mounting: Floor-stand type for field electrical connections.
 4. Automatic Transfer Switches: Where required, provide auto transfer switch connected to emergency power. UL 218 and UL 1008 and requirements for and attached to fire-pump controllers. Include enclosure complying with UL 50, Type 2, with automatic transfer switch with rating at least equal to fire-pump driver-motor horsepower. Include ampere rating not less than 115 percent of motor full-load current and suitable for switching motor-locked rotor current.

2.05 FIRE-PUMP ACCESSORIES AND SPECIALTIES

- A. Match fire-pump suction and discharge ratings as required for fire-pump capacity rating. Include the following:
1. Automatic air-release valve.
 2. Circulation relief valve.
 3. Suction and discharge pressure gages.
 4. Eccentric-tapered reducer at suction inlet.
 5. Concentric-tapered reducer at discharge outlet.
 6. Test-Header Manifold: Ductile-iron or brass body for hose valves. Include nozzle outlets arranged in single line; horizontal, flush-wall mounting attachment; and rectangular, **[polished chrome-plated] [rough]** brass finish escutcheon plate with lettering equivalent to "PUMP TEST CONNECTION."
 7. Test-Header Manifold: Ferrous body for hose valves. Manufacturer's standard finish. Include bronze or cast-iron, exposed-type valve header with nozzle outlets; and round, brass escutcheon plate with lettering equivalent to "PUMP TEST CONNECTION."
 - a. Hose Valves: UL 668, straightway pattern, and bronze with cap and chain. Include NFPA 1963 hose thread that complies with local fire department standards and finish same as for test-header-manifold escutcheon plate.
 - b. Ball Drip Valve: UL 1726.
 - c. Discharge Cone: **[Closed] [Open]** type.
 - d. Finish: Manufacturer's standard factory-applied red paint unless brass or other finish is specified.

2.06 ALARM PANELS

- A. Refer to Section 28 31 00 - Fire Detection and Alarm for requirements. Where this Section is not provided, refer to information below.
- B. Description: Factory-assembled and -wired remote panel complying with UL 508 and requirements in NFPA 20. Include audible and visible alarms matching controller type.
1. Enclosure: NEMA 250, Type 2, remote wall-mounting type.
 - a. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.
 2. Features: Include manufacturer's standard features and the following:
 - a. Motor-operating condition.
 - b. Loss-of-line power.
 - c. Phase reversal.

2.07 PRESSURE GAGES

- A. Description: UL 393, 3-1/2- to 4-1/2-inch- diameter dial with range of 0- to 250-psig minimum. Include caption "WATER" on dial face.

2.08 GROUT

- A. Description: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas, concrete bases, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of fire pumps.
- B. Examine roughing-in for fire-suppression piping to verify actual locations of piping connections before fire-pump installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 CONCRETE BASES

- A. Install concrete bases of dimensions indicated for fire pumps, pressure-maintenance pumps, and controllers.
- B. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
 - 1. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 3. Install anchor bolts to elevations required for proper attachment to supported equipment.
- C. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.03 INSTALLATION

- A. Install in accordance with NFPA 20.
- B. Provide access space around pumps for service; no less than minimum as recommended by manufacturer.
- C. Set base-mounting-type pumps on concrete bases. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.
 - 1. Support pump baseplate on rectangular metal blocks and shims or on metal wedges having small taper, at points near anchor bolts, to provide 3/4- to 1-1/2-inch (19- to 38-mm) gap between pump base and concrete base for grouting.
 - 2. Adjust metal supports or wedges until pump and driver shafts are level. Verify that coupling faces and pump suction and discharge flanges are level and plumb.
- D. Install suction and discharge piping equal to or greater than diameter of fire-pump nozzles.
- E. Install valves that are same size as piping connecting fire pumps, bypasses, test headers, and other piping systems.
- F. Install pressure gages on fire-pump suction and discharge at pressure-gage tappings.
- G. Support pumps and piping separately so weight of piping does not rest on pumps.
- H. Install piping accessories, hangers and supports, anchors, valves, meters and gages, and equipment supports.

- I. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.
- J. Provide drains for bases and seals, piped to and discharging into floor drains.
- K. Provide for connection to electrical service. Refer to Section 26 05 83 - Wiring Connections.
- L. Lubricate pumps before start-up.
- M. Final Checks Before Startup: Perform the following preventive-maintenance operations and checks before startup:
 - 1. Lubricate oil-lubricated bearings.
 - 2. Remove grease-lubricated bearing covers and flush bearings with kerosene and thoroughly clean. Fill with new lubricant according to manufacturer's recommendations.
 - 3. Disconnect coupling and check electric motor for proper rotation. Rotation shall match direction of rotation marked on pump casing.
 - 4. Check that the pump is free to rotate by hand. Do not operate the pump if it is bound or if it drags even slightly until cause of trouble is determined and corrected.
- N. Starting procedure for pumps:
 - 1. Prime pump by opening suction valve and closing drains, and prepare pump for operation.
 - 2. Open sealing liquid supply valve if pump is so fitted.
 - 3. Start motor.
 - 4. Open discharge valve slowly.
 - 5. Observe leakage from stuffing boxes and adjust sealing liquid valve for proper flow to ensure lubrication of packing. Do not tighten gland immediately, but let packing run in before reducing leakage through stuffing boxes.
 - 6. Check general mechanical operation of pump and motor.
- O. Check, align, and certify pumps by qualified installer prior to start-up.

3.04 CONNECTIONS

- A. Piping installation requirements are specified in Section 21 11 00 - Facility Fire-Suppression Water-Service Piping. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps and equipment to allow service and maintenance.
- C. Connect water supply and discharge piping to fire pumps. Connect water supply and discharge piping to pressure-maintenance pumps.
- D. Connect relief-valve discharge to point of disposal.
- E. Connect controllers to pumps.
- F. Connect fire-pump controllers to building fire-alarm system. Refer to Section 28 31 00 - Fire Detection and Alarm.
- G. Ground equipment according to Section 26 05 26 - Grounding and Bonding for Electrical Systems.

- H. Connect wiring according to Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

3.05 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform field tests for each fire pump when installation is complete. Comply with operating instructions and procedures in NFPA 20 to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected or that does not perform as indicated, then retest to demonstrate compliance. Verify that each fire pump performs as indicated.
- C. Perform the following field tests and inspections and prepare test reports:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Final Checks before Startup: Perform the following preventive-maintenance operations and checks:
 - a. Lubricate oil-lubrication-type bearings.
 - b. Remove grease-lubrication-type bearing covers, flush bearings with kerosene, and clean thoroughly. Fill with new lubricant according to manufacturer's written instructions.
 - c. Disconnect coupling and check electric motor for proper rotation. Rotation shall match direction of rotation marked on pump casing.
 - d. Verify that pump is free to rotate by hand. If pump is bound or if it drags even slightly, do not operate until cause of trouble is determined and corrected.
 - 3. Starting procedure for pumps is as follows:
 - a. Prime pump by opening suction valve and closing drains, and prepare pump for operation.
 - b. Open sealing-liquid supply valves if pump is so fitted.
 - c. Start motor.
 - d. Open discharge valve slowly.
 - e. Observe leakage from stuffing boxes and adjust sealing-liquid valve for proper flow to ensure lubrication of packing. Do not tighten gland immediately, but let packing run in before reducing leakage through stuffing boxes.
 - f. Check general mechanical operation of pump and motor.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Arrange for disposal of large quantities of water if fire-pump test water must be wasted.
 - 1. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Fire hoses are for field-acceptance tests only and are not property of Board.

3.06 CLOSEOUT ACTIVITIES

- A. Startup Services: Provide services of factory-authorized service representative to provide startup service and to demonstrate and train Board maintenance personnel as specified below.
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
 - 2. Train Board maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
 - 3. Review data in the "Operating and Maintenance Manual." Refer to Section 01 78 00 - Closeout Submittals

4. Schedule training with at least 7 days' advance notice.
 5. Provide fire hoses in number, size, and of length required to reach a storm drain or other acceptable location to dispose of fire pump test water. These fire hoses are for field acceptance tests only and are not intended to become property of the Board.
- B. Demonstrate automatic operation of system including verification of pressure switch set points to Board Representative and maintenance personnel.

END OF SECTION 21 30 00

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical systems and work.
- B. Construction requirements for concrete bases.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2009 (Reapproved 2015).
- F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- H. Chicago Electrical Code - Municipal Code of the City of Chicago, Building/Electrical Code Requirements; 2018.
- I. MFMA-4 - Metal Framing Standards Publication; 2004.
- J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- K. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- L. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- M. NFPA 70 - National Electrical Code; 2017.
- N. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel; 2004.
- O. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Install floor-mounted electrical equipment on a minimum of 4 inch concrete housekeeping pad, with a minimum of 4 inches of equipment inset on all sides. Concrete shall be in accordance with Section 03 30 00 - Cast-in-Place Concrete.
6. Provide steel supports, anchor bolts, inserts, etc., for all equipment specified under this section of the specifications.
7. Provide formed steel support channels extending from and solidly anchored to the floor and ceiling slabs and mount the designated equipment thereto.
8. Coordinate installation of roof curbs, equipment supports, and roof penetrations specified under Section 07 72 00 - Roof Accessories.
9. Notify Architect/Engineer of Record of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
10. Provide concrete pads for:
 - a. Switchboards.
 - b. Transformers.
11. Provide steel support channels for:
 - a. Communication and special systems cabinets.
 - b. Disconnect switches.
 - c. Fire alarm system cabinets.
 - d. Individual motor starters.
 - e. Individual circuit breakers.
 - f. Panelboards.
 - g. Wall mounted transformers.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00 - Cast-in-Place Concrete.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- D. Installer's Qualification Statement: Include evidence of compliance with specified requirements.
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 QUALITY ASSURANCE

- A. Comply with the City of Chicago Electrical Code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Installer Qualification for Field-Welding: Procedures and personnel according to AWS D1.1/D1.1M
- D. Manufacturer's Qualifications: Company specializing in manufacturing products specified in this Section with a minimum three years' experience.
- E. Listing and Labeling: Provide products specified in this section that are listed and labeled.
- F. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- G. Product Listing Organization Qualifications: An organization recognized by OSHA Regulation 1910.7 as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and in original packaging.

PART 2 - PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 1. Comply with MFMA-4.
 - 2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
 - 3. Channel Material:
 - a. Indoor Dry Locations: Use zinc coating or treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic.
 - b. Outdoor and Damp or Wet Indoor Locations: Use hot-dip galvanized.
 - 4. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Thomas & Betts Corporation: www.tnb.com.
 - c. Unistrut, a brand of Atkore International Inc.: www.unistrut.com.
 - d. GS Metals Corporation; www.cmdgroup.com.
 - e. Allied Tube & Conduit, part of Atkore International; www.alliedeg.us
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - 1. Minimum Size, Unless Otherwise Indicated or Required:
- F. Anchors and Fasteners:
 - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 - 3. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 - 4. Plastic and lead anchors are not permitted.
 - 5. Powder-actuated fasteners are permitted only as follows:
 - a. Use only threaded studs; do not use pins.
 - 1) Threaded-heat-treated steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used..
 - 6. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4 or MSS SP-58.
 - b. Channel Material: Use Steel or malleable-iron, slotted support system units similar to MSS Type 18..
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
 - 7. Manufacturers - Mechanical Anchors:
 - a. Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - 1) Hilti, Inc.: www.us.hilti.com.
 - 2) ITW Red Head, a division of Illinois Tool Works, Inc.: www.itwredhead.com.
 - 3) Cooper B-Line, a division of Eaton Corporation; www.cooperindustries.com.
 - 4) Empire Tool and Manufacturing Company; www.empireindustries.com
 - 5) MKT Fastening, LLC; www.mktfastening.com
 - 8. Manufacturers - Powder-Actuated Fastening Systems:
 - a. Hilti, Inc.: www.us.hilti.com.
 - b. ITW Ramset, a division of Illinois Tool Works, Inc.: www.ramset.com.
 - c. Simpson Strong-Tie Company Inc.: www.strongtie.com.
 - d. MKT Fastening, LLC; www.mktfastening.com.
- G. Clamps (attachment to steel structural elements):
 - 1. MSS SP-58, suitable for attached structural element.

- H. Through Bolts:
 - 1. Structural type, hex head, and high strength.
 - 2. Comply with ASTM A325.
- I. Toggle Bolts:
 - 1. All-steel springhead type.
- J. Hanger Rods:
 - 1. Threaded steel.
 - 2.

2.02 VIBRATION ISOLATORS

- A. General: Provide vibration isolators with either known undeflected heights or other markings so that, after adjustment, when carrying their load, the deflection under load can be verified, thus determining that the load is within the proper range of the device and that the correct degree of vibration isolation is being provided according to the design.
 - 1. Provide isolators that operate in the linear portion of their load versus deflection curve. Furnish load versus deflection curves from the manufacturer that are linear, over a deflection range 50% above the design deflection.
- B. Manufacturers:
 - 1. California Dynamics Company; www.caldyn.com
 - 2. Mason Industries: www.mason-ind.com
- C. Vibration Isolator Types:
 - 1. General Properties:
 - a. The ratio of lateral to vertical stiffness shall be not less than 0.9 or greater than 1.5.
 - b. The theoretical vertical natural frequency for each support point, based upon the load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than (+/-) 10%.
 - c. Wave motion through the isolator shall be reduced to the following extent: Isolation above the primary vertical system resonance frequency shall follow the theoretically predicted isolation curve for single degree of freedom systems with 1-dB to 50 dB at all frequencies above the 150 Hz.
 - d. All neoprene mountings shall have a shore hardness of 40 -65 after minimum aging of 30 days, or corresponding open-aging.
 - 2. Isolator Description:
 - a. Type MS shall be spring type, without housings or snubbers, equipped with leveling bolts and with two layers of ribbed or waffled neoprene pads, separated by a 1/16" galvanized steel plate under the base plate. Neoprene sleeves and washer shall be installed at all anchor bolts.
 - b. Type HS shall be suspension hangers having a steel frame and spring element, in series with a neoprene pad, cut or washer. The isolator shall be designed so that hanger rod may be misaligned 15 degrees in any direction relative to the vertical, without contacting hanger box frame.
 - c. Type MN shall be neoprene isolator support type unit having a minimum static deflection of ¼".
 - d. Type HN shall be a suspension hanger type employing a neoprene isolator unit having a minimum static deflection of ¼".
- D. Equipment Frames
 - 1. Mounting frames and brackets shall be provided to carry the load of the equipment without causing mechanical distortion or stress to the equipment.
 - 2. The mounting frames shall consist of welded, wide flange or channel structural steel, with welder brackets to accept the isolators. The section depth of any frame member shall be

not less than 1/10th of the length of the longest frame member, and not less than 1/10th of the greatest span between support points. All frame members shall have the same depth.

2.03 MANUFACTURERD SUPPORTING DEVICES

- A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps as described in NECA 1 and NECA 101.
- B. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- C. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs shall have number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish. Provide OZ/Gedney type "S" cable support or equal.
- D. U-Channel Systems: 12-gauge steel channels, with 9/16 inch diameter holes, at a minimum of 2 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacturer.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

2.04 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 05 50 00 - Metal Fabrications for steel shapes and plates.
- C. Pipe Sleeves: Provide pipe sleeves of one of the following:
 - 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
 - a. 3 inch and smaller: 2 gauge.
 - b. 4 inch to 6 inch: 16 gauge.
 - c. Over 6 inch: 14 gauge.
 - 2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
 - 3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1 and .NECA 101
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect/Engineer of Record, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect/Engineer of Record, do not provide support from roof deck.
- F. RMC, IMC, and EMT may be supported by openings through structure members, as permitted in the Chicago Electrical Code.
- G. Minimum static design load used for strength of support assemblies shall be weight of supported components plus 200 pounds.
- H. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- I.
- J. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations 1 inch off of wall or surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
 - 5. To Wood: Fasten with lag screws or through bolts.
 - 6. To New Concrete: Bolt to concrete inserts.
 - a. Do not penetrate water proofing.
 - 7. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 8. To Existing Concrete: Expansion anchor fasteners.
 - a. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 9. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts Spring-tension clamps.

- a. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
 10. To Light Steel: Sheet metal screws.
 11. Fasteners: Select so the load applied to each fastener does not of its proof test load.
 12. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration and shock-resistant fasteners for attachments to concrete slabs.
 13. Provide weight-distributing facilities, where required, so as not to exceed the load-bearing capabilities of floors or walls that bear the weight of, or support, electrical systems.
 14. Exposed part of hangers and supports shall be painted with one coat of rust-inhibiting primer.
 15. Equipment shall not be held in place by its own dead weight. Provide base anchor fasteners in each case.
 16. Miscellaneous Supports: Support miscellaneous electrical components as required to provide the same structural safety factors as specified for raceway supports. Install metal channel or angle iron racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- K. Conduit Support and Attachment: Also comply with Section 26 05 33.13 - Conduit for Electrical Systems.
- L. Box Support and Attachment: Also comply with Section 26 05 33.16 - Boxes for Electrical Systems.
- M. Interior Luminaire Support and Attachment: Also comply with Section 26 51 00 - Interior Lighting.
- N. Exterior Luminaire Support and Attachment: Also comply with Section 26 56 00 - Exterior Lighting.
- O. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- P. Overhead boxes shall be supported independently of associated raceways.
- Q. Secure fasteners according to manufacturer's recommended torque settings.
- R. Remove temporary supports.
- S. Concrete Bases:
1. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
 2. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 00 - Cast-in-Place Concrete.
 3. Anchor equipment to concrete base.
 - a. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - c. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
- T. Installation of Fabricated metal Supports:

1. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
2. Comply with installation requirements in Section 05 50 00 - Metal Fabrications for site-fabricated metal supports.
3. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
4. Field Welding: Comply with AWS D1.1/D1.1M.

3.03 SCHEDULE, TABLE 1: SPACING FOR RACEWAY SUPPORTS:

* Maximum spacing for IMC above apply to straight runs only. Otherwise the maximums for EMT appl

RACEWAY SIZE (INCHS)	NO. OF CONDUCTORS IN RUN		MAXIMUM SPACING OF SUPPORTS (FEET) FOR RGS AND IMC	MAXIMUM SPACING OF SUPPORTS (FEET) FOR EMT
<u>HORIZONTAL RUNS</u>				
1/2, 3/4	1 or 2	Flat ceiling or wall	5	5
1/2, 3/4	1 OR 2	Where limited to support by building construction.	7	7
1/2, 3/4	3 or more	Any location	7	7
1/2-1	3 or more	Any location	7	7
1 and larger	1 or 2	Flat ceiling or wall	6	6
1 and larger	1 or 2	Where limited to support by building construction.	10	10
1 and larger	3 or more	Any location	10	10
Any	-	Concealed	10	10
<u>VERTICAL RUNS</u>				
1/2, 3/4	-	Exposed	7	7
1, 1 1/4	-	Exposed	8	8
1 1/2 and larger	-	Exposed	10	10
Up to 2	-	Shaftway	14	10
2 1/2	-	Shaftway	16	10
3 and larger	-	Shaftway	20	10
Any	-	Concealed	10	10

* Maximum spacing for IMC above apply to straight runs only. Otherwise the maximums for EMT apply.

- A. Abbreviations:
1. EMT:
 2. IMC:
 3. RGS:

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

3.05 CLEANING AND PAINTING

3.06

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
 - 2.
- B. Touchup: Comply with requirements in Section 09 91 23 - Interior Painting for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780/A780M.

END OF SECTION 26 05 29

SECTION 26 05 33.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Aluminum rigid metal conduit (RMC).
- C. Intermediate metal conduit (IMC).
- D. Flexible metal conduit (FMC).
- E. Liquidtight flexible metal conduit (LFMC).
- F. Electrical metallic tubing (EMT).
- G. Rigid polyvinyl chloride (PVC) conduit.
- H. Conduit fittings.
- I. Accessories.

1.02 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
- D. Chicago Electrical Code - Municipal Code of the City of Chicago, Building/Electrical Code Requirements; 2018.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- G. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.
- H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.
- I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
- K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.
- L. NFPA 70 - National Electrical Code; 2017.

- M. TIA-569-D - Telecommunications Pathways and Spaces; Rev D, 2015.
- N. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- O. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- P. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- Q. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- R. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- S. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- T. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- U. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 5. Notify Architect/Engineer of Record of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
 - 1. Indicate each type and size of conduit to be utilized within project.
 - 2. Indicate each type and size of conduit fitting to be utilized within project.
- C. Shop Drawings:
 - 1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
 - 2. Include proposed locations of roof penetrations and proposed methods for sealing.
- D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch trade size and larger.

1.05 QUALITY ASSURANCE

- A. Comply with NECA's "Standard of Installation".
- B. Comply with the Chicago Electrical Code.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA Regulation 1910.7 as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.
- B. Effectively protect all materials, accessories, and components from any damage or injury from the time of fabrication until final Owner acceptance.
- C. Store equipment in spaces with environments controlled within manufacturer's ambient temperature and humidity tolerances for non-operating equipment.

PART 2 - PRODUCTS

PART 3 -

3.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by the City of Chicago Electrical Code and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 - 1. Under Slab on Grade: Use galvanized steel rigid metal conduit.
 - 2. Exterior, Direct-Buried: Use rigid PVC conduit where permitted by the City of Chicago Electrical Code..
 - 3. Service Entrance: Use galvanized steel rigid metal conduit.
 - 4. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit.
 - 5. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 - 6. Where rigid polyvinyl (PVC) conduit larger than 2 inch trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
 - 7. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection.
 - 8. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges.
- D. Embedded Within Concrete:

1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit.
 2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit.
 3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit.
- E. Concealed Within Masonry Walls: Use electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).
- H. Exposed, Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- I. Exposed, Interior, Not Subject to Physical Damage: Use electrical metallic tubing (EMT).
- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
1. Locations subject to physical damage include, but are not limited to:
 - a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
 - b. Loading dock..
 - c. Mechanical rooms.
- K. Exposed, Exterior: Use intermediate metal conduit (IMC).
- L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use intermediate metal conduit (IMC).
- M. Hazardous (Classified) Locations: Use galvanized steel rigid metal conduit.
- N. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
1. Maximum Length: 6 feet.
- O. Connections to Vibrating Equipment:
1. Dry Locations: Use flexible metal conduit.
 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 3. Maximum Length: 6 feet unless otherwise indicated.

3.02 CONDUIT REQUIREMENTS

- A. Electrical Service Conduits: Also comply with Section 26 21 00 - Low-Voltage Electrical Service Entrance.
- B. Communications Systems Conduits: Also comply with Section 27 10 00 - Structured Cabling.
- C. Fittings for Grounding and Bonding: Also comply with Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- E. Provide products listed, classified, and labeled as suitable for the purpose intended.
- F. Minimum Conduit Size, Unless Otherwise Indicated:
1. 3/4-inch trade size..

- G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- H. Where conduit size is not indicated, size to comply with the City of Chicago Electrical Code but not less than applicable minimum size requirements specified.

3.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedeg.com/#sle.
 - 2. Wheatland Tube Company: www.wheatland.com/#sle.
 - 3. O-Z/Gedney, a brand of Emerson Industrial Automation; www.emersonindustrial.com.
 - 4. Tenaris (formerly Maverick Tube Corporation); www.tenaris.com
- B. Description: The City of Chicago Electrical Code, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 - 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

3.04 INTERMEDIATE METAL CONDUIT (IMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedeg.com/#sle.
 - 2. Wheatland Tube Company: www.wheatland.com/#sle.
 - 3. O-Z/Gedney, a brand of Emerson Industrial Automation; www.emersonindustrial.com.
 - 4. Tenaris (formerly Maverick Tube Corporation); www.tenaris.com
- B. Description: The City of Chicago Electrical Code, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- C. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 - 3. Material: Use steel or malleable iron.
 - 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

3.05 FLEXIBLE METAL CONDUIT (FMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit; www.alliedeg.com.
 - 2. Wheatland Tube Company; www.wheatland.com.
 - 3. O-Z/Gedney, a brand of Emerson Industrial Automation; www.emersonindustrial.com.
 - 4. Tenaris (formerly Maverick Tube Corporation); www.tenaris.com

- B. Description: The City of Chicago Electrical Code, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- C. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.

3.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit; www.alliedeg.com.
 - 2. Wheatland Tube Company; www.wheatland.com.
 - 3. O-Z/Gedney, a brand of Emerson Industrial Automation; www.emersonindustrial.com.
 - 4. Tenaris (formerly Maverick Tube Corporation); www.tenaris.com
- B. Description: The City of Chicago Electrical Code, type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.

3.07 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedeg.com.
 - 2. Wheatland Tube Company: www.wheatland.com.
 - 3. O-Z/Gedney, a brand of Emerson Industrial Automation; www.emersonindustrial.com.
 - 4. Tenaris (formerly Maverick Tube Corporation); www.tenaris.com
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Description: The City of Chicago Electrical Code, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- D. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 - 3. Connectors and Couplings: Use compression (gland) type with insulated throat.
 - a. Do not use indenter type connectors and couplings.
 - b. Do not use set-screw type connectors and couplings.
 - 4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

3.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
 - 1. Electri-Flex Company; www.electriflex.com.

2. Hubbell Company, RACO products; www.hubbell-rtb.com
3. CertainTeed Pipe and Plastics; www.certainteed.com

B. Description: The City of Chicago Electrical Code, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

3.09 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

A. Manufacturers:

1. Electri-Flex Company: www.electriflex.com/#sle.
2. Hubbell Company, RACO products; www.hubbell-rtb.com.
3. CertainTeed Pipe and Plastics; www.certainteed.com

B. Description: The City of Chicago Electrical Code, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.

C. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

3.10 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.

E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

F. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

PART 4 - EXECUTION

4.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

4.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.
- E. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- H. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.
- I. Conduit Routing:
 - 1. Unless dimensioned, any conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - 5. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
 - 6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 7. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 8. Protect stub-ups from damage where conduits rise through floor slabs. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
 - 9. Arrange conduit to provide no more than the equivalent of three 90 degree bends between pull points.
 - a. For Telecommunications conduit, fewer bends are allowed.
 - 10. Arrange conduit to provide no more than 150 feet between pull points.
 - a. For Telecommunications conduit, install pull boxes every 100 feet.
 - 11. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plan and straight legs of offsets parallel, unless otherwise indicated.
 - a. Use raceway fittings compatible with raceways and suitable for use and location.
 - b. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.
 - 12. Route conduits above water and drain piping where possible.
 - 13. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 - 14. Maintain minimum clearance of 6 inches between conduits and piping for other systems.

15. Maintain minimum clearance of 6 inches between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
 16. Group parallel conduits in the same area together on a common rack.
- J. Conduit Support:
1. Secure and support conduits in accordance with the City of Chicago Electrical Code and Section 26 05 29 - Hangers and Supports for Electrical Systems, using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 6. Use conduit clamp to support single conduit 1 1/2 inch and smaller from beam clamp or threaded rod and for fastening raceways to trapeze supports.
 7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 - a. Sized so capacity can be increased by 25 percent in future without exceeding specified design load limits.
 - b. Secure raceways and cables to supports with single-bolt conduit clamps.
 8. Use of spring steel conduit clips for support of conduits is not permitted.
 9. Use of wire for support of conduits is not permitted.
- K. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
 7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- L. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.

5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
 7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00 - Firestopping.
 10. Install sealing fittings in suitable, approved, and accessible locations.
 - a. Install in flush steel box with blank cover plate.
 - 1) Finish similar to adjacent plates or surfaces.
 - b. Install at the following locations:
 - 1) Where conduits pass from warm to cold locations.
 - 2) Where required by the City of Chicago Electrical Code.
- M. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31 23 16 - Excavation and Section 31 23 23 - Fill.
 2. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches.
 - b. Under Slab on Grade: 12 inches to bottom of slab.
 3. Provide underground warning tape in accordance with Section 26 05 53 - Identification for Electrical Systems along entire conduit length.
- N. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Include proposed conduit arrangement with submittals.
 2. Maximum Conduit Size: 1 inch (27 mm) unless otherwise approved.
 3. Install conduits within middle one third of slab thickness.
 4. Secure conduits to prevent floating or movement during pouring of concrete.
- O. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 - Cast-in-Place Concrete with minimum concrete cover of 3 inches on all sides unless otherwise indicated.
- P. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with the City of Chicago Electrical Code.
- Q. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where conduits are subject to earth movement by settlement or frost.
- R. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
 3. Where conduits penetrate coolers or freezers.

- S. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave minimum slack of 12 inches at each end.
- T. Provide grounding and bonding in accordance with Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- U. Voice and Data System Raceways, 2-Inch Trade Size and Smaller: In addition to the above requirements, install raceways in maximum lengths of 100 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements. Provide insulating bushings at all terminations. Comply with EIA/TIA-569-D.
 - 1. Conduit to be color coded for Voice and Data systems in accordance with Section 26 05 53 - Identification for Electrical Systems.

4.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- D. Correct deficiencies and replace damaged or defective conduits.

4.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.
- B. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
- C. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

4.05 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 26 05 33.13

SECTION 26 05 33.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Boxes for hazardous (classified) locations.
- D. Floor boxes.

1.02 REFERENCE STANDARDS

- A. Chicago Electrical Code - Municipal Code of the City of Chicago, Building/Electrical Code Requirements; 2018.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- F. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- H. NFPA 70 - National Electrical Code; 2017.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 508A - Industrial Control Panels; 2013.
- L. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- M. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
- N. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by the Chicago Electrical Code.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to the City of Chicago Electrical Code.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to the City of Chicago Electrical Code.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect/Engineer of Record of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual locations for junction boxes, pull boxes, cabinets and enclosures, and floor boxes.

1.05 QUALITY ASSURANCE

- A. Comply with City of Chicago Electrical Code.
- B. Comply with NECA's "Standard of Installation".
- C. Product Listing Organization Qualifications: An organization recognized by OSHA Regulation 1910.7 as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 BOXES

- A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by the City of Chicago Electrical Code.
 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 4. here box size is not indicated, size to comply with the City of Chicago Electrical Code but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
 4. Use cast aluminum boxes where aluminum rigid metal conduit is used.
 5. Use nonmetallic boxes where exposed rigid PVC conduit is used.
 6. Use suitable concrete type boxes where flush-mounted in concrete.
 7. Use suitable masonry type boxes where flush-mounted in masonry walls.
 8. Use raised covers suitable for the type of wall construction and device configuration where required.
 9. Use shallow boxes where required by the type of wall construction.
 10. Do not use "through-wall" boxes designed for access from both sides of wall.
 11. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 12. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 13. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
 14. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 15. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 16. Wall Plates: Comply with Section 26 27 26 - Wiring Devices.
 17. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Hubbell Incorporated; : www.hubbell-rtb.com.
 - c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com.
 - d. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
 - e. Appleton Electric, a brand of Emerson Corporation; www.emersonindustrial.com
 - f. Walker Systems, a part of Wiremold, a brand of Legrand; www.legrand.us .
 - g. Hoffman, a brand of Pentair Technical Products; www.hoffmanonline.com
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 3. Junction and Pull Boxes Larger Than 100 cubic inches:
 - a. Provide hinged-cover enclosures unless otherwise indicated.
 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Removable interior panel and removable front.

- b. Hinged door in front cover with flush latch and concealed hinge.
- c. Keyed latch to match panelboards.
- d. Metal barriers to separate wiring of different systems and voltages.
- e. Accessory feet where required for freestanding equipment.
- 5. Finish for Painted Steel Enclosures: Finished inside and out with manufacturer's standard enamel. unless otherwise indicated.
- 6. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com.
 - c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com.
 - d. Hubbell Incorporated; RACO Products; www.hubbell-rtb.com.
 - e. O-Z/Gedney, a brand of Emerson Industrial Automation; www.emersonindustrial.com
 - f. Appleton Electric, a brand of Emerson Corporation; www.emersonindustrial.com
 - g. Walker Systems, a part of Wiremold, a brand of Legrand; www.legrand.us
- D. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.
 - 1. Manufacturers:
 - a. Appleton, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
 - b. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
 - c. Hubbell Incorporated; Killark Products: www.hubbell-killark.com.
- E. Floor Boxes:
 - 1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26 - Wiring Devices; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
 - 2. Use cast iron floor boxes within slab on grade.
 - 3. Use sheet-steel or cast iron floor boxes within slab above grade.
 - 4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
 - 5. Manufacturer: Same as manufacturer of floor box service fittings, comply with Section 26 27 26 - Wiring Devices.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that mounting surfaces are ready to receive boxes.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and the City of Chicago Electrical Code.
- D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

- E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
 - 1. In masonry walls, saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

- F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

- G. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 - Access Doors and Panels as required where approved by the Architect/Engineer of Record.
 - 2. Unless dimensioned, box locations indicated are approximate.
 - 3. Locate boxes as required for devices installed under other sections or by others.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26 - Wiring Devices.
 - b. Communications Systems Outlets: Comply with Section 27 10 00 - Structured Cabling.
 - 4. Locate boxes so that wall plates do not span different building finishes.
 - 5. Locate boxes so that wall plates do not cross masonry joints.
 - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 7. Unless otherwise indicated, where multiple outlet boxes are installed at the same location and at the same mounting height, install devices in multi-gang barriered box appropriate for the devices types.
 - a. Multi-ganged devices shall have a common, multi-device faceplate.
 - 8. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
 - 9. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
 - 10. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 - b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
 - 11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect/Engineer of Record:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
 - 12. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
 - 13. Installation of Combination Device Wall Enclosures:
 - a. In each instance where two or more device boxes are generally located in the same vicinity and at the same mounting height, mount those devices in a common multi-gang barriered box appropriate for the device types.
 - b. Combination receptacle and communications devices (i.e. television, data and receptacle shall be installed in minimum 2 gang boxes with barriers to segregate the systems.
 - c. Combination devices (i.e. data/voice outlet and normal and IG receptacle) installed in minimum 3 gang box under common wall plate. Provide barriers to segregate systems.

- H. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 - Hangers and Supports for Electrical Systems using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 4. Install hinged-cover enclosures and cabinets plumb. Support each corner.
- I. Install boxes plumb and level.
- J. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- K. Floor-Mounted Cabinets: Mount on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- L. Install boxes as required to preserve insulation integrity.
- M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00 - Firestopping.
- P. Close unused box openings.
- Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- R. Provide minimum 2-gang box with barriers for combination receptacle and data locations for specialty equipment (i.e. televisions, monitors).
- S. Combination devices (i.e. data/voice outlet and normal and isolated ground receptacle) installed in minimum 3-gang box with barriers.
- T. Provide grounding and bonding in accordance with Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- U. Identify boxes in accordance with Section 26 05 53 - Identification for Electrical Systems.
- 3.03 CLEANING
- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

- B. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
- C. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.04 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 26 05 33.16

**SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.

- B. Identification nameplates and labels.
- C. Identification signs.
- D. Wire and cable markers.
- E. Voltage markers.
- F. Underground warning tape.
- G. Floor marking tape.
- H. Warning signs and labels.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1910.145 - Accident Prevention Signs and Tags current edition.
- B. ASME A13.1 - Scheme for the Identification of Piping Systems 2020.
- C. Chicago Electrical Code - Municipal Code of the City of Chicago, Building/Electrical Code Requirements 2018.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace 2018.
- E. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Samples:
 - 1. For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features..
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.05 QUALITY ASSURANCE

- A. Comply with ASME A13.1.
- B. Comply with ANSI/IEEE 802.7.
- C. Comply with 29 CFR 1910.145.

1.06 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

1.07 COORDINATION

- A. Coordinate all names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation

and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Designations and labeling shall be consistent throughout the project.

- B. Coordinate installation with coverings and painting of surfaces.
- C. Coordinate installation with location of access panels and doors.
- D. Install identifying devices before installation of acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Switchboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use identification nameplate to identify main overcurrent protective device.
 - 5) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - b. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces.
 - 5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - c. Transformers:
 - 1) Identify kVA rating.
 - 2) Identify voltage and phase for primary and secondary.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify load(s) served. Include location when not within sight of equipment.
 - d. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
 - e. Transfer Switches:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
 - 4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
 - f. Electricity Meters:
 - 1) Identify load(s) metered.
 - g. UPS:
 - 1) Identify kVA rating.
 - 2) Identify voltage and phase for primary and secondary.

- 3) Identify power source and circuit number. Include location when not within sight of equipment.
- 4) Identify load(s) served. Include location when not within sight of equipment
- h. Motor Control centers:
 - 1) Identify ampere rating.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - 3) Identify voltage and phase.
 - 4) Use identification nameplate to identify main overcurrent protective device.
 - 5) Use identification nameplate to identify load(s) served for each starter. Do not identify spares and spaces.
- 2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
 - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
- 3. Emergency System Equipment:
 - a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with the Chicago Electrical Code.
 - b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
 - c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.
- 4. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
- 5. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with the Chicago Electrical Code.
- 6. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with the City of Chicago Electrical Code.
- 7. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
- 8. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
- 9. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
- 10. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
- 11. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances.
 - a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 91 23 - Interior Painting and 09 91 13 - Exterior Painting.
- 12. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by the Chicago Electrical Code, including but not limited to the following.
 - a. Service equipment.
 - b. Industrial control panels.

- c. Motor control centers.
 - d. Elevator control panels.
 - e. Industrial machinery.
13. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
- a. Comply with NFPA 70E
 - b. Minimum Size: 3.5 by 5 inches.
 - c. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
 - d. Labels shall be machine printed, with no field-applied markings.
 - e. Service Equipment: Include the following information in accordance with the Chicago Electrical Code.
 - 1) Nominal system voltage.
 - 2) Available fault current.
 - 3) Clearing time of service overcurrent protective device(s).
 - 4) Date label applied.
14. Within all switchboard rooms, electrical closets, and other spaces containing electrical equipment provide the following:
- a. Vitreous enameled metal sign, red on white, reading "Electrical Equipment Room - No Storage Permitted."
 - b. Mounted in clearly visible locations within rooms.
 - 1) If wall space in room does not permit mounting, mount to door on inside of room.
15. In all switchboard rooms:
- a. Install up-to-date black-lined print of feeder diagram of building completed with feeder schedules.
 - 1) Print shall be installed in frame, behind glass.
 - 2) Print to include up-to-date field record information.
 - 3) Print to be on mylar.
 - 4) Print to have lettering no smaller than 1/8 inch.
- B. Identification for Conductors and Cables:
- 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 - 3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes where there are more than three branch circuits, provide metal tags. Provide source and circuit number for each ungrounded conductor..
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
 - d. Provide write-on tags to conductors and list source and circuit number for conductors to be extended in the future.

4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
 5. Use underground warning tape to identify direct buried cables and cables buried in raceway for the following systems:
 - a. Power
 - b. Lighting
 - c. Communications
 - d. Control wiring
 - e. Optical Fiber
 - f. Connection to City OEMC network
- C. Identification for Raceways:
1. Comply with ASME A13.1 for size of letters for legend and minimum length of color field for each raceway.
 2. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
 3. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
 - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
 - 1) Color Code:
 - (a) Emergency Power System: Red.
 - (b) Fire Alarm System: Red.
 - (c) Control Wiring: Green and red.
 - (d) Telecommunication Systems:
 - (1) Provide blue colored conduit for telecommunication system raceway. Conduit to be in accordance with Section 26 05 33.13 - Conduit for Electrical Systems.
 - (e) Mechanical and Electrical Supervisory System: Green and blue.
 - (f) Security System: Blue and yellow.
 - (g) Fire-Suppression Supervisory and Control System: Red and yellow.
 - 2) Field-Painting: Comply with Section 09 91 23 - Interior Painting and 09 91 13 - Exterior Painting.
 - 3) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
 4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
 - a. Provide one label or marker at each end of the pathway and at any exposed pints (i.e., screw cover boxes, pull points, etc.)
 5. Exposed raceways shall be labeled at transitions into and out of inaccessible spaces.
 6. Provide alphanumeric identifiers to designate locations for origin and the end of the pathway.
 - a. Type of pathways shall be identified:
 - 1) CN-conduit
 - 2) TCN-telecommunications conduit
 - 3) RK-rack
 - 4) W-workstation
 - b. Numbered from each origin point in series starting from 1.
 7. Use underground warning tape to identify underground raceways.
 8. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.

- D. Identification for Boxes:
 - 1. Use voltage markers to identify highest voltage present.
 - 2. Use voltage markers or color coded boxes to identify systems other than normal power system.
 - a. Color-Coded Boxes: Field-painted in accordance with Section 09 91 23 - Interior Painting and 09 91 13 - Exterior Painting per the same color code used for raceways.
 - b. For exposed boxes in public areas, do not color code.
 - 3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
 - a. For exposed boxes in public areas, use only identification labels.
- E. Identification for Devices:
 - 1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26 - Wiring Devices.
 - 2. Use identification label to identify fire alarm system devices.
 - a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
 - 3. Use identification label to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 - 1. Manufacturers:
 - a. Seton Identification Products: www.seton.com/#sle.
 - b. Quentin D. Schwab.
 - c. Joe Halm Building Specialties
 - d. Mechanical Tag Systems
 - e. N&E Specialty Company
 - 2. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic nameplates suitable for exterior use.
 - 1) With non-corroding screws.
 - 3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or melamine with beveled edges; minimum thickness of 1/16 inch; engraved text.
 - 4. Text:
 - a. Text to be 1/2 inch high letters on 1-1/2 inch label for single line.
 - b. Text to be 1/2 inch high letters on 2 inch label for 2 line text applications.
 - c. Increase sizes of labels and letters to be viewed from floor in elevated applications.
 - 5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
- B. Identification Labels:
 - 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
 - 1. Minimum Size: 1.5 inches by 2.5 inches.
 - 2. Legend:
 - a. System designation where applicable:
 - b. Equipment designation or other approved description.
 - 3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height:
 - a. System Designation: 1/2 inch.
 - b. Equipment Designation: 1/2 inch.
5. Color:
 - a. Normal Power System: White text on black background.
 - b. Emergency Power System: White text on red background.
 - c. Fire Alarm System: White text on red background.
- D. Format for General Information and Operating Instructions:
 1. Minimum Size: 1 inch by 2.5 inches.
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/4 inch.
 5. Color: Black text on white background unless otherwise indicated.
- E. Format for Caution and Warning Messages:
 1. Minimum Size: 2 inches by 4 inches.
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/2 inch.
 5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Control Device Identification:
 1. Minimum Size: 3/8 inch by 1.5 inches.
 2. Legend: Load controlled or other designation indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch.
 5. Color: Black text on clear background.
- G. Format for Fire Alarm Device Identification:
 1. Minimum Size: 3/8 inch by 1.5 inches.
 2. Legend: Designation indicated and device zone or address.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch.
 5. Color: Red text on white background.

2.03 IDENTIFICATION SIGNS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches; 1/2 inch for viewing distances up to 72 inches; and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions. Provide additional information as required by Owner Representative

2.04 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on,

vinyl split sleeve, or metal tag type markers suitable for the conductor or cable to be identified.

- B. Markers for Conductor and Cable Bundles: Use plastic marker tags or metal tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Text Height: Comply with ANSI A13.1.
- F. Color: Black text on orange background unless otherwise indicated.

2.05 VOLTAGE MARKERS

- A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- C. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
 - 2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
 - 4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- D. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
 - 2. Markers for System Identification:
 - a. Emergency Power System: Text "EMERGENCY".
 - b. Other Systems: Type of service.
- E. Color: Black text on orange background unless otherwise indicated.

2.06 UNDERGROUND WARNING TAPE

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.
- C. Legend: Type of service, continuously repeated over full length of tape.
 - 1. Legend shall be factory printed.
- D. Color:
 - 1. Tape for Buried Power Lines: Black text on red background.

2.07 FLOOR MARKING TAPE

- A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with over laminate, 3 inches wide, with alternating black and white stripes.

2.08 WARNING SIGNS AND LABELS

- A. Comply with City of Chicago Electrical Code and 29 CFR 1910.145.
- B. Warning Signs:
 - 1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
 - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 - 3. Minimum Size: 7 by 10 inches unless otherwise indicated.
- C. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - a. Do not use labels designed to be completed using handwritten text.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 3. Minimum Size: 2 by 4 inches unless otherwise indicated.
- D. Shall include, but not limited to, the following legends:
1. Multiple power source warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 2. Workspace clearance warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Conduits: Legible from the floor.
 8. Boxes: Outside face of cover.
 9. Conductors and Cables: Legible from the point of access.
 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.
- I. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
1. Power transfer switches.
 2. Controls with external control power connections.

3.03 PATHWAY IDENTIFICATION

- A. Conduit labels shall be made adhesive and a minimum of 3/4 inch wide, embossed with the designations in 5/16-inch high letters (numbers placed in 2 locations for all spaces and on all pathways at both ends) and legibly written with a permanent marker.
- B. Minimum of two (2) labels, one at each end of the pathway and any exposed points (i.e., screw cover boxes, pull points, etc.).
- C. Exposed raceways do not need to be labeled unless transitioning into or out of an inaccessible space. When necessary, raceway designation will be (RW).
- D. All pathways shall be identified with an alphanumeric identifier to designate locations for the origin and the end of the pathway.
- E. Pathways shall follow the hierarchy.
- F. Final identification shall be required at the beginning and the end of the pathway and at all accessible points along the pathway (i.e. Pull boxes)

1. Example: Conduit leaving MDF and ending at classroom concentrator 232:

ROOM PRIMARY SIGNIFICANCE MDF MAIN DISTRIBUTION FRAM	MDF-CCE232 ROOM OF SECONDARY SIGNIFICANCE CCE232 CLASSROOM CONCENTRATOR ENCLOSURE ROOM 232
---	--

2. Example: Telecommunications service entrance from the main service entrance to the MDF:

ROOM PRIMARY SIGNIFICANCE MDF MAIN DISTRIBUTION FRAME	MDF-TCN CONDUIT IDENTIFICATION TCN TELECOMMUNICATIONS SERVICE ENTRANCE
--	---

3. When multiple rooms of secondary significance are combined together (Branched off) within the same common conduit, leaving the room of significance, each label will be attached to the common conduit and Identified on a spreadsheet in the enclosure pockets and the MDF binder.

a. Example:

- 1) **MDF-SCE256**
- 2) **MDF-TCE254**

4. When multiple conduits are extended from the MDF to a common location, a distinction is to be made between the conduits.

a. Example: Two conduits from MDF to the Telecommunications Service Entrance:

ROOM PRIMARY SIGNIFICANCE MDF MAIN DISTRIBUTION FRAME	MDF-TCN-CN1 (2) CONDUIT IDENTIFICATION TCN TELECOMMUNICATIONS SERVICE ENTRANCE	CONDUIT IDENTIFICATION CN1 CONDUIT 1
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3.04 IDENTIFICATION SIGN INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Electronic shut off valves are to be identified with signs at the activating switch or button, including:
 1. Gas Shut Off
 2. Emergency Boiler Shut Off
 3. Emergency Generator Shut Off

3.05 WARNING SIGN INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Warning Signs are required for the following elements:
- C. Warning Lights are to have an accompanying sign identifying the light meaning, including:
- D. "Gas Usage in Space" for Science Labs and Prep Rooms
- E. "Do Not Enter – Photo Developing" for Photography Dark Rooms
- F. "Refrigerant Alarm" at Chiller Room

3.06 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.

- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

- A. **END OF SECTION**

SECTION 28 26 07
EMERGENCY CALL SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Section includes providing a complete and operating emergency call system.
 - 1. Emergency Call Annunciator Panel.
 - 2. Emergency Call Stations.
 - 3. System power supply with back-up.

1.02 DEFINITIONS

- A. Refer to Section 27 05 03 - Communications General Requirements for definitions.

1.03 REFERENCE STANDARDS

- A. City of Chicago Building Code - Municipal Code of Chicago for the Building Industry; 2017.

1.04 SUBMITTALS

- A. Shop Drawings and Manufacturer's Literature.
 - 1. Submittals are required for all material in brochure form complete with wiring diagrams. Include:
 - a. Cable or wire as recommended by equipment manufacturer.
 - b. Technical data on each product, including finish.
 - c. Details of construction and connections.
 - d. Description of system operation.
 - e. Manufacturer's installation instructions.

- B. Operation and Maintenance Instructions.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who is a factory-authorized service representative to perform the work of this Section.
- B. Electrical Component Standard: Provide work complying with applicable requirements of City of Chicago Building Code.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

1.07 WARRANTY

- A. Provide manufacturers standard warranty or one (1) year warranty, whichever is longer .

1.08 MAINTENANCE SERVICE

- A. Furnish service and maintenance of emergency call system for one year from date of substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - 1. Cornell; www.cornell.com.

2.02 ANNUNCIATOR PANEL (FUNCTIONS AS ARA COMMUNICATION SYSTEM)

- A. The annunciator panel shall include one alternate action switch with internal LED indicator for each zone. An audible alarm will be mounted on the annunciator panel which will emit a minimum sound level of 90 db at 30 cm. A yellow LED light on the annunciator will illuminate and the alarm will emit a repeating sound if any of the supervised lines are faulted.
- B. The panel shall be constructed of 0.125-inch thick anodized aluminum with permanently silk-screened zone designations on the panel as well as a designation strip.
- C. Manufacturer: Cornell A41 series or approved equal with the number of zones required.

2.03 CALL STATION

- A. The call station shall consist of one momentary series switch with LED and one audible alarm device with a sound level minimum of 90db at 30 cm. The station will be wall mounted on a stainless steel plate.

2.04 POWER SUPPLY

- A. Battery back-up/power supply, 24 VDC at 3 Amps.

PART 3 - EXECUTION

3.01 WIRING

- A. Wiring shall consist of 22 gauge (minimum) wire. Four conductors are required between each Call Station and the Annunciator Panel.
- B. Power wire shall be 18 gauge (minimum). Two conductors are required between Model C-5243 battery power supply and the annunciator panel.

3.02 INSTALLATION

- A. Install equipment where shown on drawings. Stations to be mounted plumb.
- B. All wiring to be installed in conduit.
- C. Make all connections to screw type terminals. Splices or soldered connections are prohibited.

3.03 CONTRACTOR STARTUP AND REPORTING

- A. As a minimum, the system shall be tested to show that:
1. The complete system is free from grounds, opens and shorts.
 2. Each device functions as specified.
 3. Abnormal condition of any circuit required to be electrically supervised shall result in the specified trouble signals.

END OF SECTION 28 26 07

**SECTION 28 26 09
RESCUE ASSISTANCE SYSTEM**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Section includes requirements for rescue assistance system components including, but not limited to, the following:
 - 1. Master stations.
 - 2. Area stations.
 - 3. Controls, amplifiers, and terminal equipment.
 - 4. Power supplies.
 - 5. Wiring.

1.02 DEFINITIONS

- A. Refer to Section 27 05 03 - Communications General Requirements for definitions.

1.03 REFERENCE STANDARDS

- A. City of Chicago Building Code - Municipal Code of Chicago for the Building Industry; 2017.
- B. City of Chicago Electrical Code - National Electrical Code with Chicago Amendments; 2017.
- C. NFPA 70 - National Electrical Code; 2017.
- D. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Wiring diagrams, detailing wiring for power, signal, and control, differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminals to facilitate installation, operation and maintenance.
- C. Maintenance Data: For inclusion in Emergency, Operations, and Maintenance Manuals.
- D. Test Reports: Final copies of reports of startup and testing procedures.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who is a factory-authorized service representative to perform the work of this Section.
- B. Electrical Component Standard: Provide work complying with applicable requirements of City of Chicago Electrical Code.
- C. Pre-installation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

PART 2 - PRODUCTS

2.01 SYSTEM DESIGN

- A. General: Rescue assistance system shall be a multi-zone, central-control system, capable of accommodating up to twelve (12) stations in four zones. Quantity of master stations and remote stations shall be as indicated on the Drawings.
- B. Functional Performance: Components and system features and functions shall include, but are not limited to, the following:
 - 1. Pressing the "PUSH FOR HELP" button at any area station actuates a red light on the area station beside an engraved phrase "HELP REQUESTED" and sends a signal to the master station indicating the location of the call. An audible alarm will sound at both the area and master stations.
 - 2. System provides voice communication between area stations and master station. If person in rescue area cannot respond to voice communication from the master station, the "HELP COMING" light on the area station is automatically turned on by the response from the master station. Audible alarm signal shuts off at area and master station when master station responds to area station call.
 - 3. System shall be reset by keyed reset switch at area station and master station.
 - 4. Audible and visual circuit wiring shall be supervised.
- C. Coordinate system to operate in two (2) configuration modes.
 - 1. System shall always be on.
 - 2. System shall operate only when the fire alarm is initiated. (This mode avoids nuisance alarms by students walking by in stairwell).

2.02 SYSTEM REQUIREMENTS

- A. General: Provide complete and fully functional rescue assistance systems using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.
- B. Spares: Provide adequate capacity in equipment ratings, spare key or relay capacity, and spare terminal and cable conductor quantities to increase number of stations in the future by 50 percent above those indicated for the work of this project.

2.03 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - 1. Housing Devices, Inc.; www.housingdevices.com.
 - 2. Talk-A-Phone; www.talkaphone.com.
 - 3. Cornell Communications; www.cornell.com.
 - 4. Simplex Grinnell LP; a Tyco International Company; www.tycosimplexgrinnell.com.

2.04 REMOTE STATIONS

- A. Stainless Steel Remote Station:
 - 1. The remote call station shall be vandal resistant and have one momentary switch with LED and loudspeaker.
 - 2. The station shall have hands free voice communication with the annunciator.
 - 3. The station shall be flush wall mounted on a 2-gang stainless steel plate with large push button.
 - 4. The remote station shall contain an amber "call-placed" indicator and a red acknowledge indicator, a 3.5-inch 45ohm speaker and a cancel button on a stainless steel panel.
 - 5. Screw terminals shall be provided for wire connections.
 - 6. Stations must be mounted so the highest operable part or component is no higher than 48-inches off the finished floor.
 - 7. The push-button on each area station shall be heavy-duty stainless steel, vandal resistant, 3 inch in diameter, domed button. It shall be easy to push and shall not be obscured by other parts of the enclosure. The push-button shall have "Push for Help" lettering engraved in a contrasting color.

2.05 REMOTE CALL INDICATOR

- A. The remote call indicator shall contain a bulb with a translucent plastic cover mounted on a two gang, plastic faceplate.
- B. The white cover shall be removable without the use of tools and the bulb shall be bayonet mount to allow ease of bulb replacement.

2.06 REMOTE TONE LIGHT INDICATOR

- A. The remote tone light indicator shall contain a tone signaling device and a "call" indicator LED mounted on a single gang, ABS plastic faceplate.
- B. Wiring shall be via plug-in connector.
- C. Call indications shall be a steady LED and tone every eight (8) seconds.

2.07 CENTRAL AUDIO VISUAL ANNUNCIATOR UNIT

- A. The central annunciator unit shall contain an individual lamp/selector button corresponding to each calling location.
- B. Additionally it shall contain a tone signaling device, lamp test button, call and talk push buttons, a 3.5-inch 45ohm speaker and integral voice amplifier.
- C. Indicator lamps shall have removable lenses for lamp replacement and to protect lamp identification markings.
- D. Construction shall be of extruded aluminum or stainless steel with a metal flush mount wall housing and trim frame.
- E. Screw terminals shall be provided for wiring connections.
- F. An audible alarm shall be mounted on the Annunciator Panel which will emit a minimum sound level of 90db at 30cm when a remote station calls. Depressing the zone switch will answer a zone call and open the intercom line to the zone. The push to talk switch will initiate voice communication to the zone.

2.08 OPERATIONAL PLACARD

- A. The operation instructions shall be mounted adjacent to each remote station.

2.09 POWER SUPPLY/CONTROL UNIT

- A. The annunciator power supply/control unit shall consist of:
 1. 24VAC 30VA transformer.
 2. Power Supply, battery backup and control circuits.
 3. 12-inch x 12-inch swing door cabinet.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the rescue assistance system work.
- B. Notify Architect/Engineer of Record of conditions that would adversely affect installation or subsequent use.
- C. Proceed only after unsatisfactory conditions have been corrected. Commencement of work in this section will be an indication of the acceptance of substrate conditions and the Contractor will be held responsible for the satisfactory execution and results of the finished work.

3.02 INSTALLATION

- A. General: Install system in accordance with the City of Chicago Building Code and manufacturer's written instructions.
- B. Central Audio Visual Annunciator to be installed/located adjacent to the Fire Command Panel.
- C. Wiring Methods: Install wiring in a raceway system in accordance with Sections 26 05 33.13 - Conduit for Electrical Systems, 26 05 33.16 - Boxes for Electrical Systems, and 26 05 33.23 - Surface Raceways for Electrical Systems Raceways are to be concealed.
- D. Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.
- E. Control Circuit Wiring: Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.
- F. Provide physical isolation from each other for speaker-microphone, line-level, speaker-level, and power wiring. Run in separate raceways, or where in same enclosure, provide 12-inch minimum separation between conductors to speaker-microphones and adjacent parallel power and telephone wiring. Provide physical separation as recommended by equipment manufacturer for other rescue assistance system conductors.
- G. Splices, Taps, and Terminations: Make splices, taps and terminations on numbered terminal strips in junction, pull, and outlet boxes, terminal cabinets and equipment enclosures.
- H. Identification of Conductors and Cables: Use color-coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.

- I. Weatherproofing: Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.
- J. Repairs: Wherever walls, ceilings, floors, or other building finishes are cut for installation, those surfaces and materials shall be repaired, restored, and refinished in accordance with Section 01 73 29 - Cutting and Patching. The finished surface shall match adjacent surfaces, materials, textures, and finishes and shall have no visual evidence of repairs.

3.03 GROUNDING

- A. Provide equipment grounding connections for rescue assistance systems as indicated. Tighten connections to comply with tightening torques specified in UL 486A-486B to assure permanent and effective grounds.
- B. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

3.04 PROTECTION AND CLEANING

- A. Provide protective measures, in accordance with manufacturer's recommendations, during remainder of construction period to ensure that rescue assistance system components, including remote and central stations, will be free of damage at time of Preliminary Acceptance or Substantial Completion.
- B. Immediately prior to Preliminary Acceptance or Substantial Completion, remove temporary protective films and clean system components in accordance with manufacturer's instructions.

3.05 CONTRACTOR STARTUP AND REPORTING

- A. Pretesting: Upon completing installation of the system, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.
- B. Testing: Upon completion of pretesting, notify the Architect/Engineer of Record a minimum of ten (10) days in advance, of acceptance test performance schedule and conduct tests in his presence. Provide a written record of test results.
- C. Operational Test: Perform an operational system test to verify conformance of system to these Specifications.
- D. Inspection: Make observations to verify that units and controls are properly labeled, and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.
- E. Retesting: Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

3.06 DEMONSTRATION AND TRAINING

- A. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. Provide a minimum of three hours training.
- B. Schedule training with Owner through the Architect/Engineer of Record, with at least seven days advance notice.
- C. Occupancy Adjustments: When requested by the Architect/Engineer of Record within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, resetting matching transformer taps, and adjusting controls to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

END OF SECTION 28 26 09

SECTION 28 31 00

DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes Chicago Building Code compliant Class 1, zoned, non-coded, UL-certified, microprocessor-based, addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.
- B. Section Includes:
 - 1. Combination Fire-alarm and Sprinkler Supervisory Systems Control Unit and Annunciator
 - 2. Remote Annunciator
 - 3. Manual Fire-alarm Boxes
 - 4. System Smoke Detectors
 - 5. Duct Smoke Detectors
 - 6. Heat Detectors
 - 7. Speaker and Visual Notification Appliances
 - 8. Magnetic Door Holders
 - 9. Addressable Interface Devices
 - 10. Digital Alarm Communicator Transmitter
 - 11. Trouble Bell and Test Switch Stations
 - 12. Data Gathering Panels
 - 13. Power Supplies/Battery Power Backup System
- C. Related requirements:
 - 1. Section 01 40 00 "Quality Requirements"
 - 2. Section 0178 23 "Operation and Maintenance Data"
 - 3. Section 01 73 00 "Execution"
 - 4. Section 01 78 39 "Project Record Documents"
 - 5. Section 08 71 00 "Door Hardware"
 - 6. Section 21 05 23 "General Duty Valves for Fire Protection Piping"
 - 7. Section 26 05 33 "Identification for Electrical Systems"

1.3 REFERENCES

- A. City of Chicago Building Code

- B. Chicago Electrical Code
- C. NFPA 72 National Fire Alarm and Signaling Code, 2016 Edition
- D. NICET: National Institute for Certification in Engineering Technologies
- E. UL 464 Standard for Safety Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
- F. UL 521 Standard for Heat Detectors for Fire Protective Signaling Systems
- G. UL 864 Standard for Control Units and Accessories for Fire Alarm System

1.4 DEFINITIONS

- A. Definitions in NFPA 72 apply to Fire Alarm Terms used in this Section
- B. AHJ: Authority having Jurisdiction
- C. CCBC: City of Chicago Building Code
- D. FAA: Fire Alarm Annunciator Panel
- E. FCP: Fire Alarm Control Panel
- F. NAC: Notification Appliances Circuit
- G. IAC: Initiating Appliances Circuit
- H. SLC: Signaling Line Circuit
- I. CBT: City Fire Alarm Box Tie and Disconnect Panel
- J. LED: Light-Emitting Diode
- K. EEPROM: Electrically Erasable Programmable Read-Only Memory

1.5 SYSTEM DESCRIPTION

- A. Noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.
- B. This hybrid system shall be designed to combine the operational requirements of CCBC for standard Class I and residential occupancy class A-2 fire detection system, sprinkler supervisory system and ADA complaint fire detection and voice communication system.
- C. Supervisory sprinkler system shall be of the addressable type and shall be separately identified at the fire alarm control panel and remote annunciator.

- D. Two channel one-way voice system shall provide general alarm transmission over the speakers and support multiplexed signal transmission and survivable network nodes as required by CCBC.

1.6 SUBMITTALS

A. General Submittal Requirements:

- 1. All submittals shall be approved by AHJ prior to the beginning of any work.
- 2. Shop Drawings shall be prepared by person with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified fire-alarm technician, Level III minimum.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

D. Submission to AHJ: Submit detailed shop drawings in accordance with the AHJs procedures and requirements for the fire alarm plan review. Provide identical submittal to the Architect for review. Upon receipt of the comments from AHJ, submit a copy of all the annotated drawings or correction sheets to the Architect. Incorporate all comments into the detailed shop drawings and resubmit to AHJ until approval is obtained.

- 1. Include voltage drop calculations for notification appliance circuits.
- 2. Include battery-size calculations.
- 3. Include performance parameters and installation details for each type of detector, verifying that each type of detectors is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
- 4. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations
- 5. Include notification system service equipment layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
- 6. Format of the written sequence of operation shall be input/output matrix, no other formats will be reviewed.
- 7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.
- 8. Include device addresses list with the location labeling as they will appear in the display of fire alarm control panel and annunciator. Coordinate with final system programming.
- 9. Include detailed elevation showing control panels and annunciator panels' layout and dimensions. Coordinate with architectural floor plan and indicate compliance with restricted mounting location. Show coordination with all panels and devices in that location.

E. Qualification Data: For qualified Installer.

- F. Field quality-control reports.
- G. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data", include the following:
 - 1. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
 - 2. Record copy of site-specific software.
 - 3. "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
 - a. Frequency of testing of installed components.
 - b. Frequency of inspection of installed components.
 - c. Requirements and recommendations related to results of maintenance.
 - d. Manufacturer's user training manuals.
 - e. Manufacturer's required maintenance related to system warranty requirements.
 - f. Abbreviated operating instructions for mounting at fire-alarm control unit.
- H. Software and Firmware Operational Documentation.
 - 1. Provide the following:
 - a. Software operating and upgrade manuals.
 - b. Program Software Backup: On magnetic media or compact disk, complete with data files.
 - c. Device address list.
 - d. Printout of software application and graphic screens.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.
- B. The installer shall be regularly engaged in the design, installation, testing and servicing of fire detection and alarm notification system and provide evidence of at least five years of relevant experience.
- D. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system panels and devices from single source from single manufacturer.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in the Chicago Electrical Code, Art. 100, by a qualified testing agency, and marked for intended location and application.
- F. Comply with CCBC, latest Edition.
- G. Comply with Chicago Electrical Code.
- H. Comply with NFPA 72, 2016 Edition.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by the OWNER or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
 - 1. Notify the OWNER no fewer than seven days in advance of proposed interruption of fire-alarm service.
 - 2. Do not proceed with interruption of fire-alarm service without the OWNER's written permission.

1.9 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.
- B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.10 MAINTENANCE SERVICE

- A. Maintenance Service Contract: Provide maintenance of fire alarm systems and equipment for a period of 12 months commencing with Substantial Completion, using factory-authorized service representatives.
 - 1. Basic services: Respond to service calls within 24 hours of notification of system trouble. Adjust and replace defective parts and components with original manufacturer's replacement parts, components, and supplies.
 - 2. Additional Services:
 - a. Perform services within the above 12-month period not classified as routine maintenance or as warranty work when authorized in writing.
 - b. Compensation for additional services must be agreed upon in writing prior to performing services.
 - c. Provide in the 11th month of the 12 months commencing with Substantial Completion a Test, Inspect and Report of the fire alarm system.
 - 3. Renewal of Maintenance Service Contract: No later than 60 days prior to the expiration of the 1 Year System Warranty contract, deliver to the OWNER a proposal to provide contract maintenance and repair services for an additional two-year term which includes labor rates for Year 2 and 3 of Warranty Period. The OWNER will be under no obligation to accept maintenance service contract renewal proposal.

1.11 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.

- B. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 - 1. Provide 30 days' notice to the OWNER to allow scheduling and access to system and to allow the OWNER to upgrade computer equipment if necessary.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fire alarm system equipment and devices in original factory shipping cartons.
- B. Handle fire alarm system equipment and devices to avoid damage.
- C. Store fire alarm system equipment and devices indoors in clean, dry space with uniform temperature to prevent condensation. Protect fire alarm system equipment and devices from exposure to dirt, fumes, water, corrosive substances, and physical damage.
- D. If stored in areas subject to weather, cover fire alarm system equipment and devices to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packaging and flammable materials; install electric heating of sufficient wattage to prevent condensation.
- E. Install plastic covers on smoke detectors to protect from construction dust and debris. Remove covers only before final system testing.

1.13 WARRANTY

- A. Warranty all materials, installation and workmanship for three (3) years from date of acceptance, unless otherwise specified. Provide a copy of the manufacturers' warranty with closeout documentation the operation and installation manuals as required in Section 01 78 39 Project Record Documents, and Section 01 78 23 Operation and Maintenance Data.
- B. The System Supplier shall maintain a service organization with adequate spare parts stock within 50 miles of the installation. Any defects that render the system inoperative shall be repaired within 24 hours of the OWNER notifying the contractor.

1.14 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no less than 1 unit.
 - 2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no less than 1 unit.

3. Detectors: Quantity equal to 10 percent of amount of each type installed, but no less than 1 unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no less than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamper proofed components.
6. Speaker and Visual Notification Appliances: One percent of each type installed, but not less than 1 unit of each type.
7. Fuses: Two of each type installed in the system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Gamewell; a Honeywell Company
 2. EDWARDS / KIDDE Fire Protection Systems
 3. NOTIFIER; a Honeywell Company
 4. Siemens Building Technologies, Inc.; Fire Safety Division
 5. SimplexGrinnell LP; a Tyco International Company

2.2 SYSTEM OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
 1. Manual Stations
 2. Heat Detectors
 3. Smoke Detectors
 4. Manual Fire Alarm Boxes
 5. Pre-action Fire Protection System Activation
 6. Automatic Sprinkler System Water Flow
 7. Fire-Extinguishing System Operation
 8. Fire Standpipe System
 9. Fire Pump Running
- B. Fire-alarm signal shall initiate the following actions:
 1. Activate visual and audible voice signaling devices on selected levels/areas:
 - a. Strobes shall flash in all areas of the floor. All strobes shall be synchronized.
 - b. Activate system speakers and visual devices in residential units on selected levels.
 - c. Voice Communications Systems – activate Audio Channel One.
 - d. Voice Communications Manual Voice Paging Operation: Manual selection of Audio Speaker Selector Switch for floor(s) or All Call, and microphone 'Push-To-Talk' switch shall activate Audio Channel Two.
 2. Transmit an alarm signal to the remote alarm receiving station and to fire department.

3. Unlock electric door locks in designated egress paths.
 4. Release fire and smoke doors held open by magnetic door holders.
 5. Transmit signal to the Building Automation System to switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 6. Recall elevators to primary or alternate recall floors.
 7. Activate emergency lighting control.
 8. Switch local audio systems into emergency mode.
 9. Activate emergency shutoffs for gas and fuel supplies.
 10. Record events in the system memory.
 11. Indicate actuated alarm initiating device type, location and address at the local fire alarm control panel.
 12. Indicate actuated alarm zone(s) on the fire alarm panel and fire alarm annunciator.
- C. Supervisory signal initiation on FCP shall be by one or more of the following devices and actions:
1. Duct smoke detectors.
 2. Water flow switch associated with sprinkler head in elevator pit.
 3. Valve supervisory switch.
 4. Low-air-pressure switch of a dry-pipe sprinkler system.
 5. Fire-pump power failure, including a dead-phase or phase-reversal condition.
- D. System trouble signal initiation on FCP shall be by one or more of the following devices and actions:
1. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 2. Loss of primary power at control unit.
 3. Ground or a single break in control unit internal circuits.
 4. Abnormal ac voltage at control unit.
 5. Break in standby battery circuitry.
 6. Failure of battery charging.
 7. Abnormal position of any switch at control unit or annunciator.
 8. Open circuits, shorts, and grounds in designated circuits.
- E. System pathways survivability:
1. Comply with Chicago Electrical Code, art. 760.
 2. Comply with NFPA 72.
 3. Initiating Device Circuits: Class B.
 4. Addressable Loop Signaling Line Circuits: Class A.
 - a. Provide isolator module every 15 devices.
 - b. Provide minimum one (1) addressable loop per floor.
 5. Signaling Line Circuit (Network Data, Panels and Annunciators, both: initiating devices and notification appliances): Class X, Level 2.
 6. Notification Appliance: Circuits: Class B.
 7. Door holder Circuit: Class D.
 8. Install no more than 50 addressable devices on each signaling line circuit.

- F. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators.
- G. Priority of Signals: Automatic response functions shall be accomplished by the first zone initiated:
 - 1. Alarm functions resulting from initiation by the first zone shall not be altered by subsequent alarms.
 - 2. An alarm signal shall be the highest priority.
 - 3. Supervisory or trouble signals shall have second- and third-level priority.
 - 4. Signals of a higher-level priority shall take precedence over signals of lower priority even though the lower priority condition occurred first.
 - 5. Annunciate all alarm signals regardless of priority or order received.
- H. Noninterfering Signals: Signal on one zone does not prevent the receipt of signals from any other zone:
 - 1. All zones shall be manually resettable from the FCP after the initiating device or devices have been restored to normal.
 - 2. Systems that require the use of batteries or battery backup for the programming function are not acceptable.
- I. Voice /Alarm One Way communication system: For the purpose of occupant notification, this system shall be dual (2) Channel audio voice communication systems.
 - 1. The voice channels shall be designed as follows:
 - a. Channel One - Coded General Alarm Message.
 - b. Channel Two –Voice Message.
 - 2. Voice Communications Manual Voice Paging Operation: Manual selection of Audio Speaker Selector Switch for floor(s) or All Call, and microphone 'Push-To-Talk' switch.
 - 3. Audio One-Way Voice Communications
 - a. The voice communication system shall be dual (2) channel audio evacuation systems, to allow the ability to have eight simultaneous announcements/paging. The audio channels shall be designated as such:
 - 1) Continuous Evacuation tone/General Alarm Tone subject to approval by AHJ.
 - 2) Manual Paging.
 - b. The system custom digital voice message shall provide a minimum of 100 minutes.
 - c. System shall be configured to allow for "All Call" and selective voice paging from the main FCP and FAA.
 - d. Status Annunciator: Indicate the status of various voice/alarm speaker zones.
 - e. Provide as minimum one thirty (20) watt supervised audio amplifier per paging zone.
 - f. The system shall be UL 464 listed Audio Evacuation System, end-to-end compliant with requirement for 520Hz Low frequency Tone. This includes the nodes, amplifiers and high-fidelity speakers.
 - g. The system shall be using high-fidelity speakers with the following selectable sound performance levels: 81, 84, 87 and 90 dBA at 10 feet.

- h. The amplifier circuits shall be sized at 1 watt per speaker, plus 25% spare capacity.
- i. Speaker and strobe circuits shall be zoned by floor or as noted on plans, with isolating module on each circuit.
- j. Audio evacuation system supervision:
 - 1) Each speaker zone, amplifier, preamplifier, and power supply shall be supervised for component or circuit failure.
 - 2) Detection of amplifier failure shall activate trouble light and audible signal at console and initiate trouble alarm on fire alarm system.
 - 3) Provide minimum of 1 circuit for each zone or area of distinct communication.

J. Elevator Recall:

- 1. Smoke detectors at the following locations shall initiate automatic elevator recall.
 - a. Elevator lobby detectors except the lobby detector on the designated floor.
 - b. Smoke detector in elevator machine room or in the shaft located at the elevator controller when machine room less elevator is utilized.
 - c. Water-flow switch associated with the sprinkler in the elevator pit.
- 2. The elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
- 3. Floor elevator lobby smoke detector shall cause the cars to move to the alternate recall floor.
- 4. Emergency recall operation shall notify the remote supervising station and Fire Department. It shall be annunciated at FAA.
- 5. Elevator recall system shall comply with the City of Chicago Building Code.

K. Fire Doors Interface: Provide addressable relay module controlled by smoke detectors at doors in fire barrier walls. Connect to fire-alarm system to release shutter in case of fire alarm.

L. Door Controls: Door hold-open devices shall be controlled by adjacent smoke detectors communicating with the fire-alarm system.

- 1. Architectural Hardware Supplier shall supply door hold open devices. Provide fire alarm relay contacts or modules.
- 2. Magnetic door holders shall not be served by battery power. Magnetic door holders shall be supplied from the FCP at 120 to 24 volts and shall be released on the failure of primary power.

2.3 FIRE ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

- 1. City of Chicago approved.
- 2. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

- a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
 - b. Include a real-time clock for time annotation of events on the event recorder and printer.
 3. Addressable initiation devices that communicate device identity and status.
 - a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
 - b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
 4. Addressable control circuits for operation of mechanical equipment.
- B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
 1. Annunciator and Display: Liquid-crystal type, 2 line(s) of 80 characters, minimum:
 2. Approved for use in City of Chicago.
 3. Features:
 - a. Local alarm/trouble sounders.
 - b. Light emitting diode annunciator for the display of the following system operating parameters:
 - c. System AC power normal.
 - d. System Alarm condition.
 - e. System Supervisory condition.
 - f. System Trouble condition.
 - g. Alarm silence.
 4. Keypad: Full key operated alpha-numeric keypad. Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.
 5. Control keys for the following functions:
 - a. Alarm/Trouble Acknowledgement
 - b. Local alarm Silence
 - c. System Reset
 - d. Lamp Test
- C. Sprinkler Supervisory System Supervision:
 1. Each waterflow switch and associated tamper switch shall be assigned to a separate annunciator zone.
 2. Each high/low air pressure supervisory switch shall be assigned to a separate annunciator zone.
 3. Each waterflow switch shall be assigned to a separate annunciator zone.

4. Each high/low air pressure supervisory switch shall be assigned to a separate annunciator zone.
 5. Valve tamper switches shall be assigned to separate annunciator zones as scheduled.
 6. Refer to the fire protection drawings for quantity and location of waterflow switches and tamper switches. The waterflow switches and tamper switches are furnished and installed under Section 21 05 23 General Duty Valves for Fire Protection Piping.
- D. Fire Pump Supervision: Provide status indication for:
1. Power failure.
 2. Pump running.
 3. Phase reversal.
- E. Cabinet: Lockable steel enclosure:
1. Arrange panel so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure.
 2. If more than a single unit is required to form a complete control panel, provide matching modular unit enclosures.
 3. Size cabinets to accommodate all components and to allow ample gutter space for interconnection of panels as well as field wiring.
 4. Identify each enclosure, each component and module by an engraved red laminated phenolic resin nameplate with not be less than 1-inch high lettering.
 5. Provide spare space for 20% of future expansion.
- F. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory and print out the final adjusted values on system printer.
- G. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a UL listed Central Station via two dedicated telephone lines, utilizing digital alarm communicator transmitter.
- H. Audio Notification: Operation pattern shall be as directed by the City of Chicago Bureau of Fire Prevention.
- I. Silencing at control panel: Switches shall provide capability for acknowledgment of alarm; supervisory, trouble, and other specified signals at the FCP; and capability to silence the local audible signal and light an LED (light emitting diode). Subsequent zone alarms shall cause the audible signal to sound again until silenced in turn by switch operation. Restoration to normal of alarm, supervisory, and trouble conditions shall extinguish the associated LED and cause the audible signal to sound again until the restoration is acknowledged by switch operation
- J. Primary Power: 24-V dc obtained from 120-V ac service that is to be connected to the building source of the emergency power and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals and digital alarm communicator transmitter shall be powered by 24-V dc source.

1. Alarm current draw of entire fire alarm system shall not exceed 80 percent of the power-supply module rating.
- K. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
- L. Automatic Transfer Switch: Transfer the load to the battery without loss of signals or status indications in the event of failure of primary power.
- M. Batteries: Sealed lead acid. Provide sufficient capacity to operate the complete system in normal or supervisory (nonalarm) mode for a period of 24 hours. Following this period of operation on battery power, the batteries shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 15 minutes.
- N. Battery Charger: Solid state, fully automatic, variable charging rate type. Provide for 150 percent of the connected system load while maintaining the batteries at full charge. In the event batteries are fully discharged the charger shall recharge them fully within four hours. Charger output shall be supervised as part of system power supply supervision.
- O. Surge Protection:
 1. Install surge protectors recommended by control panel manufacturer. Install on all system wiring external to the building housing the control panel.
- P. Independent Systems: Alarm and supervisory systems in FCP shall be completely separate and independent. The alarm initiating zone boards in the FCP shall consist of plug-in cards. Construction requiring removal of field wiring for module removal is not acceptable.
- Q. Control Modules: Types and capacities to perform all functions of the fire alarm system. Provide local, visible, and audible signals to notify of any alarm, supervisory, and trouble condition. Provide each type of audible alarm with a distinctly different sound.
- R. Indicating Lights: Provide individual LED devices for each zone. Provide an LED test switch for each FCP section that will illuminate all LED devices on that section of the control panel. Provide manual toggle test switches or push test-buttons that do not require a key to operate. Alarm and supervisory signals shall light a red LED of the associated zone. Trouble signals shall light an amber LED for the associated zone.
- S. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions
- T. Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm or trouble condition on the system still exists.
- U. Addressable monitor and control points may be combined into logical groups or lists (in software) to the extent that such grouping does not detract from the required operation of the system, including resounding of signals subsequent to actuation of the signal silence switch.

Systems which treat logical groups like hardwired/zones with respect to alarm/trouble resound are not acceptable.

2.4 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type.
3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
6. When system smoke detector in the residential unit goes into alarm, all detectors in the same unit go into alarm. Supervisory signal is transmitted to FACP and displayed on FAA.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status (normal, alarm or status).
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
3. One form C auxiliary alarm relay rated at 2 amps @ 30Vdc.
4. Sample tube can be installed with or without the cover plate and be rotated in 45-degree increments to ensure proper alignment with duct airflow.

5. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector. Provide heated enclosure if duct detector is exposed to temperature below 32 Degrees F.
6. Each sensor shall have multiple levels of detection sensitivity.
7. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
8. Remote test station with alarm LED light key switch.
9. Cleaning of sampling tubes: access through duct housings front cover.

D. Combination Carbon Monoxide and Smoke Detectors:

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
3. Automatically adjusts its sensitivity by means of drift compensation and smoothing algorithms. The detector shall send trouble alarm if it is incapable of compensating for existing conditions.
4. Test button tests all sensors in the detector.
5. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present sensitivity selected.
 - d. Sensor range (normal, dirty, etc.).
6. Sensors: The detector shall be comprised of four sensing elements including a smoke sensor, a carbon monoxide sensor, an infrared sensor, and a heat sensor.
 - a. Smoke sensor shall be photoelectric type as described in "System Smoke Detectors" Article.
 - b. Carbon monoxide sensor shall be as described in "Carbon Monoxide Detectors" Article.
 - c. Heat sensor shall be as described in "Heat Detectors" Article.
 - d. Each sensor shall be separately listed according to requirements for its detector type.

2.5 NONSYSTEM SMOKE DETECTORS

A. General Requirements for Nonsystem Smoke Detectors:

1. Nonsystem smoke detectors shall be listed as compatible with the fire-alarm equipment installed or shall have a contact closure interface listed for the connected load.
2. Nonsystem smoke detectors shall meet the monitoring for integrity requirements in NFPA 72.
3. When non-system smoke detector in the residential unit goes into alarm, all detectors in the same unit go into alarm.

B. Single-Station Smoke Detectors:

1. Comply with UL 217; suitable for NFPA 101.
2. Operating at 120-V ac with 9-V dc battery as the secondary power source. Provide with "low" or "missing" battery chirping-sound device.
3. Auxiliary Relays: One Form A and C, both rated at 0.5 A.
4. Integral Audible Notification Appliance: Piezoelectric sounder generating low frequency tone 520 kHz with a sound level of at least 5 dB above the maximum sound level having a duration at least 60 sec. or a sound level of at least 75 dB, whichever is greater measurable at the pillow level in the respective area.
5. UL 464 listed.
6. Visible Notification Appliance: 177-cd strobe.
7. Heat sensor, 135 deg F (57 deg C) combination rate-of-rise and fixed temperature.
8. Test Switch: Push to test; simulates smoke at rated obscuration.
9. Tandem Connection: Allow tandem connection of number of indicated detectors; alarm on one detector shall actuate notification on all connected detectors.
10. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
11. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
12. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

C. Single-station combination smoke and carbon monoxide detectors:

1. Sensors: The detector shall be comprised of four sensing elements including a smoke sensor, a carbon monoxide sensor, an infrared sensor, and a heat sensor.
 - a. Smoke sensor shall be photoelectric type as described in "System Smoke Detectors" Article.
 - b. Carbon monoxide sensor shall be as described in "Carbon Monoxide Detectors" Article.
 - c. Each sensor shall be separately listed according to requirements for its detector type.
2. Automatically adjusts its sensitivity by means of drift compensation and smoothing algorithms. The detector shall send trouble alarm if it is incapable of compensating for existing conditions.
3. Test button tests all sensors in the detector.

2.6 SYSTEM HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.
 - 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.7 SYSTEM CARBON MONOXIDE DETECTORS

- A. General: Carbon monoxide detector listed for connection to fire-alarm system.
 - 1. Mounting: Adapter plate for outlet box mounting.
 - 2. Testable by introducing test carbon monoxide into the sensing cell.
 - 3. Detector shall provide alarm contacts and trouble contacts.
 - 4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
 - 5. Comply with UL 2075.
 - 6. Locate, mount, and wire according to manufacturer's written instructions.
 - 7. Provide means for addressable connection to fire-alarm system.
 - 8. Test button simulates an alarm condition.

2.8 MANUAL FIRE ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
- B. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
- C. Station Reset: Key-operated switch.
- D. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
- E. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.9 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated on drawings and with screw terminals for system connections.
 - 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

- B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
 - 1. Horns shall be field configurable for continuous, temporal, or march time pattern.
 - 2. All horns operation shall be synchronized.

- C. Voice/Tone Notification Appliances:
 - 1. Comply with UL 1480.
 - 2. Speakers for Voice Notification: Locate speakers for voice notification to support the intelligibility requirements of the "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
 - 3. High-Range Units: Rated 2 to 15 W.
 - 4. Low-Range Units: Rated 1 to 2 W.
 - 5. Mounting: Flush or surface mounted as required by field conditions.
 - 6. Matching Transformers: Tap range matched to acoustical environment of speaker location.
 - 7. Notification appliances in residential units and elsewhere indicated in contract documents shall be able to generate low frequency tone 520 kHz with a sound level of at least 5 dB above the maximum sound level having a duration at least 60 sec. or a sound level of at least 75 dB, whichever is greater measurable at the pillow level in the respective area.

- D. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
 - 1. Rated Light Output: 15/30/75/110 cd, selectable in the field.
 - 2. Visible notification appliances in residential units and elsewhere indicated in contract documents: 177 cd.
 - 3. Mounting: Wall mounted unless otherwise indicated.
 - 4. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 - 5. Flashing shall be in a temporal pattern, synchronized with other units.
 - 6. Strobe Leads: Factory connected to screw terminals.
 - 7. Mounting Faceplate: Factory finished, red.
 - 8. Strobe circuit loading shall be calculated at 75cd tap for all devices, except in mechanical, interstitial spaces where circuit loading shall be calculated at 110 cd tap.
 - 9. All strobes operation shall be synchronized.

- E. Trouble Bells: Electric-vibrating, 4-inch diameter, 24-V dc, under-dome type; with provision for housing the operating mechanism behind the bell. Bells shall produce a sound-pressure level of 94 dBA, measured 10 feet from the bell. Provide weatherproof enclosure where indicated.

2.10 MAGNETIC DOOR HOLDERS

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc.
4. Rating: 120-V ac.

a. Material and Finish: Match door hardware.

2.11 FAULT ISOLATOR MODULE

- A. Provide Fault Isolator Module (FIM) on initiating device circuits for each 25 devices on a loop
- B. Fault Isolator Module shall:
 1. Automatically re-connect isolated section of loop upon correction of fault conditions.
 2. Not require any address setting
 3. Operations shall be totally automatic. It shall not be necessary to replace or reset FIM after its normal operation.
 4. Include LED, which shall flash under normal operation and illuminate steady to indicate short circuit.

2.12 REMOTE ANNUNCIATORS:

- A. Description: Annunciator functions shall match those of fire alarm control units for alarm, supervisory, and trouble indications. Annunciators shall be in flush-mounted cabinets.
- B. Annunciator shall be as approved by the City of Chicago Fire Prevention Bureau:
 1. Provide 80-character liquid crystal display.
 2. Provide LED indicating lights for zone and signal annunciation.
 3. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire alarm control unit.
 4. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.13 ADDRESSABLE INTERFACE DEVICE

- A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- B. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall.

2.14 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Transmitter in this article is compatible with most central-station receiving equipment but verify specific compatibility and acceptability of this signal-transmission method for each project. Coordinate for availability of dual dedicated telephone lines.

- B. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.
- C. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.
- D. Local functions and display at the digital alarm communicator transmitter shall include the following:
 - 1. Verification that both telephone lines are available.
 - 2. Programming device.
 - 3. LED display.
 - 4. Manual test report function and manual transmission clear indication.
 - 5. Communications failure with the central station or fire-alarm control unit.
- E. Digital data transmission shall include the following:
 - 1. Address of the alarm-initiating device.
 - 2. Address and Zone of the supervisory signal.
 - 3. Loss of ac supply or loss of power.
 - 4. Low battery.
 - 5. Abnormal test signal.
 - 6. Communication bus failure.
- F. Secondary Power: Integral rechargeable battery and automatic charger.
- G. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.15 ELEVATOR INTERFACE CABINET

- A. Lockable continuous hinge cover, UL listed red metal cabinet enclosure with dual screw barrier terminal strips for each interface point.
- B. Provide word FIRE in white letters on the cover.
- C. Include tamper switch to be monitored by the fire alarm systems.
- D. Include the following:
 - 1. Three intelligent relays (Primary Recall, Alternate Recall, Fire Hat).
- E. Label all the relays and input modules for the function.
- F. Provide separate interface cabinet for each elevator.

2.16 SPRINKLER SYSTEM AND DUCT SMOKE DETECTORS REMOTE INDICATORS

- A. Remote status and alarm indicator and test stations, with LED indicating lights. Light shall flash when the associated device is in an alarm or trouble mode. Lamp is flush mounted in a single-gang wall plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the valve is located. The identification plate also designates protected spaces downstream from the water-flow switch.

2.17 DEVICE GUARDS

- A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
 - 1. Factory fabricated and furnished by manufacturer of device.
 - 2. Finish: Paint of color to match the protected device.

2.18 WIRE AND CABLE

- A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with Chicago Electrical Code.
- B. Signaling Line Circuits: Twisted, shielded pair, not less than No. 14 AWG, size as recommended by system manufacturer.
- C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
 - 1. Low-Voltage Circuits: No. 14 AWG, minimum.
 - 2. Line-Voltage Circuits: No. 12 AWG, minimum.

2.19 SPARE CAPACITY

- A. Provide 20% spare capacity in all panels, annunciators, on every SLC and NAC for future expansion.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with City of Chicago Building Code and NFPA 72 for installation of fire-alarm equipment.
- B. Equipment Mounting: Mount fire-alarm control unit on the wall with bottoms of the cabinets not lower than 18 inches and tops of cabinets not more than 72 inches above the finished floor.
 - 1. Connect new equipment to existing control panel in existing part of the building.

2. Connect new equipment to existing monitoring equipment at the supervising station.
3. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control and monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
4. Smooth ceiling spacing shall not exceed 30 feet.
5. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to NFPA 72.
6. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
7. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.
8. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
9. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
10. Audible Alarm-Indicating Devices: Install not lower than 96" above finished floor and not less than 6 inches below the ceiling to the bottom of device. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
11. Visible Alarm-Indicating Devices and Combination Audio/Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and not lower than 80" above finished floor and not less than 6 inches below the ceiling to the bottom of device.
Manual Stations
12. Operable part of manual stations shall be installed 48" above finished floor to the top of the device.
13. Install in unobstructed locations and within 5 feet from the doors where indicated on floor plans.
14. For surface mounting, use manufacture-supplied backboxes and trim plates.
15. Mark each device with its circuit number.
16. Device Location-Indicating Lights: Locate in public space near the device they monitor.
17. FCP and Annunciator: Install with top of panel not more than 72 inches above the finished floor.

3.2 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 08 71 00 "Door Hardware". Connect hardware and devices to fire-alarm system.
 1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
3. Smoke dampers in air ducts of designated air-conditioning duct systems.
4. Alarm-initiating connection to elevator recall system and components.
5. Alarm-initiating connection to activate emergency lighting control.
6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
7. Supervisory connections at valve supervisory switches.
8. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
9. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
10. Supervisory connections at fire-pump engine control panel.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 33 "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by Architect and AHJ.
- B. Perform tests and inspections. Comply with requirements of AHJ.
 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
 - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

3. Initial test shall be performed in compliance with procedures established by AHJ and in presence of representatives of both City of Chicago Bureau of Fire Prevention and Electrical Inspection. Contractor shall schedule and pay all applicable fees and coordinate testing.
 4. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 5. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 6. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 7. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- D. See Section 01 40 00 "Quality Requirements", for retesting and re-inspecting requirements and Section 01 73 00 "Execution", for requirements for correcting the Work.
- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.
- H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.
- 3.6 DEMONSTRATION
- A. Train the OWNER's maintenance personnel for a minimum of 2 hour on site training to adjust, operate, and maintain fire-alarm system.

END OF SECTION

GENERAL NOTES — REFLECTED CEILING PLAN

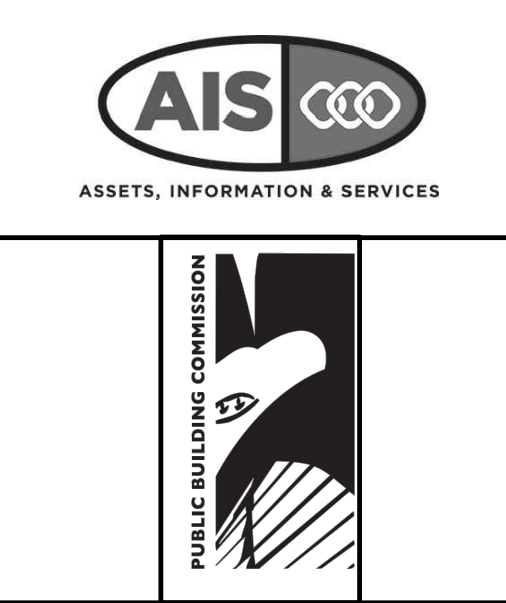
DIMENSIONS FOR REFERENCE ONLY. VERIFY ALL DIMENSIONS AND AREA QUANTITIES IN WORK PRIOR TO INITIAL WORK.

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- ALL CEILING ANNOTATIONS ARE BASED UPON CURSORY REVIEW AND ARE NOT FINAL. CONTRACTOR SHALL VERIFY THOSE ANNOTATIONS AND FIXTURES.
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Environmental Notes
 WARNING: ASBESTOS CONTAINING BUILDING MATERIALS ARE OR MAY BE PRESENT IN THIS BUILDING. NO PERSON MAY DISTURB ASBESTOS CONTAINING MATERIALS UNLESS THAT PERSON IS A LICENSED ASBESTOS ABATEMENT WORKER OR CONDUCTS SUCH WORK IN ACCORDANCE WITH PROJECT SPECIFICATIONS CONTAINING IN THE PROJECT DOCUMENTS AND IN COMPLIANCE WITH THE APPLICABLE REGULATIONS.

LEAD-BASED PAINT MAY BE PRESENT WITHIN THE BUILDING. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO TAKE APPROPRIATE SAFETY MEASURES IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL RULES AND REGULATIONS INCLUDING OSHA (1926.62) COMPLIANCE, WASTE CHARACTERIZATION AND WASTE DISPOSAL. ALL WORK WITH SURFACES CONTAINING LEAD-BASED PAINT SHALL BE DONE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.

Professional Stamp



1819 W. PERSHING RENOVATION
 1819 W PERSHING ROAD
 CHICAGO, ILLINOIS 60609
 PUBLIC BUILDING COMMISSION OF CHICAGO
 CITY OF CHICAGO, MAYOR LORI LIGHTFOOT

Architect of Record:
HARDING MODE JOINT VENTURE

224 SOUTH MICHIGAN AVE
 SUITE 245
 CHICAGO, ILLINOIS 60604
 312.922.2600 T
 312.922.8222 F
 www.harding.com
 www.modearchitectspc.com

CCJM ENGINEERS
 303 East Wacker Drive, Suite 303
 Chicago, IL 60601
 MEPP Engineers of Record

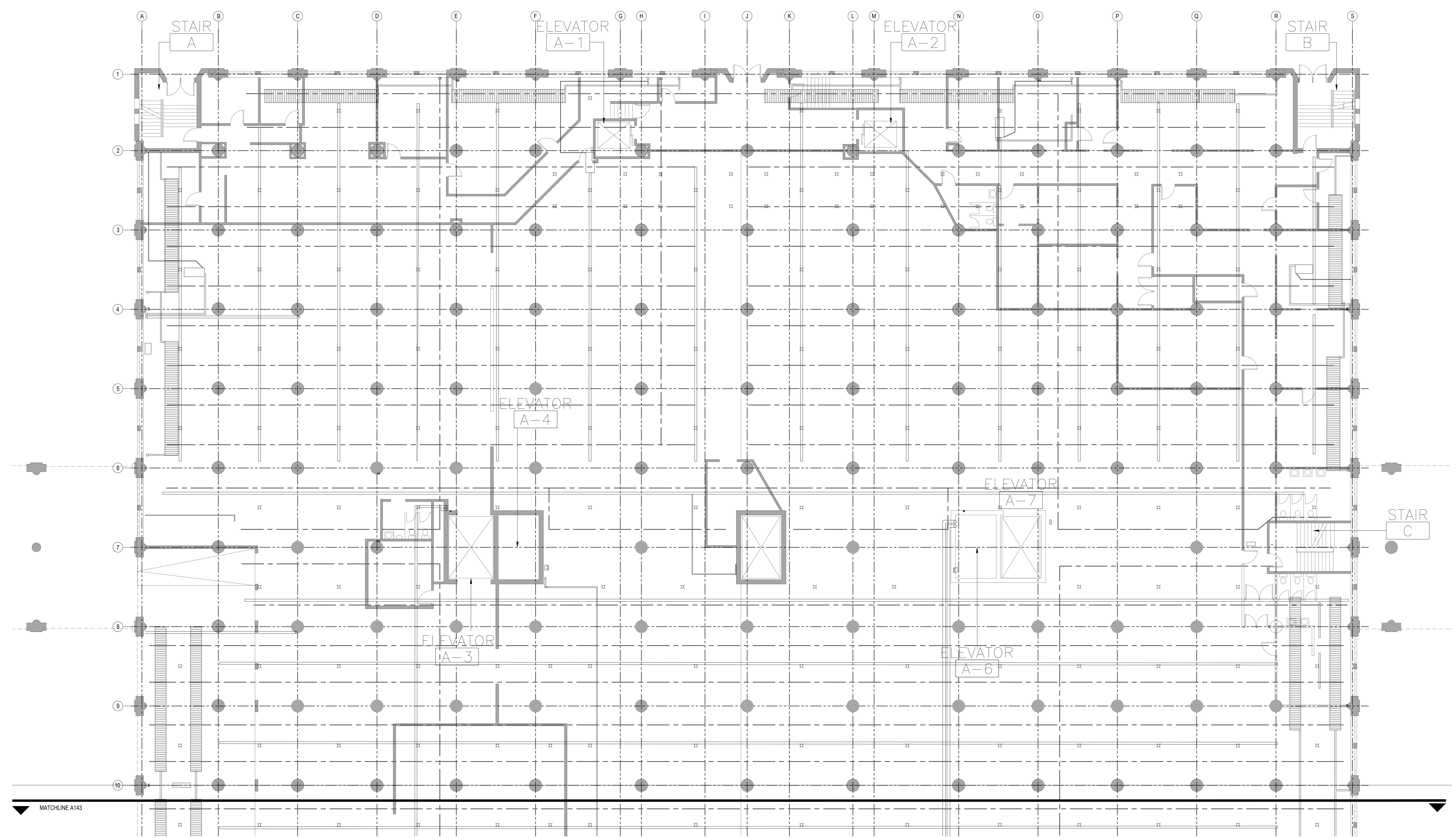
CEAA STRUCTURAL ENGINEERS
 175 North Franklin Street, Suite 410
 Chicago, IL 60606
 Structural Engineers of Record

TERRA ENGINEERING
 225 W Ohio Street, 4th Floor
 Chicago, IL 60606
 Civil Engineers of Record

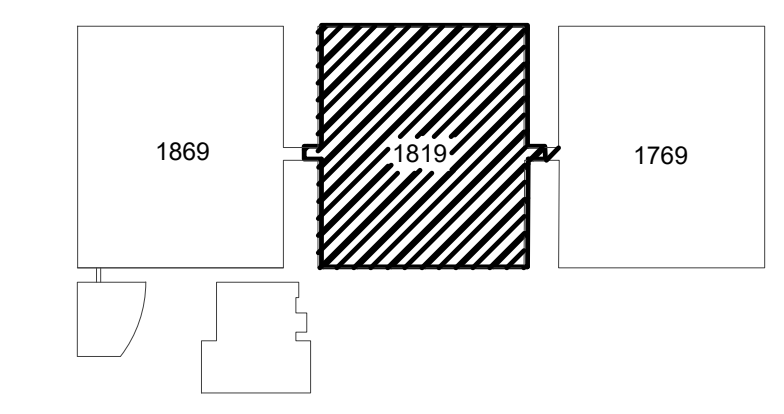
Mark	Description	Date
	ISSUE FOR BID	10/25/22
▲	ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No.:
 Project No.: #04026
 Title:
FIRST FLOOR REFLECTED CEILING PLAN - UNIT A

Sheet
A142



1 REFLECTED CEILING PLAN 1ST FLOOR
 1/8" = 1'-0"



GENERAL NOTES — REFLECTED CEILING PLAN

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 1819 W PERSHING ROAD
 CHICAGO, ILLINOIS 60609
 PUBLIC BUILDING COMMISSION OF CHICAGO
 CITY OF CHICAGO, MAYOR LORI LIGHTFOOT

Architect of Record:
HARDING MODE JOINT VENTURE

224 SOUTH MICHIGAN AVE
 SUITE 242
 CHICAGO, ILLINOIS 60604
 312.922.2600 T
 312.922.8222 F
 www.harding.com
 www.modearchitectspc.com

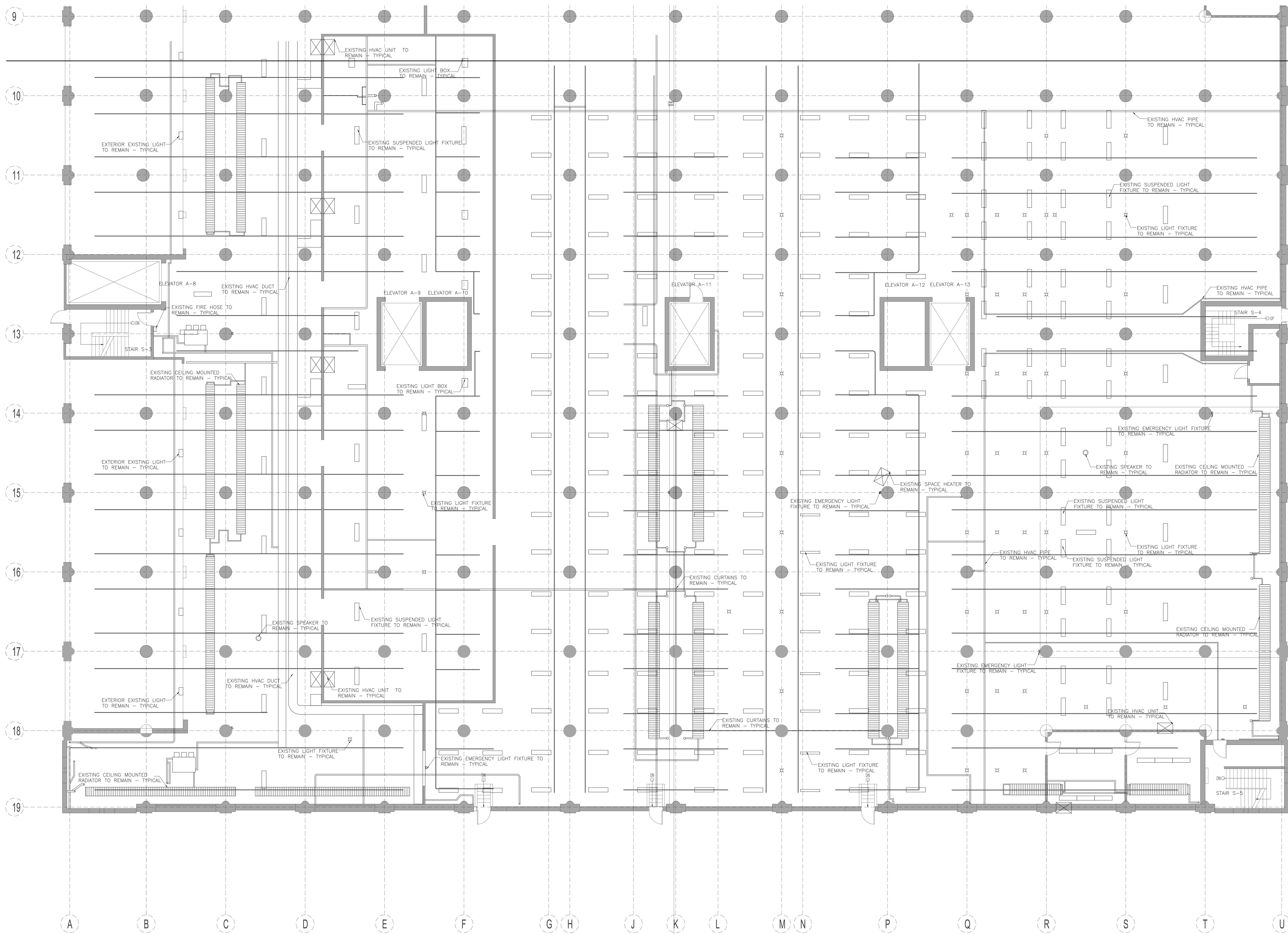
CEJM ENGINEERS
 303 East Wacker Drive, Suite 303
 Chicago, IL 60601
 MEPPF Engineers of Record

CEA&A STRUCTURAL ENGINEERS
 175 North Franklin Street, Suite 410
 Chicago, IL 60606
 Structural Engineers of Record

TERRA ENGINEERING
 225 W Ohio Street, 4th Floor
 Chicago, IL 60606
 Civil Engineers of Record

Signature	Mark	Description	Date
		ISSUE FOR BID	10/25/22
		ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No.: #04028
 Project No.: #04028
 Title:
EXISTING CONDITIONS FIRST FLOOR REFLECTED CEILING PLAN - UNIT B
 Sheet:
A-143



E6 EXISTING CONDITIONS FIRST FLOOR REFLECTED CEILING PLAN - UNIT B
 SCALE 1/8" = 1' - 0"

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GENERAL NOTES — REFLECTED CEILING PLAN

DIMENSIONS FOR REFERENCE ONLY. VERIFY ALL DIMENSIONS AND AREA QUANTITIES IN WORK PRIOR TO INITIAL WORK.

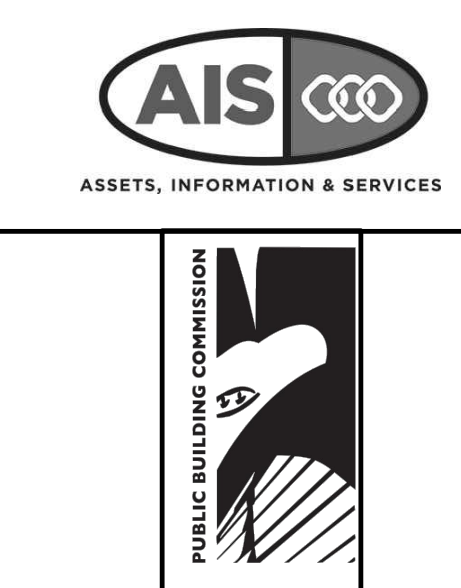
- EXISTING SPRINKLER PIPING IS SHOWN CONCEPTUALLY. IT IS NOT INTENDED TO BE COMPLETE OR FINAL. ALL SPRINKLER PIPING MUST BE VERIFIED BY CONTRACTOR. SEE MEP/FP DRAWINGS FOR DETAILS.
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Environmental Notes

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Professional Stamp



**1819 W. PERSHING
RENOVATION**
1819 W PERSHING ROAD
CHICAGO, ILLINOIS 60609

PUBLIC BUILDING COMMISSION OF CHICAGO
CITY OF CHICAGO, MAYOR LORI LIGHTFOOT

Architect of Record:

**HARDING MODE
JOINT VENTURE**

224 SOUTH MICHIGAN AVE
SUITE 245
CHICAGO, ILLINOIS 60604
312.922.2600 T
312.922.8222 F
www.harding.com
www.modearchitectspc.com

CCJM ENGINEERS
303 East Wacker Drive, Suite 303
Chicago, IL 60601
MEPPP Engineers of Record

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ENGINEERS**
175 North Franklin Street, Suite 410
Chicago, IL 60606
Structural Engineers of Record

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225 W Ohio Street, 4th Floor
Chicago, IL 60606
Civil Engineers of Record

Mark	Description	Date
ISSUE FOR BID		10/23/22
ADDENDUM 3		12/07/22

PBC Project Name: 1819 W. Pershing Renovation

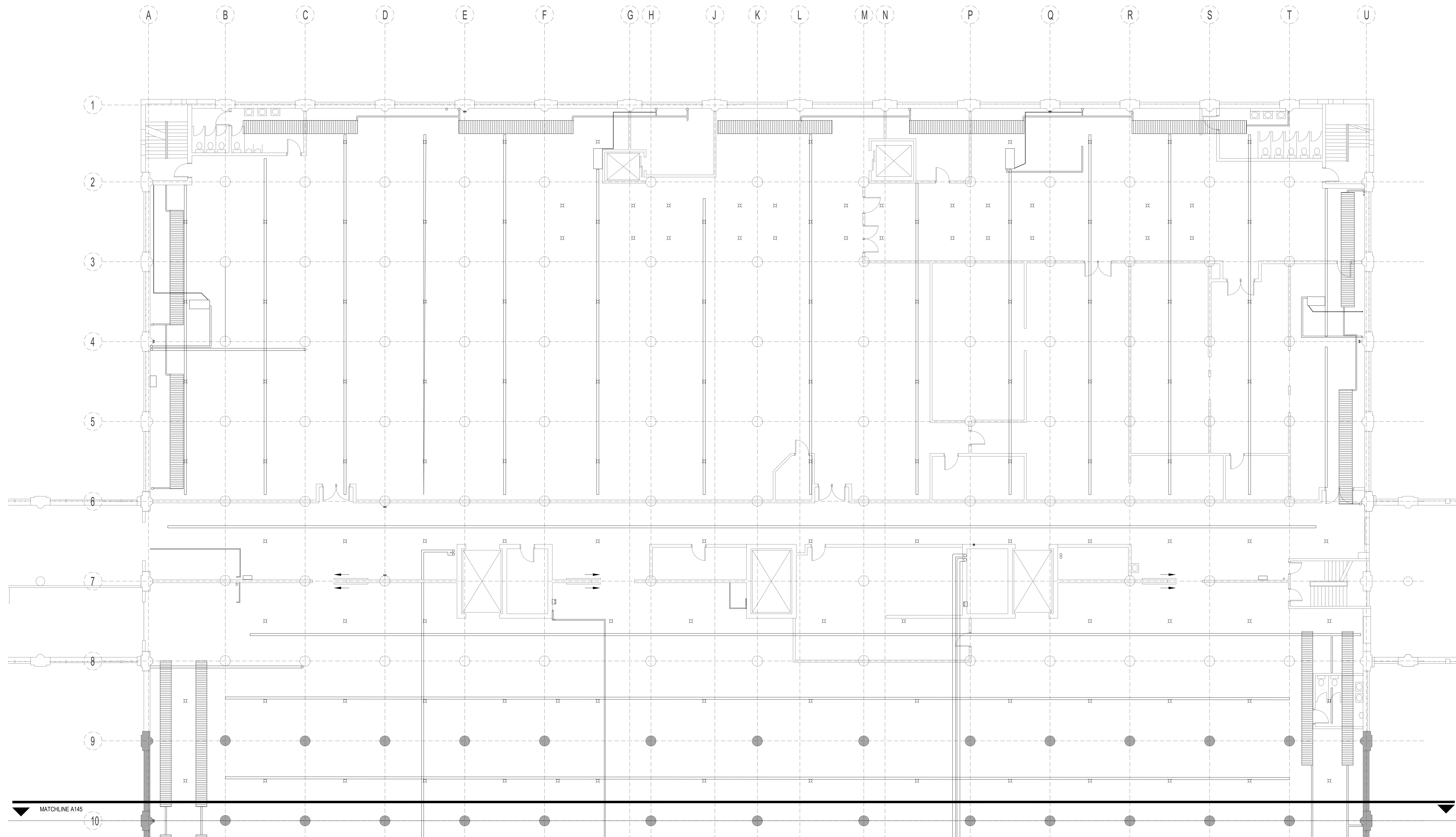
PBC Contract No:

Project No: #04026

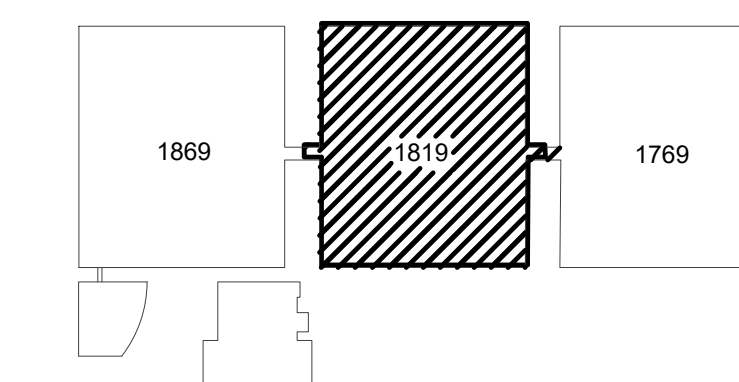
Title

**SECOND FLOOR
REFLECTED CEILING
PLAN - UNIT A**

Sheet
A144



1 REFLECTED CEILING PLAN 2ND FLOOR
1/8" = 1'-0"



Harding Partners p:\epa\Drawings\1819 wpr-middle sheets\epa mode formatted sheets\epa a145 20220301 - second floor south reflected ceiling plan.dwg 12/7/2022 2:27 PM LAST SAVED BY reslars

GENERAL NOTES - REFLECTED CEILING PLAN

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 CHICAGO, ILLINOIS 60609
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Architect of Record:

HARDING MODE JOINT VENTURE

224 SOUTH MICHIGAN AVE
 SUITE 245
 CHICAGO, ILLINOIS 60604
 312.922.2600 T
 312.922.8222 F
 www.harding.com
 www.modearchitectspc.com

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 303 East Wacker Drive, Suite 303
 Chicago, IL 60601
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Signature	Mark	Description	Date
		ISSUE FOR BID	10/25/22
	Δ	ADDENDUM 3	12/07/22

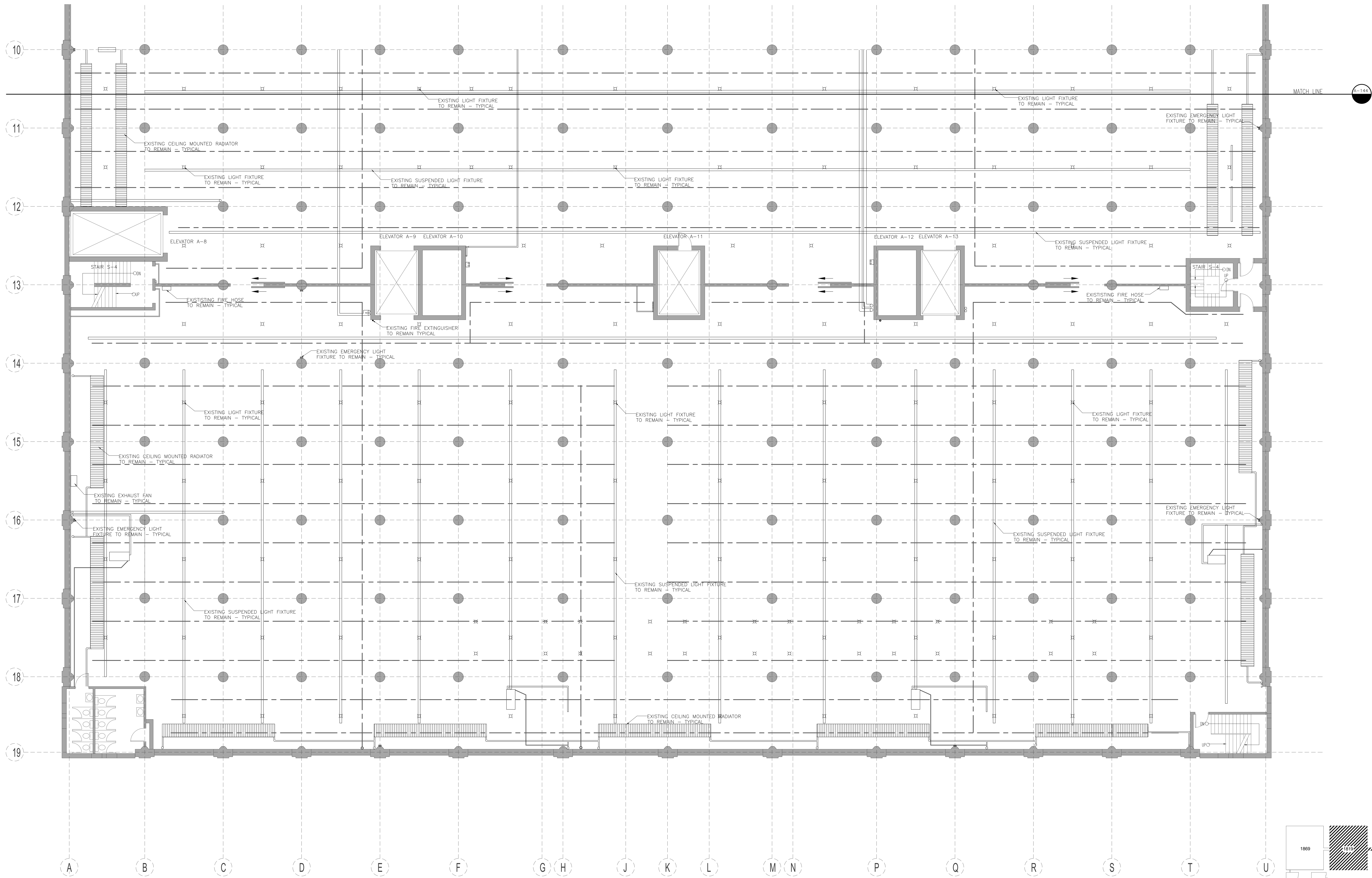
PBC Project Name: 1819 W. Pershing Renovation

PBC Contract No: #04028

Project No: 1819

Title: EXISTING CONDITIONS SECOND FLOOR REFLECTED CEILING PLAN - UNIT B

Sheet: A-145



E6 EXISTING CONDITIONS SECOND FLOOR REFLECTED CEILING PLAN - UNIT B
 SCALE 1/8" = 1' - 0"

GENERAL NOTES — REFLECTED CEILING PLAN

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Mark	Description	Date
ISSUE FOR BID		10/25/22
ADDENDUM 3		12/07/22

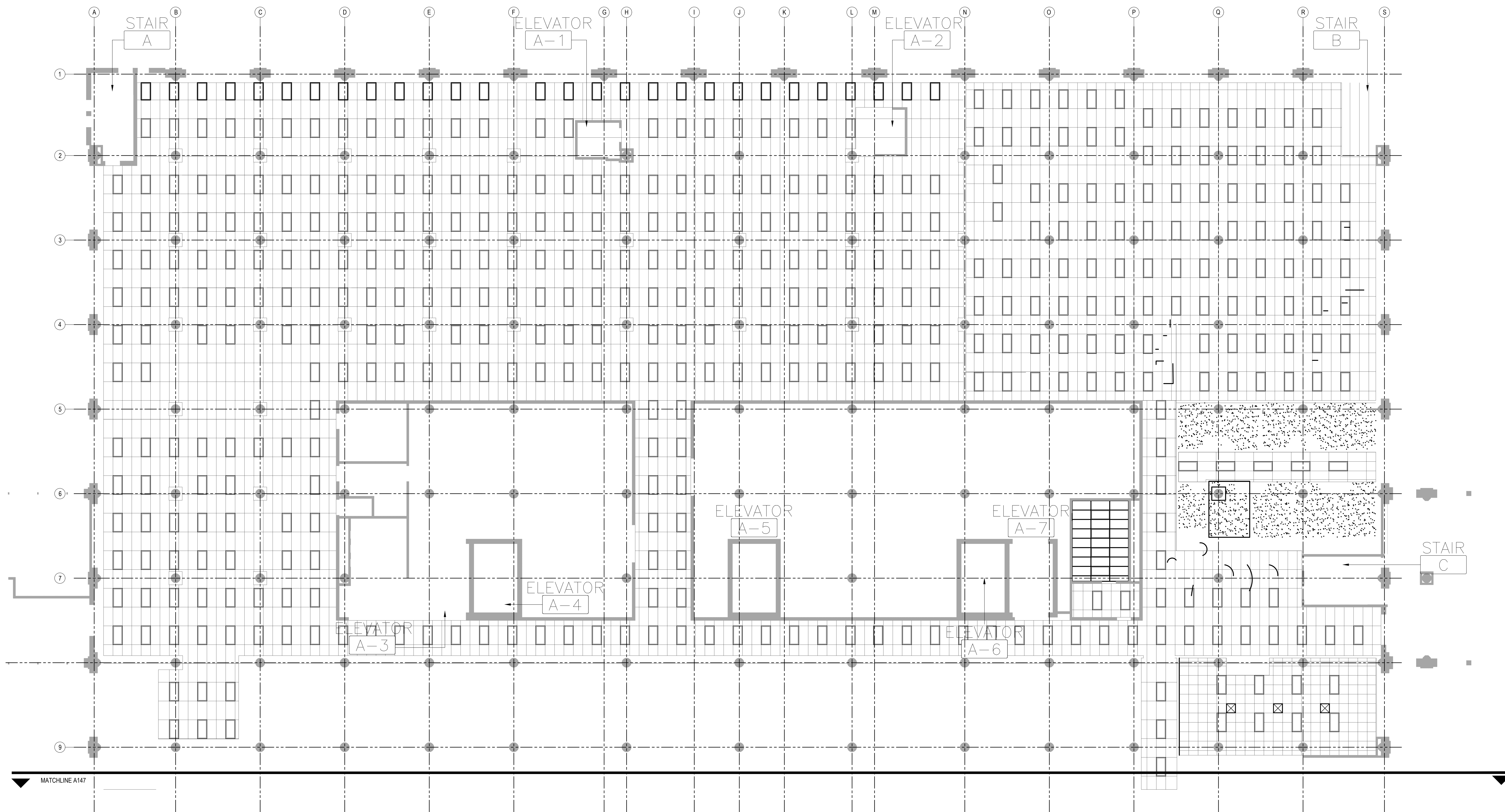
PBC Project Name: 1819 W. Pershing Renovation

PBC Contract No: #04026

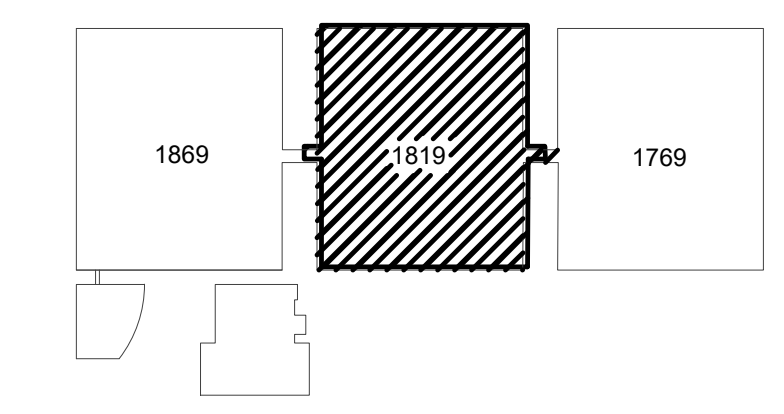
Project No: #04026

THIRD FLOOR REFLECTED CEILING PLAN - UNIT A

Sheet A146



1 REFLECTED CEILING PLAN
3RD FLOOR
 1/8" = 1'-0"



GENERAL NOTES — REFLECTED CEILING PLAN

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HARDING MODE JOINT VENTURE

224 SOUTH MICHIGAN AVE
 SUITE 245
 CHICAGO, ILLINOIS 60604
 312.922.2600 T
 312.922.8222 F
 www.harding.com
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Mark	Description	Date
ISSUE FOR BID		10/25/22
ADDENDUM 3		12/07/22

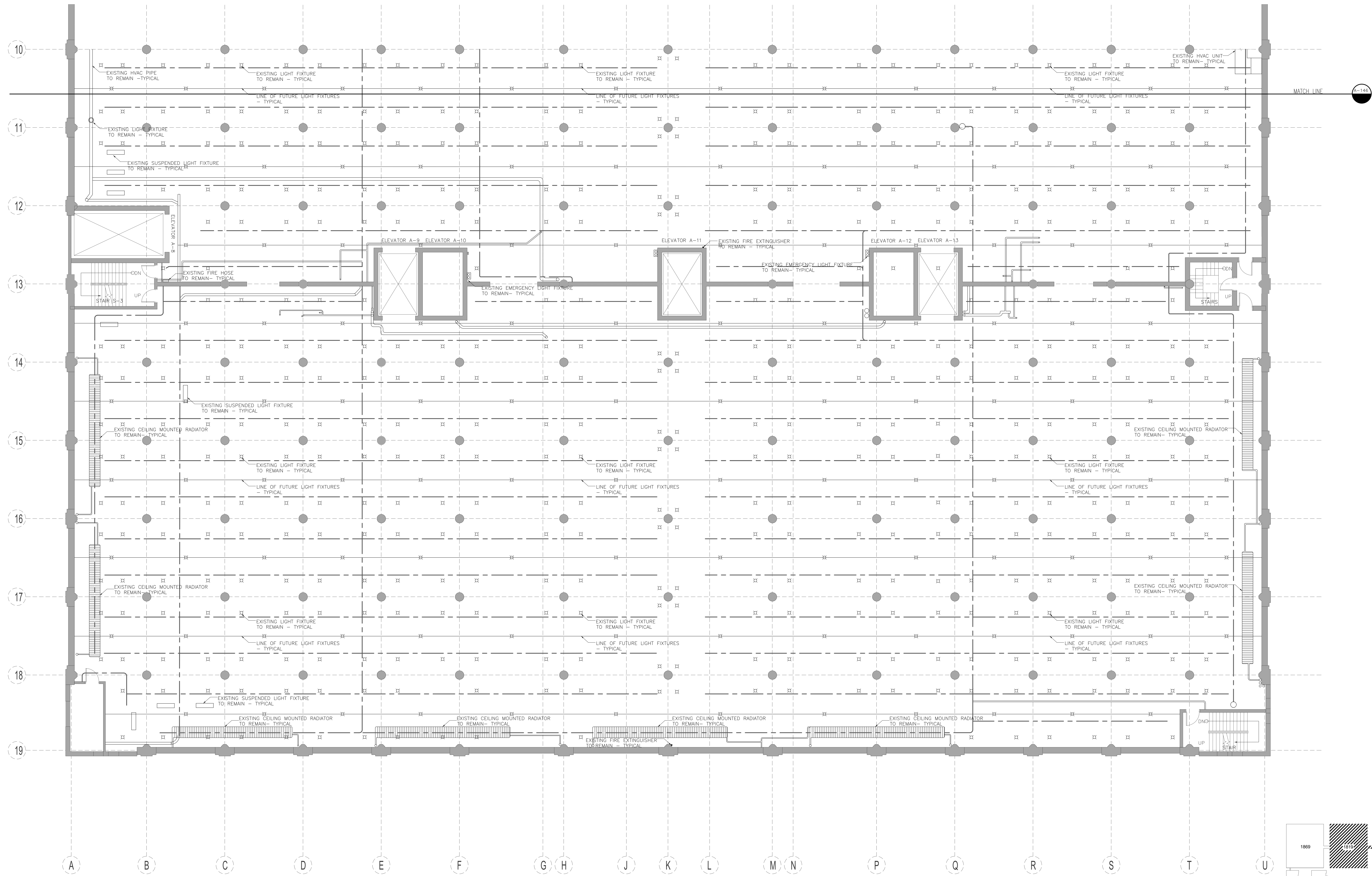
PBC Project Name: 1819 W. Pershing Renovation

PBC Contract No: #04028

Project No: #04028

Title: EXISTING CONDITIONS THIRD FLOOR PLAN REFLECTED CEILING PLAN- UNIT B

Sheet: A-147



E6 EXISTING CONDITIONS THIRD FLOOR REFLECTED CEILING PLAN - UNIT B
 SCALE 1/8" = 1' - 0"

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GENERAL NOTES — REFLECTED CEILING PLAN

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- AS PART OF FIRE PROTECTION AND FIRE ALARM WORK, CONTRACTOR TO PROVIDE 25,000SF ALLOWANCE TO REMOVE AND REINSTALL EXISTING CEILING GRID AND ACT FOR THE FOURTH FLOOR. PROVIDE AN ALLOWANCE TO REPLACE 5,000SF OF CEILING GRID AND TILE THAT ARE TOO DAMAGED TO REINSTALL EXISTING LIGHT FIXTURES, DUCTWORK, GRILLES, AND DIFFUSERS TO REMAIN.

Environmental Notes

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Architect of Record:

HARDING MODE JOINT VENTURE

221 SOUTH MICHIGAN AVE
 SUITE 245
 CHICAGO, ILLINOIS 60604
 312.922.2600 T
 312.922.8222 F
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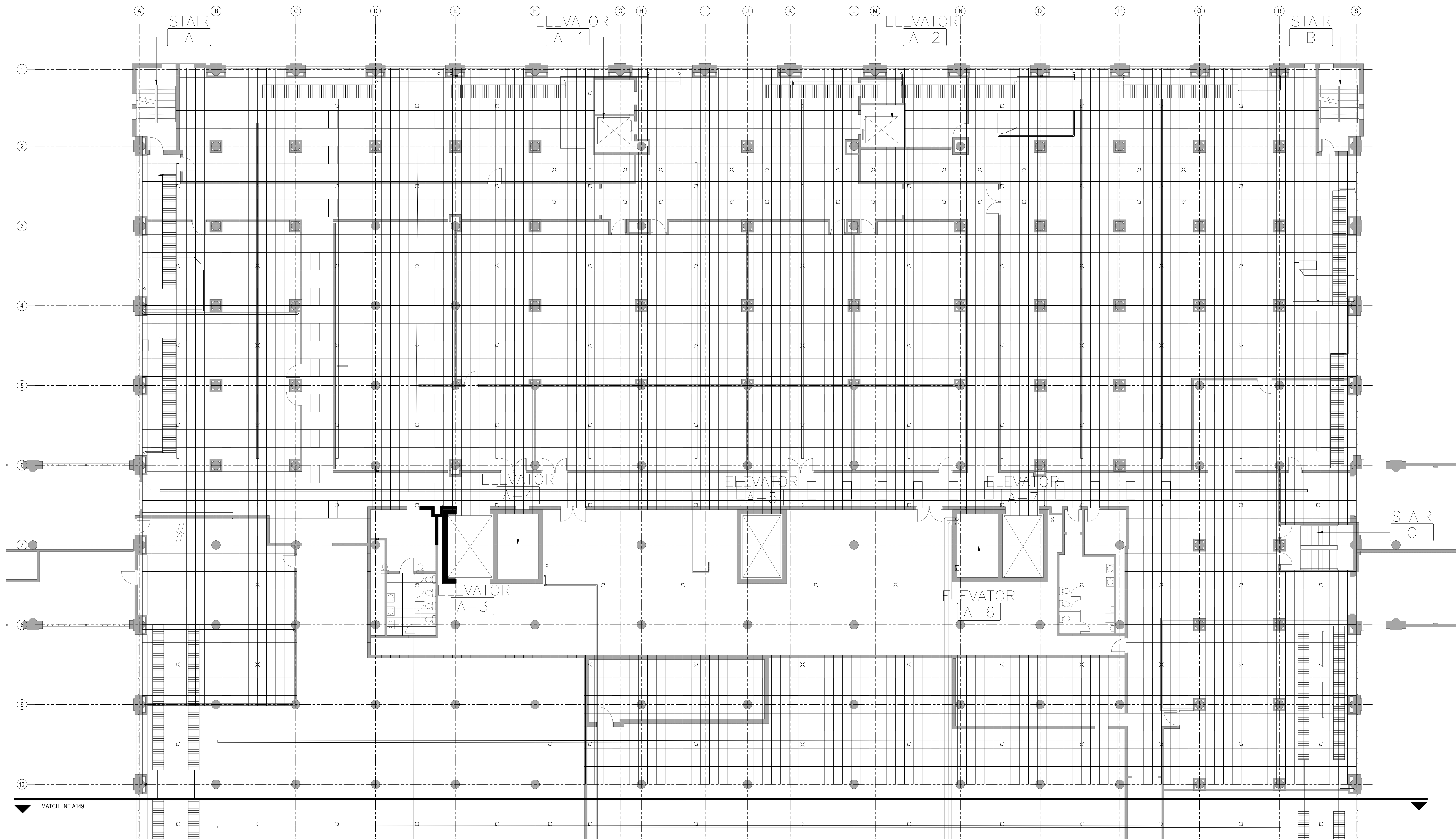
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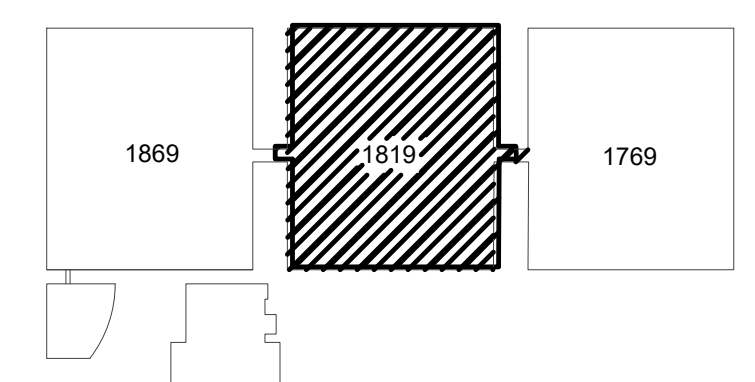
Significance	Mark	Description	Date
		ISSUE FOR BID	10/25/22
▲		ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No: #04026
 Project No: #04026
 Title:
FOURTH FLOOR REFLECTED CEILING PLAN - UNIT A

Sheet
A148



1 REFLECTED CEILING PLAN
1/8" = 1'-0"
 4TH FLOOR



GENERAL NOTES – REFLECTED CEILING PLAN

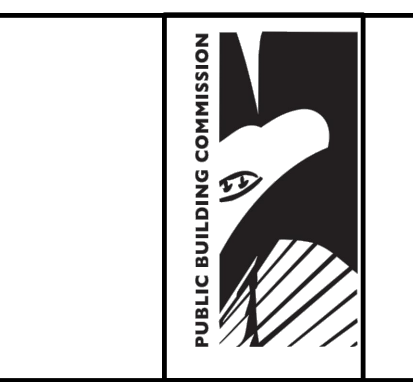
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 CHICAGO, ILLINOIS 60604
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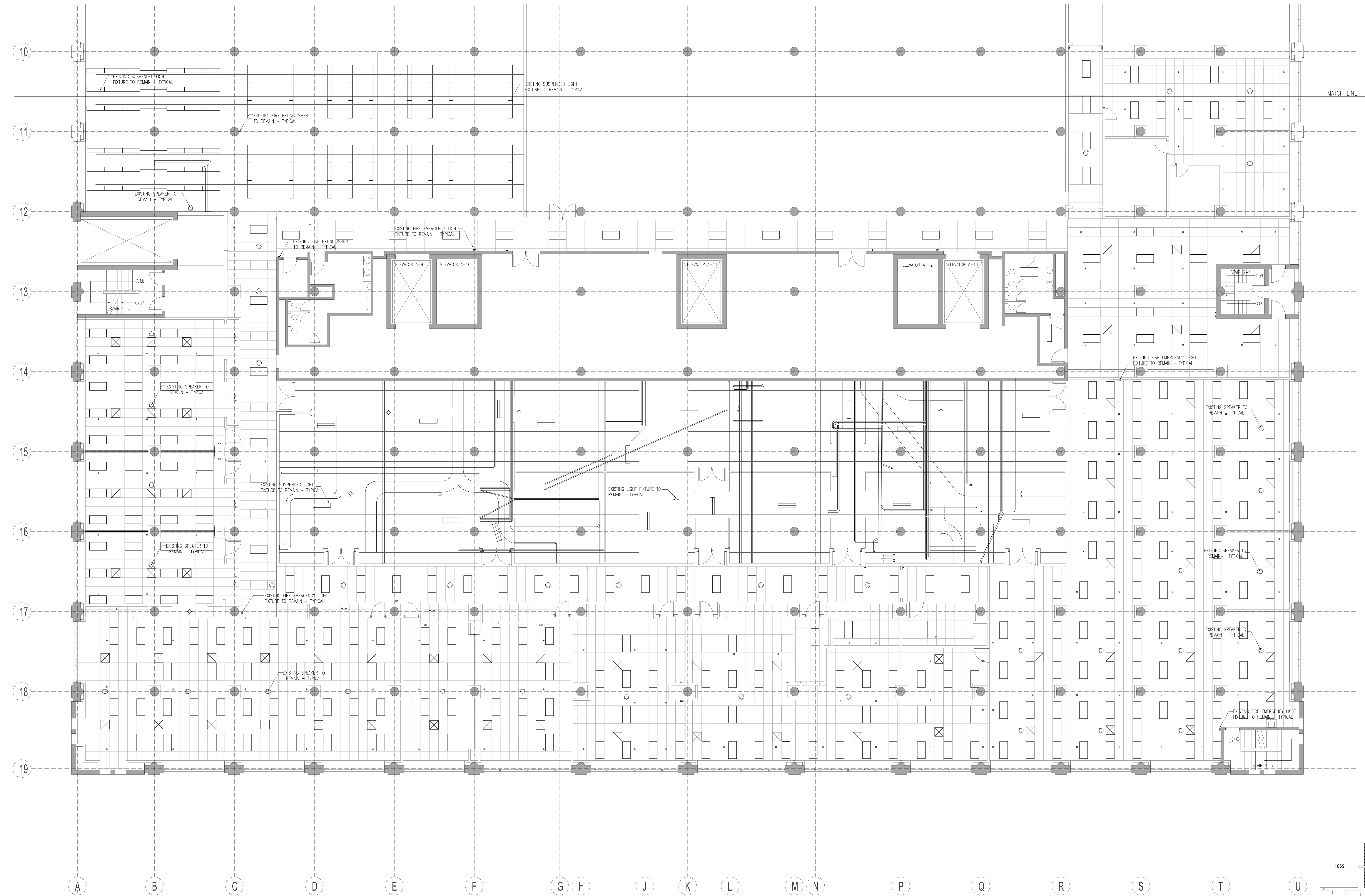
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 Chicago, IL 60606
 Structural Engineers of Record

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Signature	Mark	Description	Date
		ISSUE FOR BID	10/25/22
		ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No: #04028
 Project No: #04028
 Title:
EXISTING CONDITIONS FOURTH FLOOR REFLECTED CEILING PLAN - UNIT B
 Sheet:
A-149



E6 EXISTING CONDITIONS FOURTH FLOOR REFLECTED CEILING PLAN - UNIT B
 SCALE 1/8" = 1' - 0"

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GENERAL NOTES — REFLECTED CEILING PLAN

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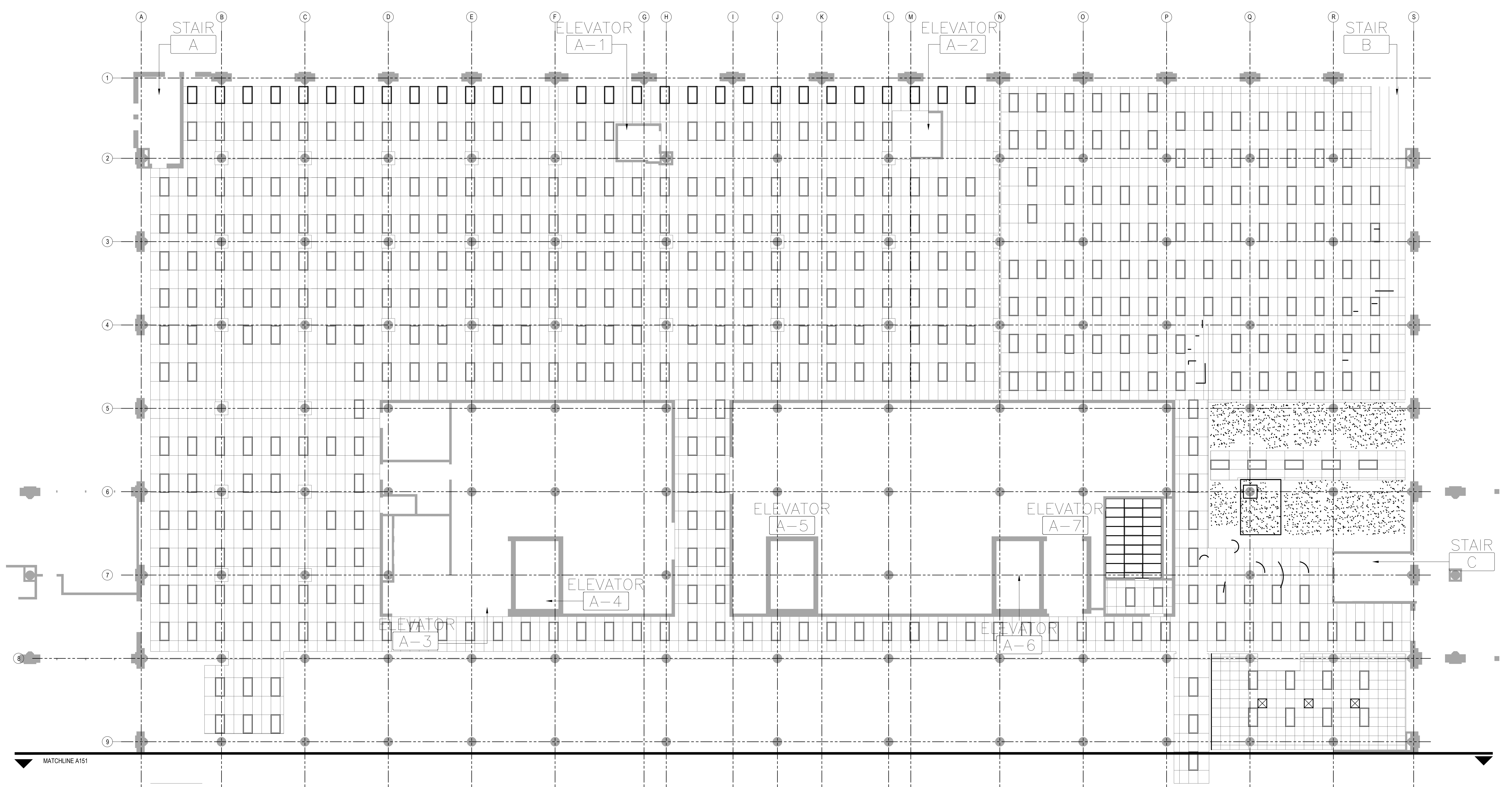
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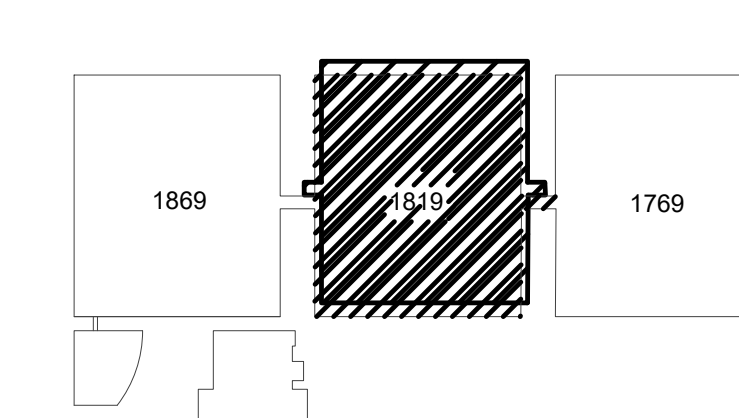
Mark	Description	Date
	ISSUE FOR BID	10/25/22
▲	ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No: #04026
 Project No: #04026
 Title: **FIFTH FLOOR REFLECTED CEILING PLAN - UNIT A**

Sheet **A150**



1, REFLECTED CEILING PLAN
1/8" = 1'-0"
 5TH FLOOR



6 5 4 3 2 1

GENERAL NOTES – REFLECTED CEILING PLAN
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- ALL CEILING ANNOTATIONS ARE BASED UPON CURSORY REVIEW AND ARE NOT FINAL. CONTRACTOR SHALL VERIFY THESE ANNOTATIONS AND FIXTURES.
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- AS PART OF FIRE PROTECTION AND FIRE ALARM WORK, CONTRACTOR TO PROVIDE 20,000 SF ALLOWANCE TO REMOVE AND RE-INSTALL EXISTING CEILING GRID AND ACT FOR THE FIFTH FLOOR. PROVIDE AN ALLOWANCE TO REPLACE 2,000 SF OF SUSPENDED GYP. BO CEILING DAMAGED DURING INSTALLATION OF FIRE PROTECTION AND ALARMS. EXISTING LIGHT FIXTURES, DUCTWORK, GRILLES, AND DIFFUSERS TO REMAIN.

Environmental Notes

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1819 W. PERSHING RENOVATION
 1819 W PERSHING ROAD
 CHICAGO, ILLINOIS 60609
 PUBLIC BUILDING COMMISSION OF CHICAGO
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Architect of Record:

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 CHICAGO, ILLINOIS 60604
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Issuance	Mark	Description	Date
		ISSUE FOR BID	10/25/22
	A	ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation

PBC Contract No: #04028

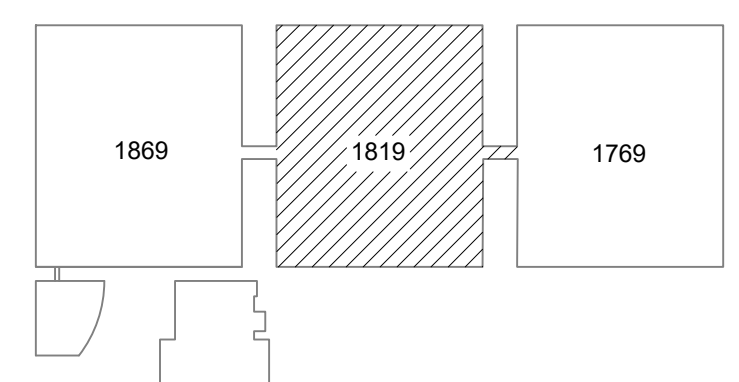
Project No: 1819

EXISTING CONDITIONS FIFTH FLOOR REFLECTED CEILING PLAN - UNIT B

Sheet
A-151



D6 FIFTH FLOOR REFLECTED CEILING PLAN
 SCALE 1/8" = 1'-0"



Harding Partners p:\pbc\drawings\1819_wpr-middle\sheet\pbc\mode\formatted\sheet\pbc\151_20210604 - fifth floor reflected ceiling plan.dwg 12/17/2022 2:35 PM LAST SAVED BY rslars

FIRE ALARM SYMBOLS	
[S]	FIRE ALARM MANUAL PULL STATION
[SD]	SMOKE DETECTOR
[HD]	HEAT DETECTOR
[DD]	DUCT DETECTOR
[CC]	CARBON MONOXIDE DETECTOR
[EOL]	END OF LINE DEVICE
[FACP]	FIRE ALARM CONTROL PANEL WITH VOICE COMMUNICATION
[FAXP]	FIRE ALARM ANNUNCIATOR PANEL
[NAC]	NOTIFICATION APPLIANCE CIRCUIT
[A]	AUDIBLE GENERAL ALARM
[V]	VISUAL STROBE
[AV]	AUDIOVISUAL DEVICE
[SV]	SPEAKER ALARM WITH VISUAL STROBE
[S]	SPEAKER ALARM
[FA]	CITY/MUNICIPAL TIE
[T]	TROUBLE BELL
[SCPA]	SUPERVISORY CONTROL PANEL ANNUNCIATOR
[VSS]	VALVE SUPERVISION SWITCH
[WFS]	WATER FLOW SWITCH
[FD]	FIRE DEPARTMENT BELL
[SCAP]	SPRINKLER CONTROL ANNUNCIATOR PANEL
[SSCP]	SPRINKLER CONTROL PANEL
[R]	FAN SHUT DOWN RELAY
[RTS]	REMOTE TEST SWITCH
[DDAP]	DUCT DETECTOR ANNUNCIATOR PANEL
[CCDP]	CARBON MONOXIDE CONTROL PANEL
[MDO]	MAGNETIC DOOR HOLD OPEN
[DHBP]	DOOR HOLDER RELAY PANEL
[DDAP]	DUCT DETECTOR ANNUNCIATOR PANEL

RESCUE ASSISTANCE SYMBOLS	
[RACP]	RESCUE ASSISTANCE ANNUNCIATOR PANEL
[RACP]	RESCUE ASSISTANCE CONTROL PANEL
[RA]	RESCUE ASSISTANCE COMMUNICATION
[RAS]	RESCUE ASSISTANCE SIGN
[C]	CALL BUTTON
[HABP]	HANDICAP DOOR ASSIST BUTTON

NOTES	
GENERAL NOTE:	
1. NEW FIRE ALARM SYSTEM CITY APPROVED LAYOUT SHALL BE REVIEWED AND APPROVED BY PM, EOR AND SCHOOL PRIOR TO CONTRACTOR BEGINNING WORK.	
2. FIRE ALARM WIRING SHALL BE INSTALLED IN CONDUIT AND CONCEALED IN FINISHED SPACES WHERE ARCHITECTURALLY FEASIBLE. WHERE IS IT IS NOT ARCHITECTURALLY FEASIBLE TO CONCEAL CONDUIT, SURFACE MOUNTED RACEWAY WILL BE PERMITTED IN FINISHED SPACES.	
3. FIRE ALARM CONTRACTOR SHALL ACT AS GENERAL CONTRACTOR AND ENGAGE ALL TRADES REQUIRED FOR THE PROJECT (E.G. HVAC, TEMPERATURE CONTRACTOR) IN ORDER TO FULLY INTEGRATE OTHER SYSTEMS WITH NEW FIRE ALARM SYSTEM.	
4. FOR GENERAL ARCHITECTURAL WORK REFER TO DIV 01 SPECIFICATIONS.	
DEMOLITION NOTES:	
1. EXISTING SYSTEMS SHOWN ARE BASED ON FIELD WALK THRU ONLY, BUT THEY MAY NOT REFLECT THE ACTUAL CONDITIONS IN EVERY CASE. THE CONTRACTOR SHALL INSPECT THE SITE AND EXAMINE THE WORK BEFORE SUBMITTING HIS PROPOSAL.	
2. THE CONTRACTOR SHALL CAREFULLY EXAMINE THE CONTRACT DOCUMENTS, VISIT THE SITE, AND THOROUGHLY BECOME FAMILIAR WITH THE BUILDING STANDARDS AND LOCAL CONDITIONS RELATING TO THE WORK. FAILURE TO DO SO WILL NOT RELIEVE THE CONTRACTOR OF THE OBLIGATIONS OF THE CONTRACT.	
3. DEMOLITION WORK APPLIES TO AREAS AND SYSTEM AS INDICATED ON THE PLANS ONLY.	
4. ELECTRICAL CONTRACTOR SHALL REMOVE ALL ELECTRICAL EQUIPMENT AFFECTED BY THE DEMOLITION. COORDINATE EXACT SCOPE OF WORK WITH ARCHITECTURAL, MECHANICAL AND PLUMBING DRAWINGS.	
5. ALL EXPOSED CONDUITS, HANGERS, SUPPORTS, ETC. THAT ARE ABANDONED SHALL BE REMOVED. CONDUIT WHICH IS BURIED IN CONCRETE OR OTHERWISE INACCESSIBLY POSITIONED MAY BE ABANDONED. IN SUCH CASES, WIRE SHALL BE PULLED OUT OF THE CONDUIT AND THE CONDUIT ITSELF PLUGGED AT EACH END.	
6. WHERE EXISTING DEVICES, CONDUIT WIRE, SUPPORTS, HANGERS AND OTHER ELECTRICAL EQUIPMENT MUST BE REMOVED AS A RESULT OF THE ALTERATIONS, THEY SHALL BE COMPLETELY REMOVED, BACK TO THE FIRST OUTLET WHICH IS LEFT UNAFFECTED. IF REMOVED BACK TO THE PANEL, LABEL THAT CIRCUIT AS SPARE.	
7. PATCH ALL HOLES IN SLABS, WALLS AND CEILING WHERE ELECTRICAL DEVICES AND/OR CONDUIT ARE REMOVED. IF THE REMOVAL OF CONDUIT, BOXES, EQUIPMENT, ETC. COMPROMISES THE FIRE RATING OF THESE ITEMS, THE CONTRACTOR SHALL SEAL OPENINGS WITH CODE APPROVED FIRE STOPPING MATERIAL. ELECTRICAL CONTRACTOR TO COORDINATE WITH GENERAL CONTRACTOR FOR ANY PATCH DAMAGED ARCHITECTURAL FINISHES PER DETAILS ON ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.	
8. WHERE EXISTING ELECTRICAL WORK PREVENTS PROPER CONSTRUCTION OF NEW WORK, REMOVE, REROUTE, RELOCATE, OR IN OTHER WAYS ALTER EXISTING WORK TO ACCOMMODATE.	
9. ALL PROPOSED DEMOLITION WORK SHALL BE THOROUGHLY COORDINATED WITH ALL OTHER TRADES IF APPLICABLE.	
10. CONTRACTOR IS TO PERFORM DEMOLITION WORK IN A NEAT, SKILLFUL, AND CAREFUL MANNER SO AS NOT TO DAMAGE OR DEFACE EXISTING CONSTRUCTION THAT IS TO REMAIN.	

FIRE ALARM GENERAL NOTES	
1. PROVIDE A NONCODED, ADDRESSABLE SYSTEM WITH MANUAL AND AUTOMATIC ALARM INITIATION; AUTOMATIC SENSITIVITY CONTROL OF SMOKE AND HEAT DETECTORS; AUDIO AND VISUAL ALARM DEVICES; AND MULTIPLEX SIGNAL TRANSMISSION DEDICATED TO FIRE ALARM SERVICE ONLY, INTEGRATED WITH CITY TIE.	
2. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL MATERIAL, LABOR, EQUIPMENT, DEVICES, ETC. NECESSARY FOR A COMPLETE AND FULLY OPERATIONAL FIRE ALARM SYSTEM. ALL WORK SHALL COMPLY WITH THE CITY OF CHICAGO BUILDING CODE, NATIONAL FIRE PROTECTION ASSOCIATION, CITY OF CHICAGO FIRE PREVENTION BUREAU AND AMERICANS WITH DISABILITIES ACT.	
3. FIRE ALARM CALCULATIONS INCLUDING BATTERY LOAD, VOLTAGE DROP, AND WIRING SIZING SHALL BE PERFORMED AND SUBMITTED BY THE FA CONTRACTOR AS PART OF THE FIRE ALARM SHOP DRAWING SUBMITTAL PROCESS WHICH TIME THE CONTRACTOR SHALL SUBMIT ALL REQUIRED INFORMATION TO THE APPROPRIATE CODE OFFICIALS.	
4. FIRE ALARM DEVICES ARE SHOWN FOR REFERENCE ONLY. FIRE ALARM PERMIT SHALL BE BY INSTALLING FIRE ALARM CONTRACTOR COORDINATE EXACT LOCATION AND INSTALLATION OF DEVICES WITH FIRE ALARM SHOP DRAWINGS. EMPLOY CPS APPROVED CONTRACTOR FOR ALL FIRE ALARM WORK.	
5. PROVIDE NEW DETECTION AND NOTIFICATION DEVICES THROUGHOUT. ALL FIRE ALARM DEVICE ROUGH-INS SHALL BE INSTALLED IN ACCORDANCE WITH CITY APPROVED SHOP DRAWINGS.	
6. ALL FIRE ALARM SYSTEM WIRING SHALL BE ROUTED IN RACEWAYS, WIREMOLD RACEWAY SURFACE MOUNTED METAL RACEWAY SHALL BE INSTALLED IN OCCUPIED AREAS WHEN CONDUIT CANNOT BE CONCEALED IN EXISTING WALLS. WIRING SHALL BE CLEAR FROM SHORTS, OPENS AND GROUNDS. PROVIDE A SYSTEM GROUND FOR DEVICES AS REQUIRED PER CHICAGO CODE. USE ONLY APPROVED CABLE WITH RACEWAY OR CONDUITS. THE CONTRACTOR SHALL PROVIDE ALL STROBE CIRCUITS WITH A MAXIMUM OF STROBES PER CIRCUIT AS REQUIRED BY MFG.	
7. CONTRACTOR TO COORDINATE LAYOUT OF DEVICES IN MECHANICAL ROOMS, KITCHEN, STORAGE WITH EXISTING DUCTWORK, PIPING, STORAGE RACKS, BOOKSHELVES TO PROVIDE ADDITIONAL DEVICES AS REQUIRED TO ACHIEVE FULL COVERAGE.	
8. THE CONTRACTOR SHALL PROVIDE MANUAL PULL STATIONS AT EACH EXIT EXTERIOR DOOR AND STAIRWELL.	
9. THE CONTRACTOR SHALL PROVIDE CAPACITY IN FIRE ALARM CONTROL PANEL TO SERVE ALL DETECTION DEVICES. PULL MINIMUM SPARE CAPACITY OF 20% INDIVIDUAL DETECTION SIGNALING LINES SHALL PROVIDE A SPARE CAPACITY OF NO LESS THAN 20% PER LINE WHEN SYSTEM INSTALLATION IS COMPLETED. A MINIMUM OF ONE SPARE ANNUNCIATOR ZONE SHALL BE PROVIDED FOR EACH FLOOR PER BUILDING AT MAIN FIRE ALARM ANNUNCIATOR PANEL. ANNUNCIATOR, DISTRIBUTION OF DETECTION SIGNALING LINE CIRCUITS SHALL BE SUCH THAT FAILURE OF ANY LINE WILL NOT PROHIBIT MONITORING AND ALARM REPORTING FROM ADJACENT AREAS.	
10. THE CONTRACTOR SHALL PROVIDE BATTERY BACKUP EMERGENCY POWER SUPPLY TO FIRE ALARM CONTROL PANEL AND ALARM SYSTEM.	
11. FIRE ALARM CONTRACTOR SHALL SEAL ALL PENETRATIONS THRU FIRE RATED STRUCTURES WITH FIRE RATED MATERIAL, WITH SAME RATING AS PENETRATED STRUCTURE. INSTALLED PER MANUFACTURERS GUIDELINES AND U.L. REQUIREMENTS.	
COMPLETE FIRE ALARM SYSTEM SHALL BE PROVIDED IN ACCORDANCE WITH THE CITY OF CHICAGO BUILDING CODE, NATIONAL FIRE PROTECTION ASSOCIATION, CITY OF CHICAGO FIRE PREVENTION BUREAU AND AMERICANS WITH DISABILITIES ACT.	
NOTE: ALL GENERAL ROUGH-IN FOR NEW FIRE ALARM SYSTEM SUCH AS: CONDUITS, FITTING, RACEWAYS, BACKBOXES, BOXES, SUPPORTS, WIRING TIE SHALL BE DONE BY (FIRE ALARM) ELECTRICAL CONTRACTOR. FIRE ALARM SYSTEM CONTRACTOR TO FULLY COORDINATE WORK BETWEEN THE TRADES (ELECTRICAL, FIRE SUPPRESSION AND ITS OWN) AND IS RESPONSIBLE FOR SYSTEM INSTALLATION, TERMINATION, TESTING INCLUDING ALL REQUIRED COORDINATION WITH CITY FIRE MARSHAL AND INSPECTION BUREAU.	
NEW FIRE ALARM SYSTEM LAYOUT SHALL BE REVIEWED AND APPROVED BY PM, EOR AND SCHOOL PRIOR TO CONTRACTOR BEGINNING WORK.	

ABBREVIATIONS				
ABBREVIATIONS ARE ALPHABETICALLY LISTED BY DESCRIPTION.				
NOTE:	ABBREV.	DESCRIPTION	ABBREV.	DESCRIPTION
	AFF	ABOVE FINISHED FLOOR	FA	FIRE ALARM
	AHJ	AUTHORITY HAVING JURISDICTION	FD	FIRE DEPARTMENT CONNECTION
	ALM	ALARM	GHW	GALVANIZED HEAVY WALL STEEL
	ACS	AUXILIARY CONTACTS	CON	CONDUIT
	A	AMPERE	HV	HIGH VOLTAGE
	ANC	AMPERES INTERRUPTING CAPACITY	INC	INTERMEDIATE STEEL CONDUIT
	AL	ALUMINUM	JB	JUNCTION BOX
	ANN	ANNUNCIATOR	kmf	CIRC. MILES WIRE CROSS SECTION AREA
	ATS	AUTOMATIC TRANSFER SWITCH	MFR	MANUFACTURER
	AWG	AMERICAN WIRING GAUGE	MTD	MOUNTED
	BR	BRANCH	N	NEUTRAL
	BRKR	BREAKER	NC	NOT IN CONTRACT
	CAB	CABINET	NTS	NOT TO SCALE
	CB	CIRCUIT BREAKER	PN	PANEL
	CO	CIRCUIT	PH	PHASE
	CLO	CLOSET	PIR	PIR
	CU	COEFFICIENT OF UTILIZATION	PB	PULL BOX
	CEC	CHICAGO ELECTRICAL CODE	RT	RANTIGHT
	C	CONDUIT	RECP	RECEPTACLE
	CONN	CONNECTION	S	SWITCH
	CONV	CONVENIENCE	SVS	SYSTEM
	CU	COPPER	UL	UNDERWRITERS LABORATORIES
	DS	DISCONNECT SWITCH	UNO	UNLESS NOTED OTHERWISE
	E.C.	ELECTRICAL CONTRACTOR	UPS	UNINTERRUPTIBLE POWER SUPPLY
	EM	EMERGENCY	W	W
	EMT	ELECTRIC METALLIC TUBING	WG	WREGUARD
	EQ	EQUIPMENT	WP	WEATHERPROOF
	EX	EXISTING TO REMAIN	EXR	EXISTING TO BE REMOVED
	EXPL	EXISTING TO BE REPLACED	EXRL	EXISTING TO BE RELOCATED

Environmental Notes
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Architect of Record:
HARDING MODE JOINT VENTURE
224 SOUTH MICHIGAN AVE
SUITE 245
CHICAGO, ILLINOIS 60604
312.922.2600 T
312.922.8222 F
www.harding.com
www.modearchitectspc.com

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Mark	Description	Date
	ISSUE FOR BID	10/25/22
Δ	ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation
PBC Contract No:
Project No: #04028
Title

FIRE ALARM NOTES AND SYMBOLS

Sheet

FA-001

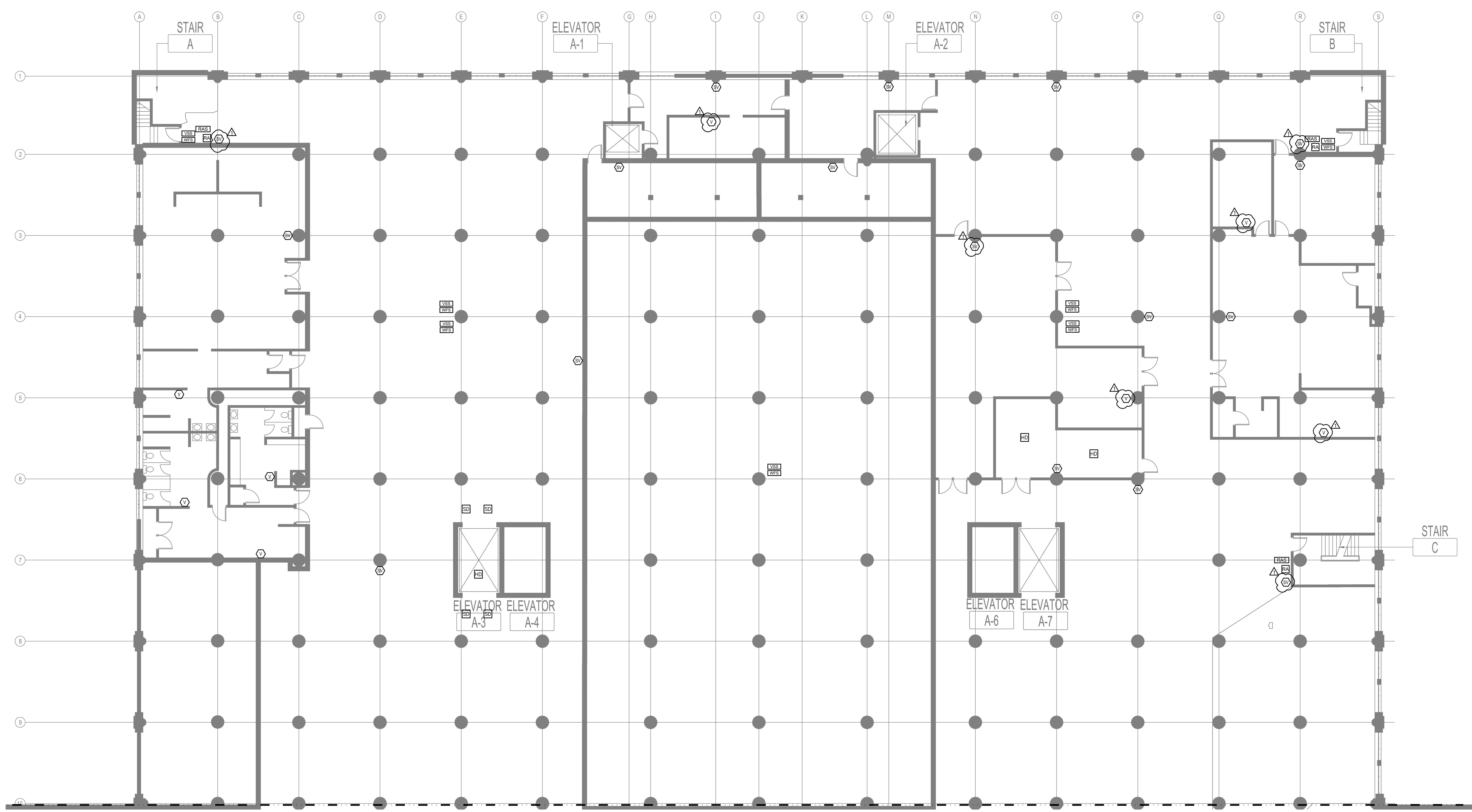
- GENERAL NOTES:
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 - VERIFY FINAL LOCATION OF RESCUE ASSISTANCE DEVICES WITH ARCHITECT BEFORE ROUGH-IN. LOCATION OF RESCUE ASSISTANCE DEVICES SHALL COMPLY WITH CHICAGO CODE.
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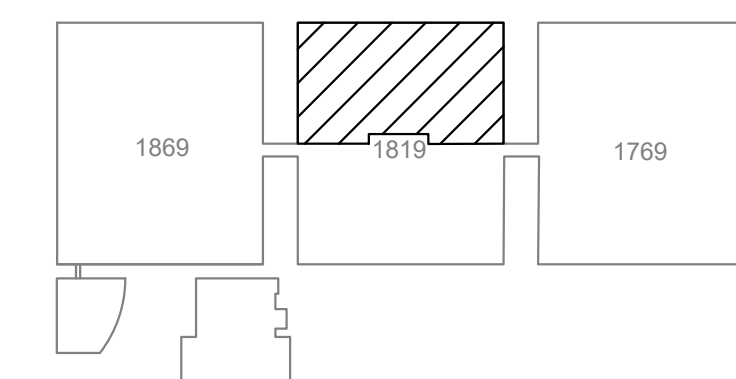
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Signature	Description	Date
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PBC Project Name: 1819 W. Pershing Renovation
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1 FIRE ALARM BASEMENT PLAN - NORTH
 1/8" = 1'-0"

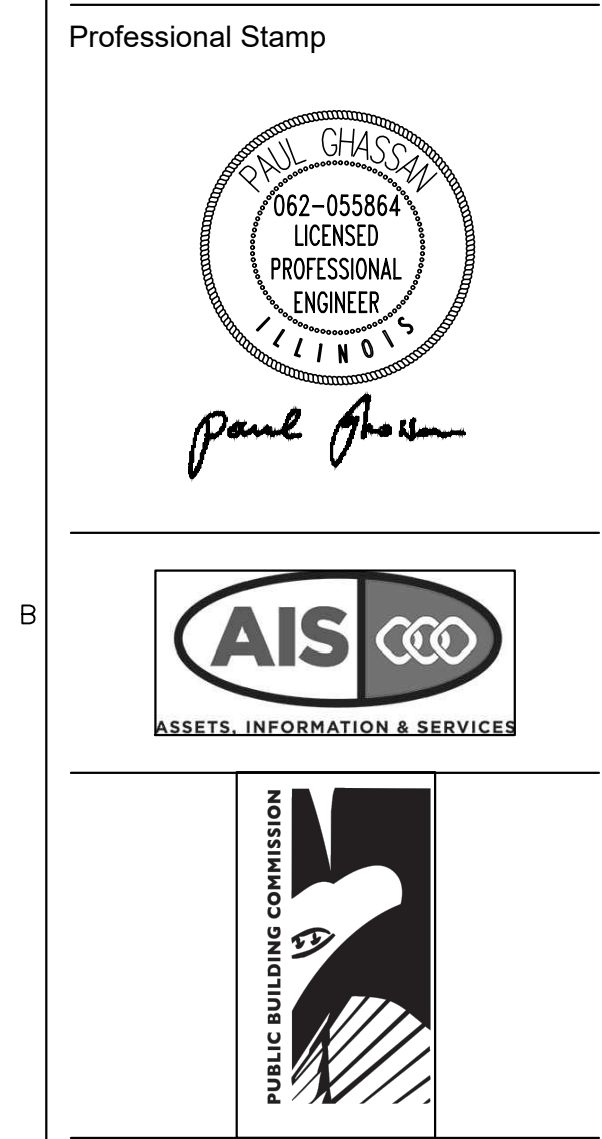
FIRE ALARM BASEMENT PLAN - NORTH
FA-100A

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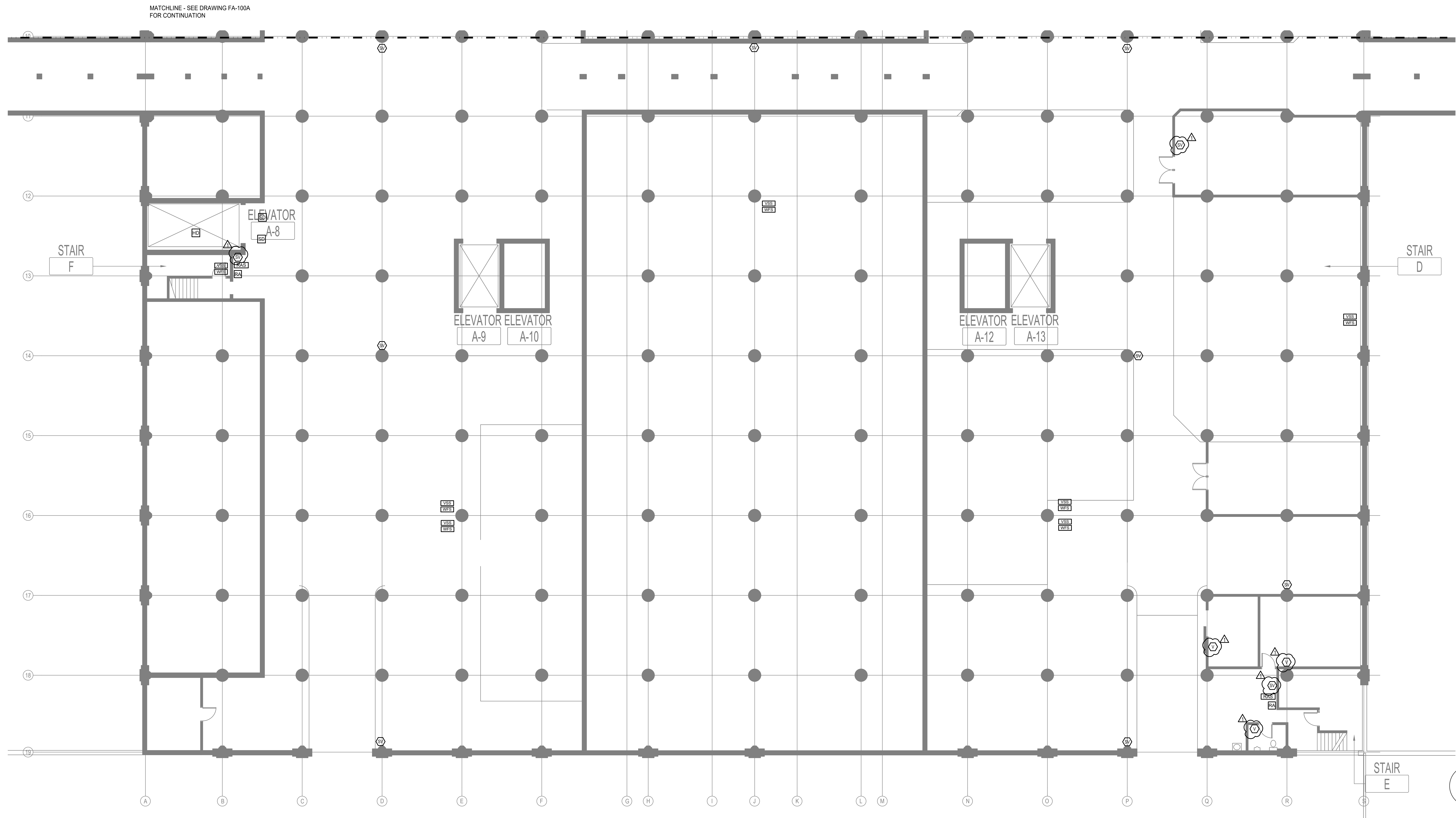
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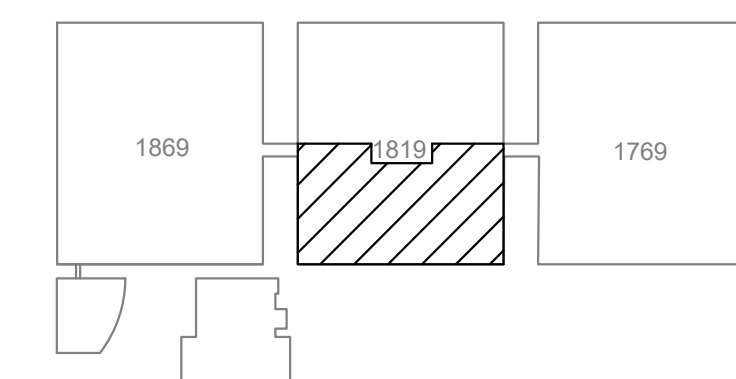
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	ADDENDUM 3		12/07/22

PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No:
 Project No: #04026
 Title:
FIRE ALARM BASEMENT PLAN - SOUTH
 Sheet:
FA-100B



1 FIRE ALARM BASEMENT PLAN - SOUTH
 1/8" = 1'-0"



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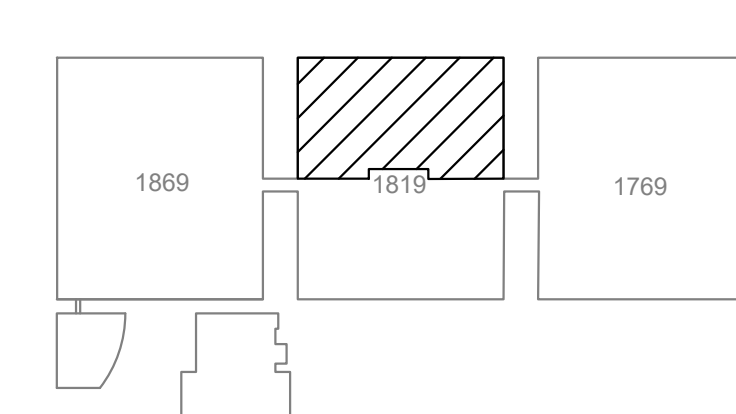
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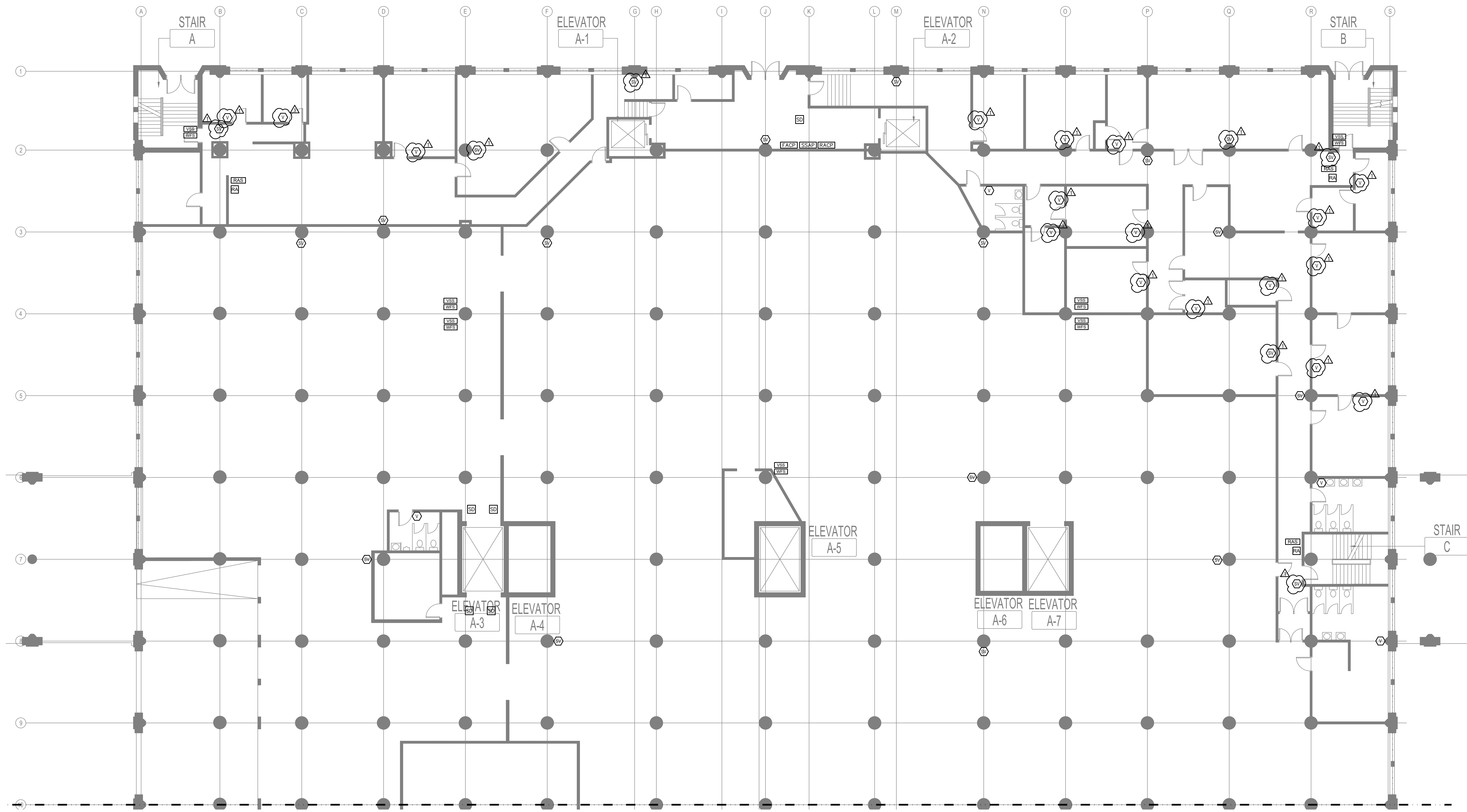
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		ISSUE FOR BID	10/25/22
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PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No:
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 Title:



FIRE ALARM 1ST FLOOR PLAN - NORTH

Sheet
FA-101A



MATCHLINE - SEE DRAWING FA-101B FOR CONTINUATION

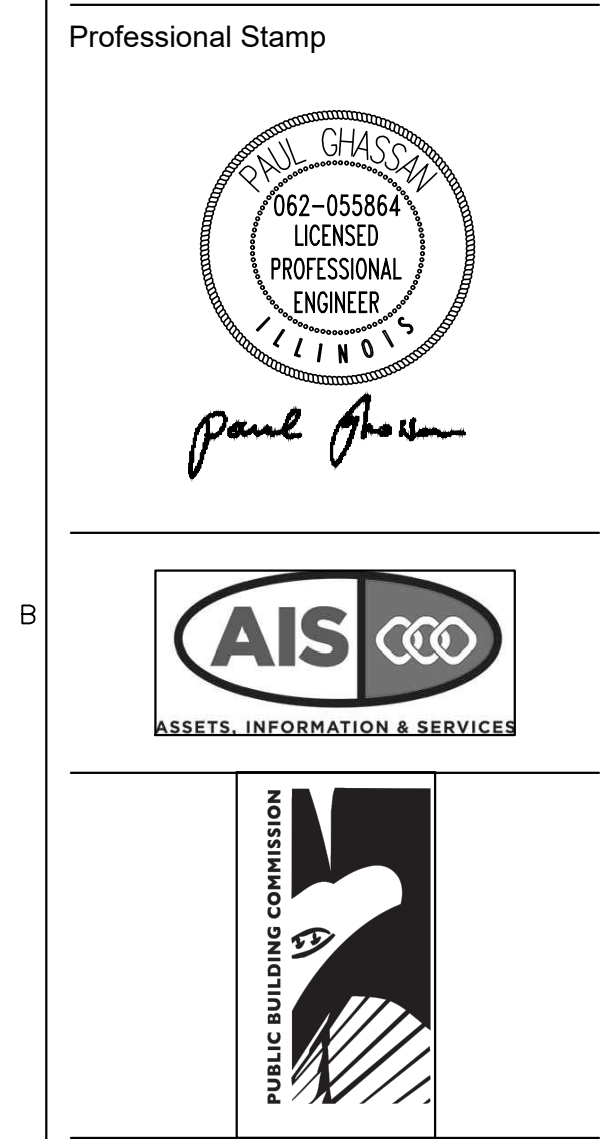
1 FIRE ALARM 1ST FLOOR PLAN - NORTH
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- GENERAL NOTES:
- REFER TO DRAWING FA01 FOR GENERAL FIRE ALARM NOTES AND SYMBOL LIST
 - VERIFY FINAL LOCATION OF RESCUE ASSISTANCE DEVICES WITH ARCHITECT BEFORE ROUGH-IN. LOCATION OF RESCUE ASSISTANCE DEVICES SHALL COMPLY WITH CHICAGO CODE.
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Environmental Notes

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 CITY OF CHICAGO, MAYOR LORI LIGHTFOOT

Architect of Record:
HARDING MODE JOINT VENTURE
 224 SOUTH MICHIGAN AVE
 SUITE 245
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 312.922.8222 F
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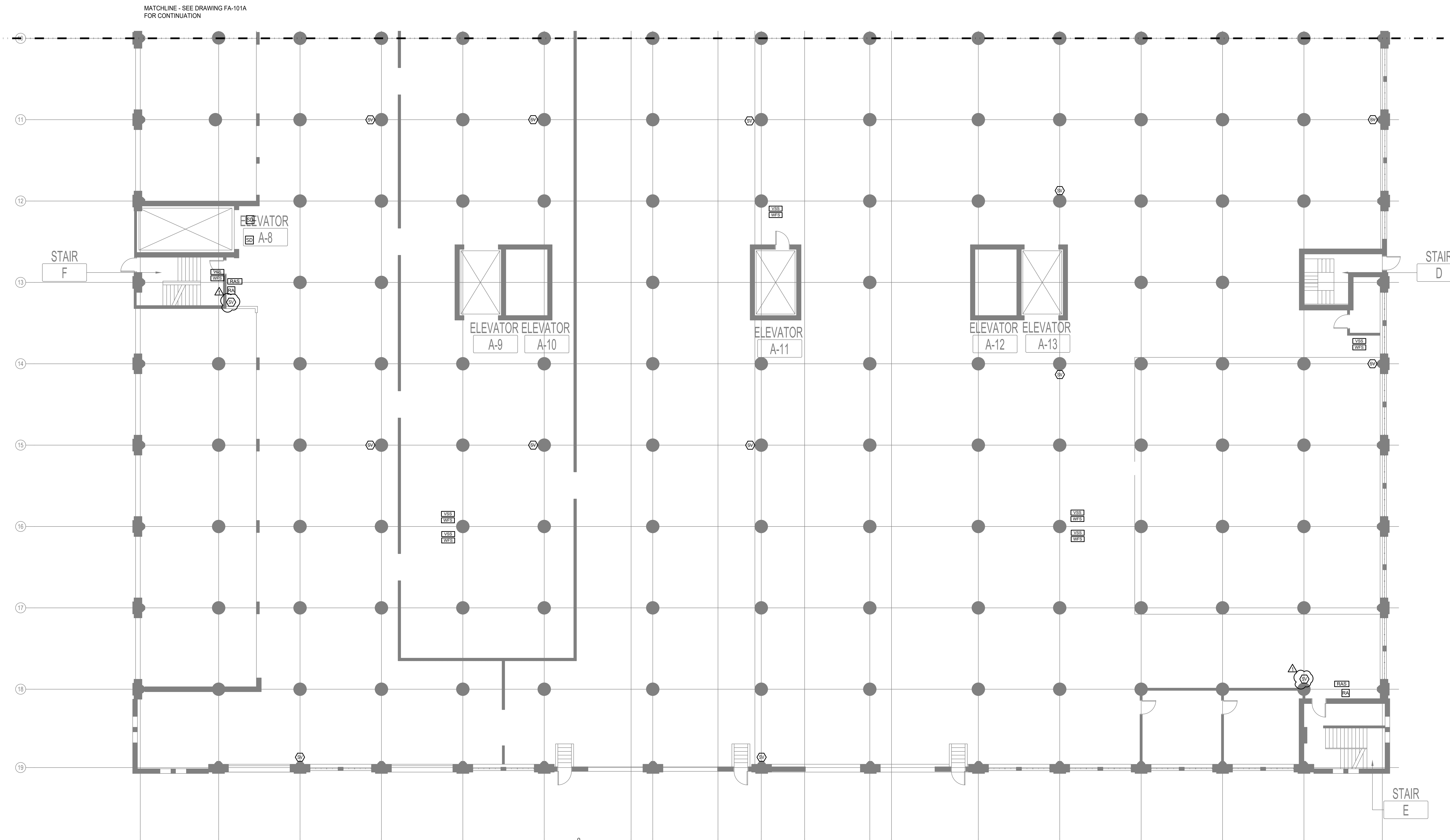
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	△	ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No:
 Project No: #04026
 Title:

FIRE ALARM 1ST FLOOR PLAN - SOUTH

Sheet
FA-101B



1 FIRE ALARM 1ST FLOOR PLAN - SOUTH
 1/8" = 1'-0"

- GENERAL NOTES:
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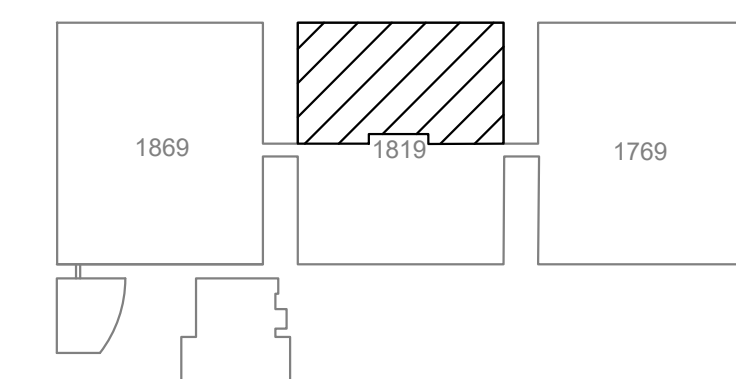
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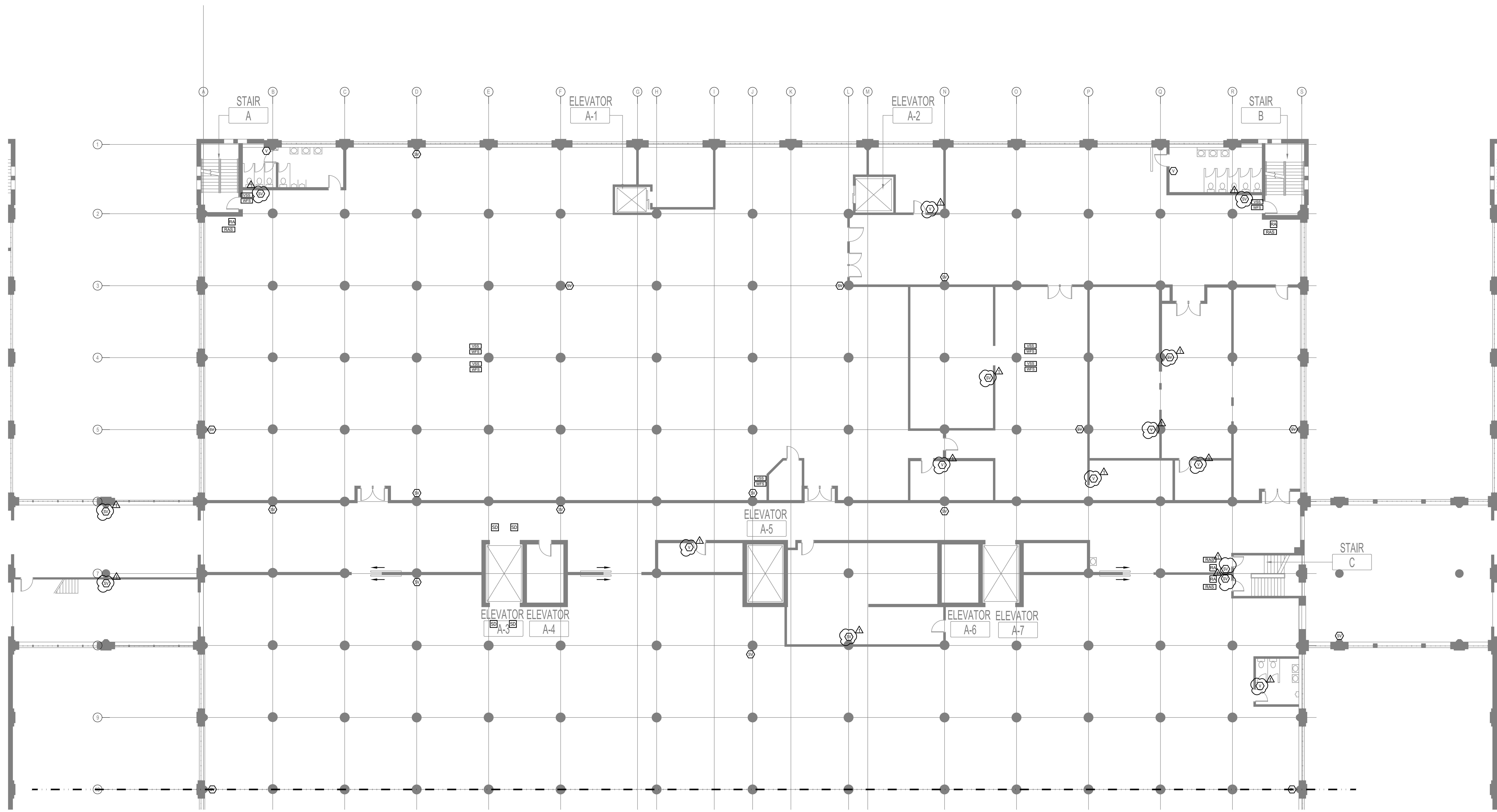
Issued/Revised	Mark	Description	Date
	ISSUE FOR BID		10/25/22
	ADDENDUM 3		12/07/22

PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No:
 Project No: #04026
 Title:



FIRE ALARM 2ND FLOOR PLAN - NORTH

Sheet
FA-102A



MATCHLINE - SEE DRAWING FA-102B FOR CONTINUATION

1 FIRE ALARM 2ND FLOOR PLAN - NORTH
 1/8" = 1'-0"

- GENERAL NOTES:
- REFER TO DRAWING FA01 FOR GENERAL FIRE ALARM NOTES AND SYMBOL LIST
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Architect of Record:
HARDING MODE JOINT VENTURE
 224 SOUTH MICHIGAN AVE
 SUITE 245
 CHICAGO, ILLINOIS 60604
 312.922.2600 T
 312.922.8222 F
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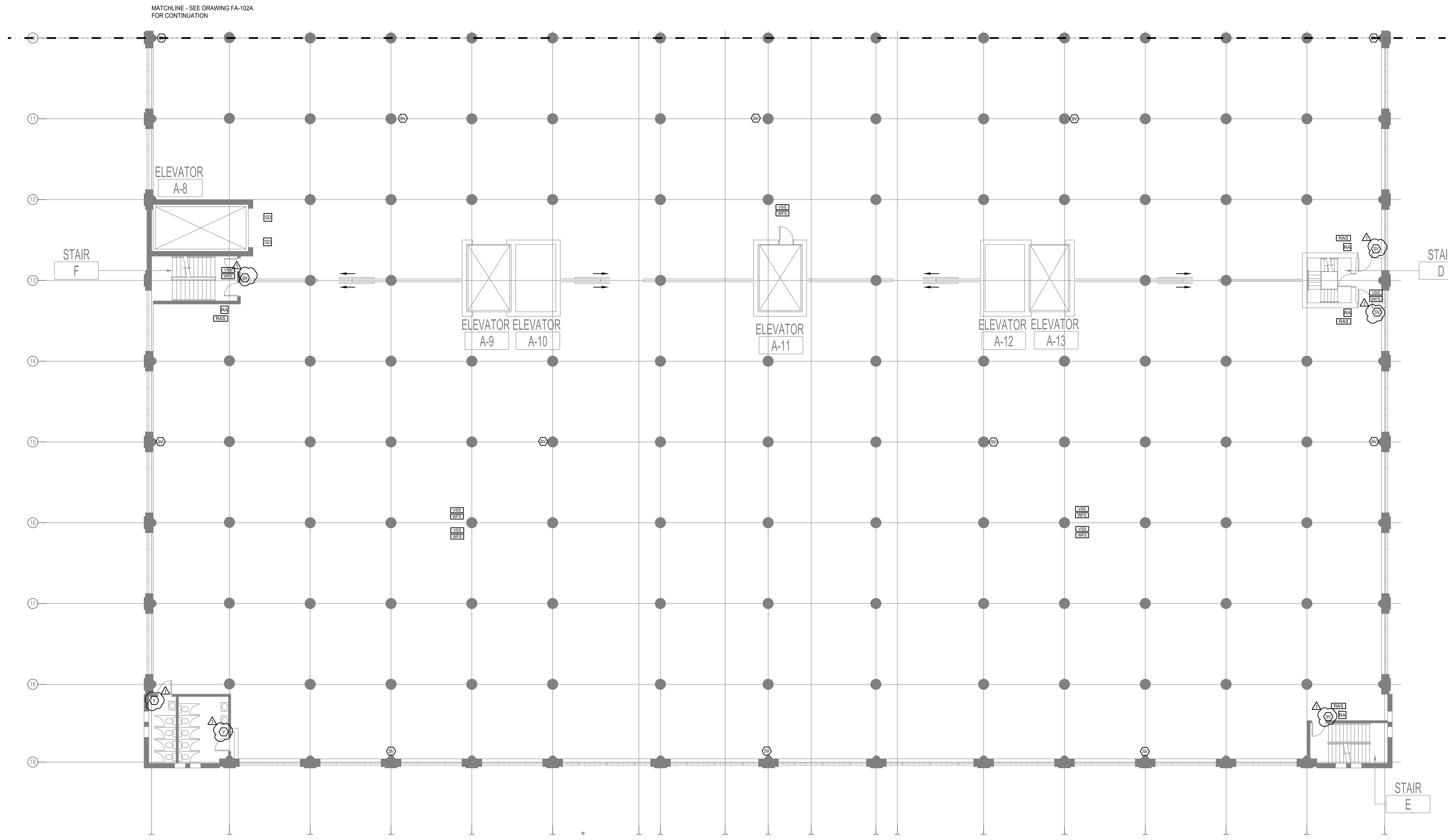
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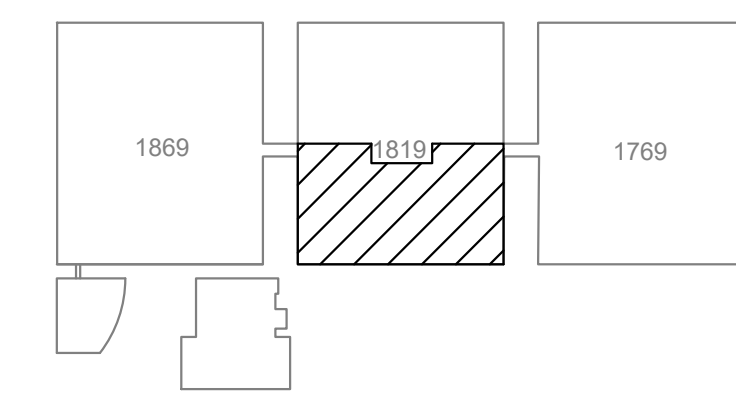
PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No:
 Project No: #04236
 Title:

FIRE ALARM 2ND FLOOR PLAN - SOUTH

Sheet
FA-102B



1 FIRE ALARM 2ND FLOOR PLAN - SOUTH
 1/8" = 1'-0"



- GENERAL NOTES:
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 224 SOUTH MICHIGAN AVE
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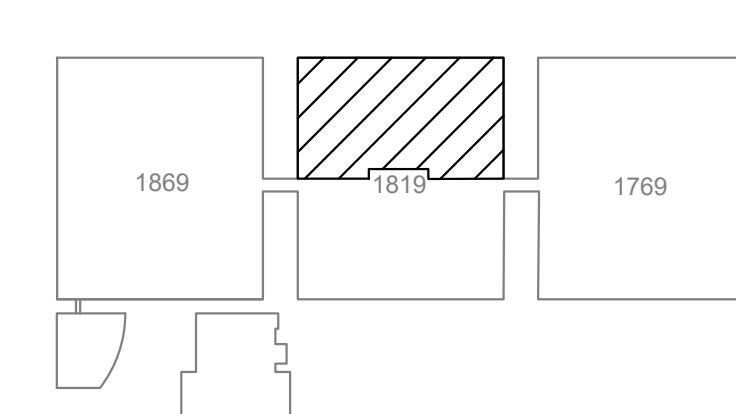
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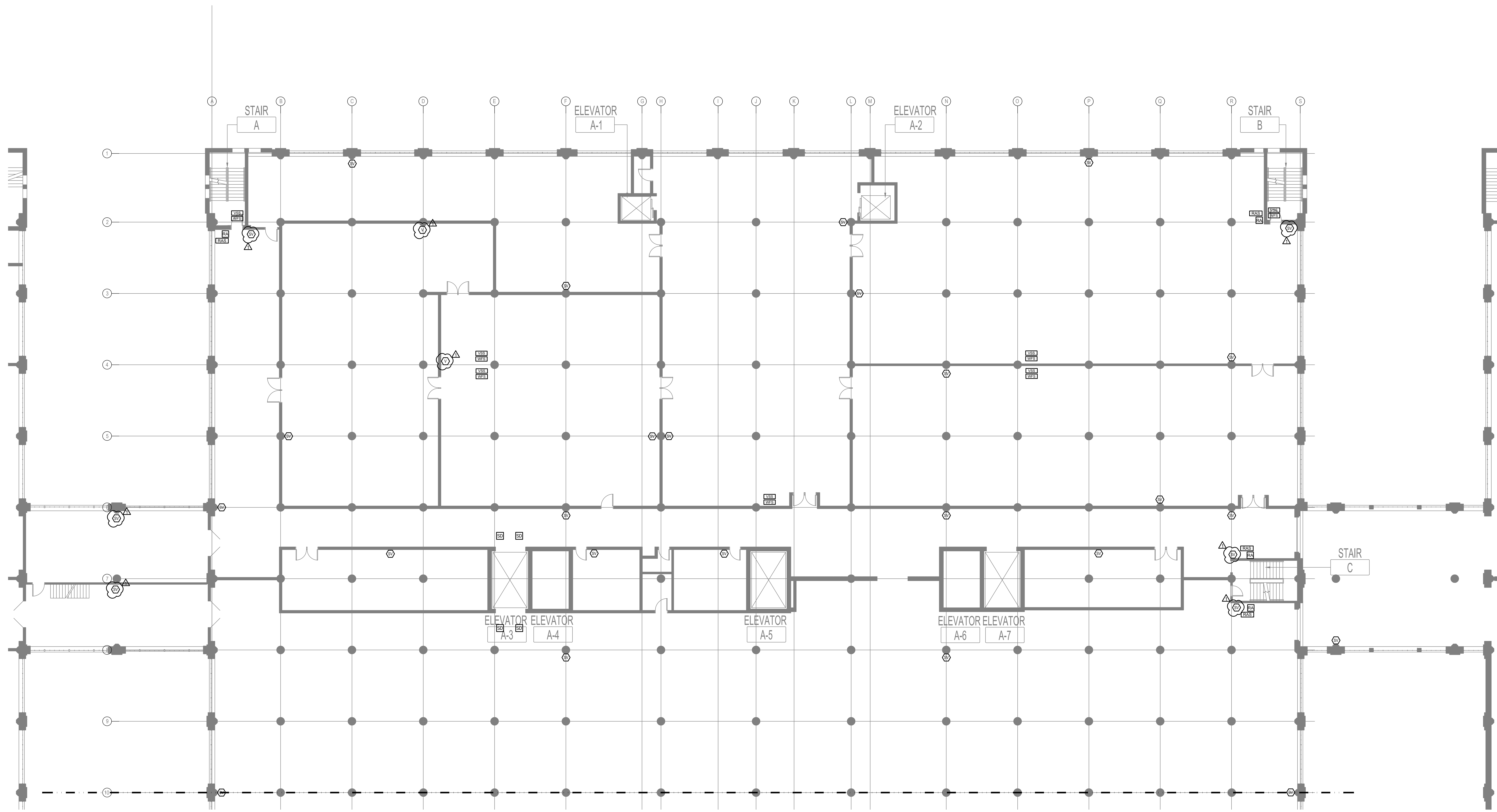
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PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No:
 Project No: #04236
 Title



FIRE ALARM 3RD FLOOR PLAN - NORTH
 Sheet
FA-103A



MATCHLINE - SEE DRAWING FA-103B FOR CONTINUATION

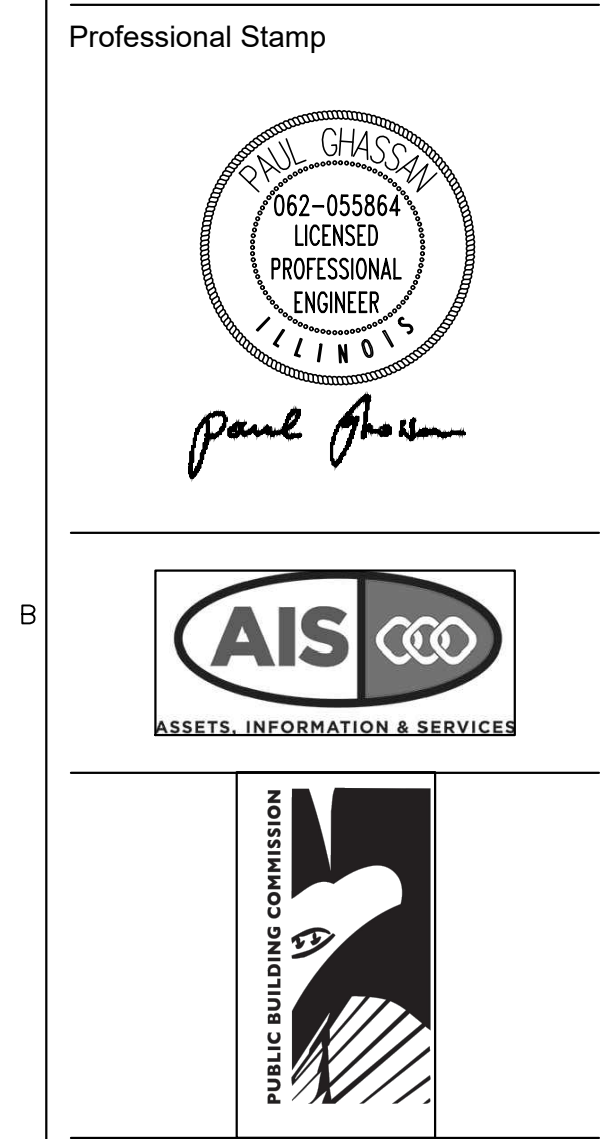
1 FIRE ALARM 3RD FLOOR PLAN - NORTH
 1/8" = 1'-0"

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 SUITE 245
 CHICAGO, ILLINOIS 60604
 312.922.2600 T
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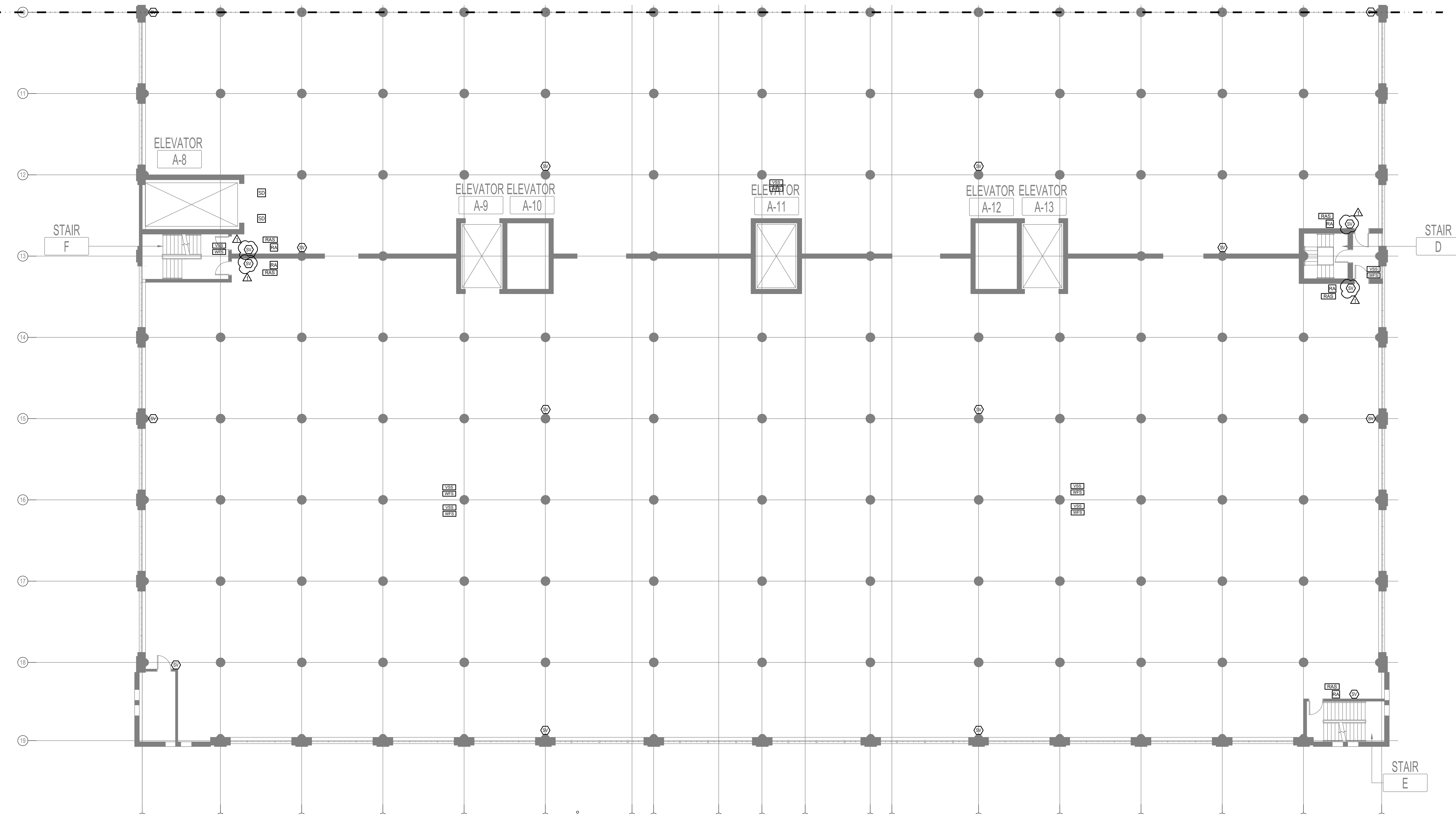
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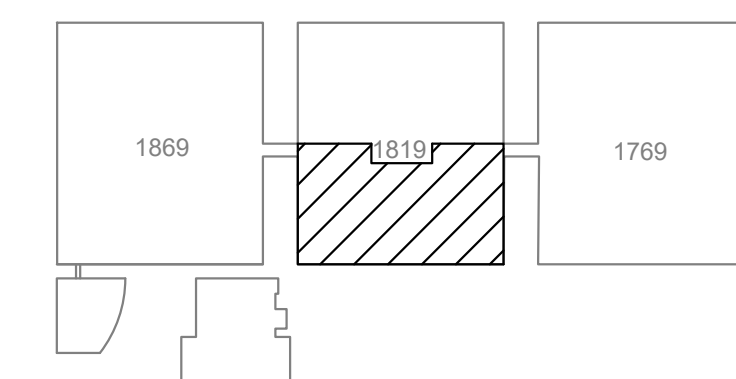
PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No:
 Project No: #04026
 Title:

FIRE ALARM 3RD FLOOR PLAN - SOUTH
 Sheet
FA-103B

MATCHLINE - SEE DRAWING FA-103A FOR CONTINUATION



1 FIRE ALARM 3RD FLOOR PLAN - SOUTH
 1/8" = 1'-0"




- GENERAL NOTES:
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Environmental Notes

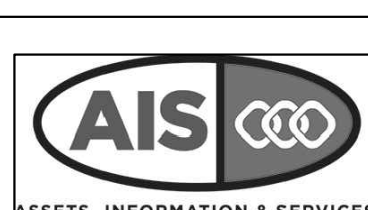

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Professional Stamp



Paul Johnson
Professional Engineer
ILLINOIS

1819 W. PERSHING RENOVATION
 1819 W PERSHING ROAD
 CHICAGO, ILLINOIS 60609
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 CITY OF CHICAGO, MAYOR LORI LIGHTFOOT

Architect of Record:
HARDING MODE JOINT VENTURE
 224 SOUTH MICHIGAN AVE
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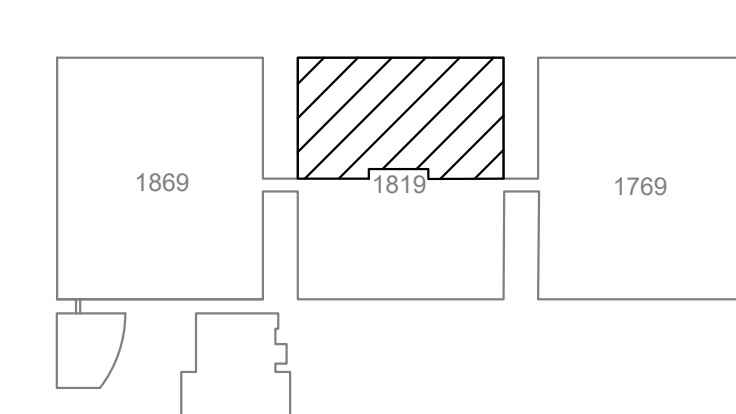
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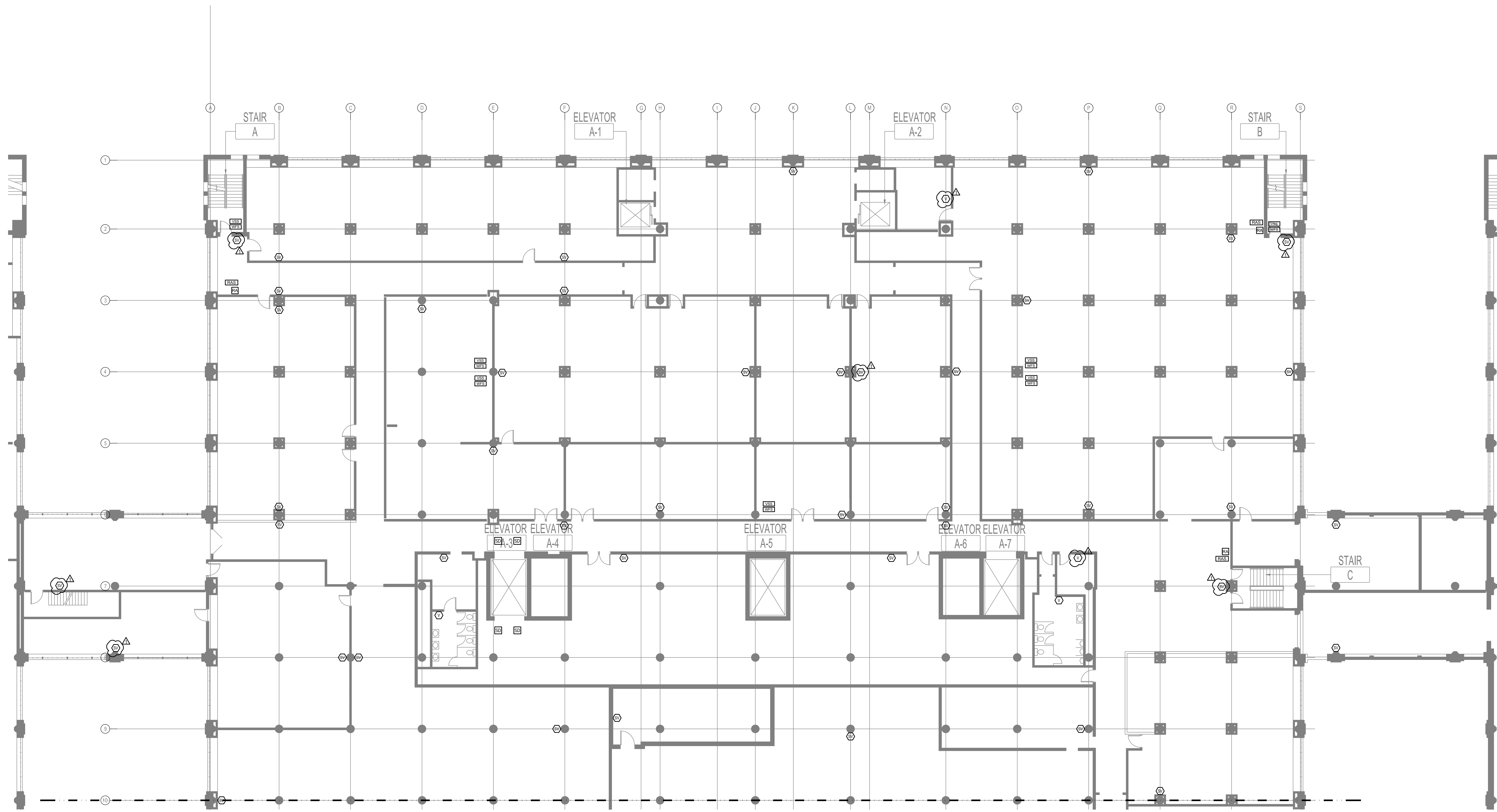
Signature	Mark	Description	Date
		ISSUE FOR BID	10/25/22
	△	ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No:
 Project No: #04236
 Title:



FIRE ALARM 4TH FLOOR PLAN - NORTH

Sheet
FA-104A



MATCHLINE - SEE DRAWING FA-104B FOR CONTINUATION

1 FIRE ALARM 4TH FLOOR PLAN - NORTH
 1/8" = 1'-0"

- GENERAL NOTES:
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HARDING MODE JOINT VENTURE
 224 SOUTH MICHIGAN AVE
 SUITE 245
 CHICAGO, ILLINOIS 60604
 312.922.2600 T
 312.922.8222 F
 www.harding.com
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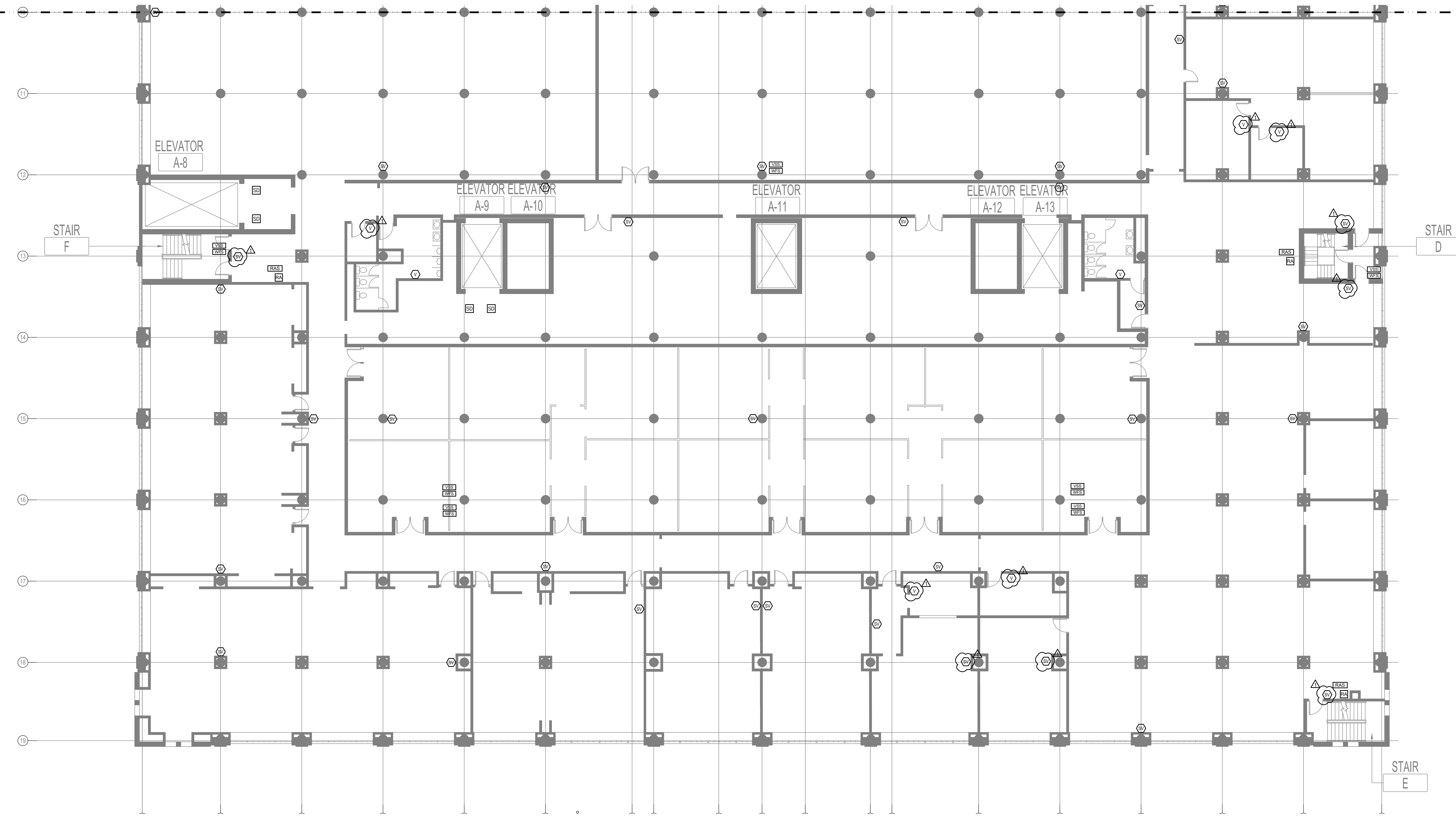
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PBC Project Name: 1819 W. Pershing Renovation
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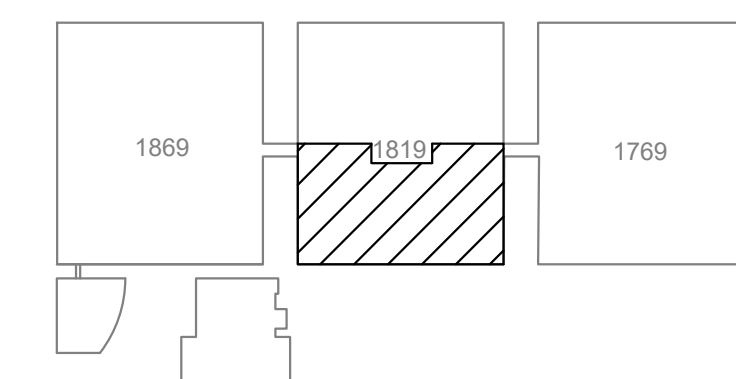
FIRE ALARM 4TH FLOOR PLAN - SOUTH

Sheet
FA-104B

MATCHLINE - SEE DRAWING FA-104A FOR CONTINUATION



1 FIRE ALARM 4TH FLOOR PLAN - SOUTH
 1/8" = 1'-0"



- GENERAL NOTES:
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Professional Stamp

Paul Johnson
Professional Engineer
No. 185584
State of Illinois

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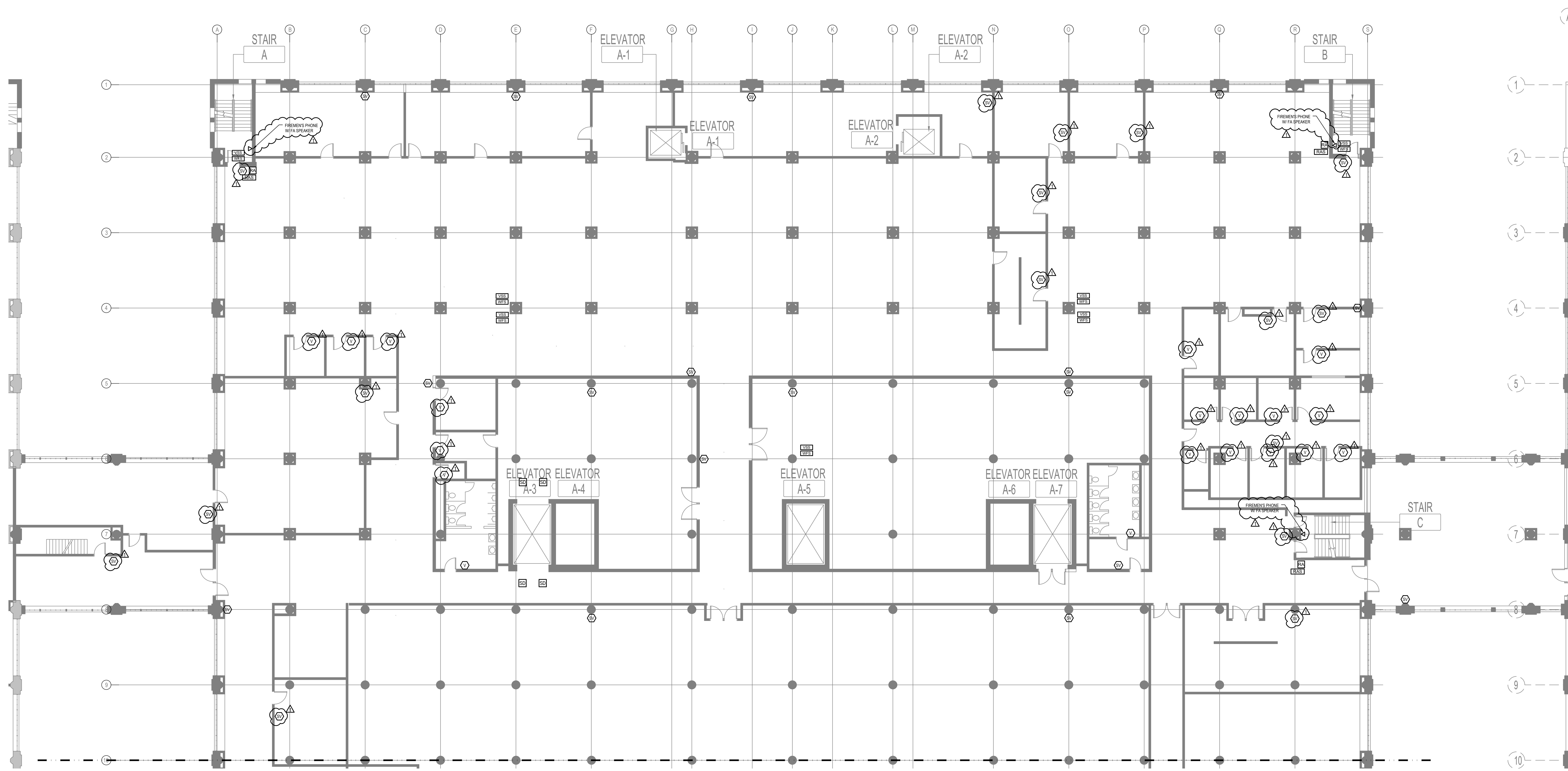
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Issued/Mark	Description	Date
ISSUE FOR BID		10/25/22
ADDENDUM 3		12/07/22

PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No:
 Project No: #04236
 Title:

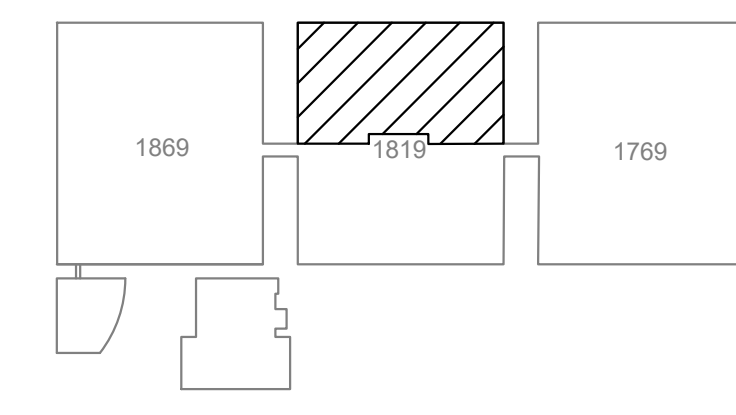
FIRE ALARM 5TH FLOOR PLAN - NORTH

Sheet
FA-105A



MATCHLINE - SEE DRAWING FA-105B FOR CONTINUATION

1 FIRE ALARM 5TH FLOOR PLAN - NORTH
 1/8" = 1'-0"



- GENERAL NOTES:
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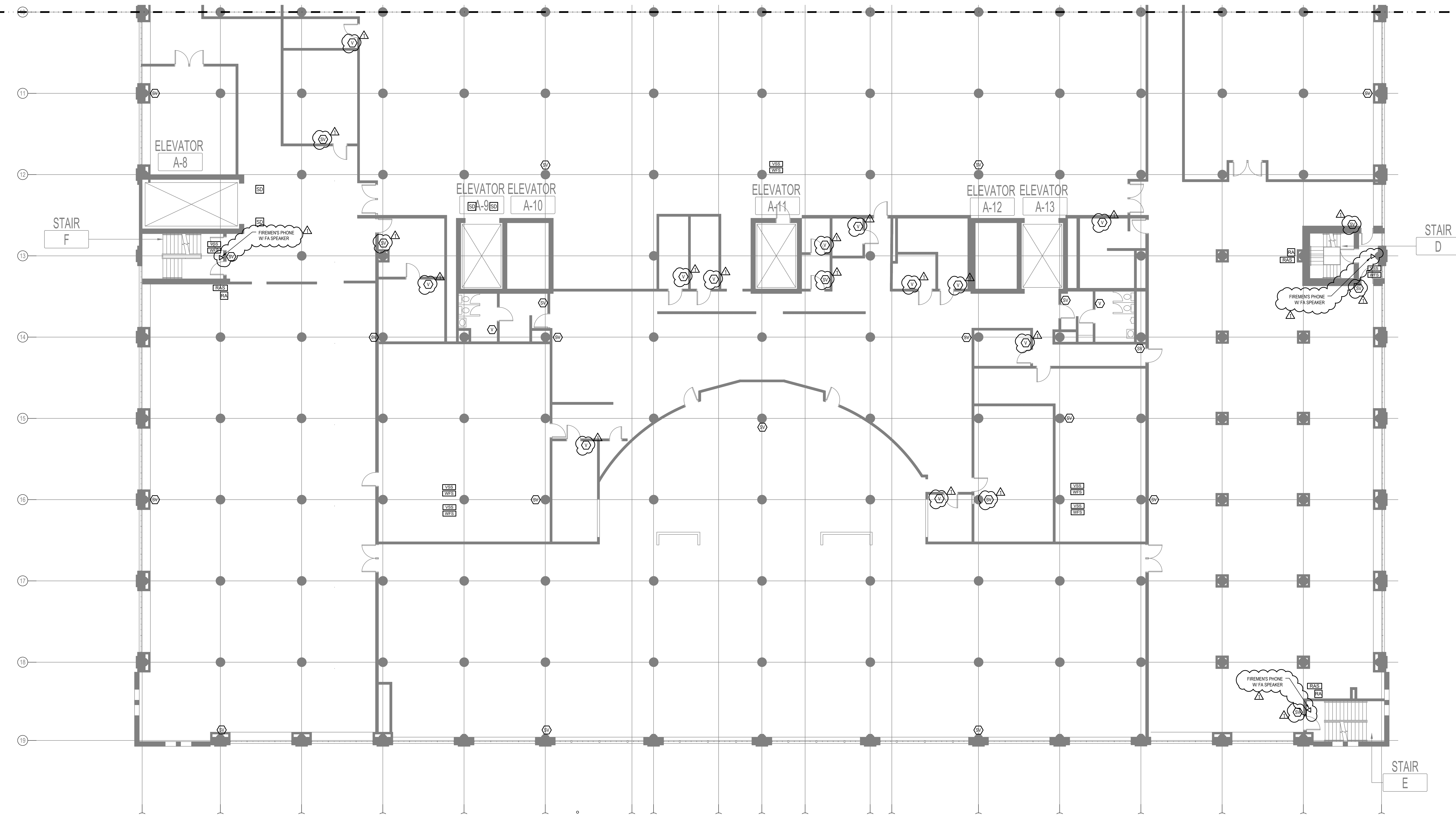
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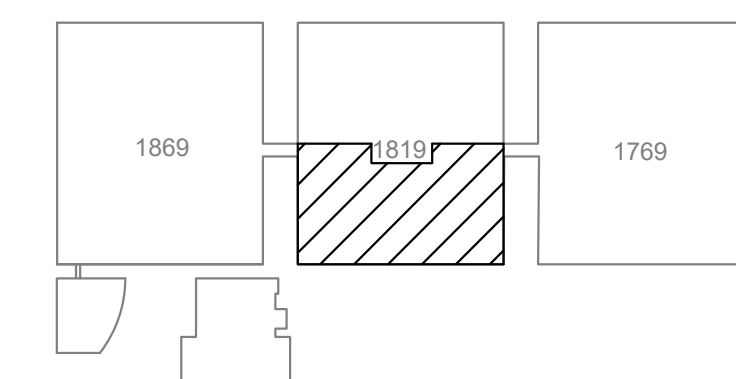
PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No:
 Project No: #04026
 Title:

FIRE ALARM 5TH FLOOR PLAN - SOUTH
 Sheet
FA-105B

MATCHLINE - SEE DRAWING FA-105A FOR CONTINUATION



1 FIRE ALARM 5TH FLOOR PLAN - SOUTH
 1/8" = 1'-0"




- GENERAL NOTES:
- REFER TO DRAWING FA01 FOR GENERAL FIRE ALARM NOTES AND SYMBOL LIST
 - VERIFY FINAL LOCATION OF RESCUE ASSISTANCE DEVICES WITH ARCHITECT BEFORE ROUGH-IN. LOCATION OF RESCUE ASSISTANCE DEVICES SHALL COMPLY WITH CHICAGO CODE.
 - COORDINATE WITH FIRE PROTECTION CONTRACTOR LOCATION OF FIRE ALARM DEVICES SUCH AS: TAMPER SWITCH, FLOW SWITCH ETC.

Environmental Notes

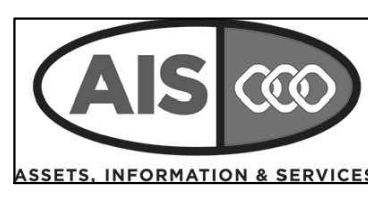

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Architect of Record:
HARDING MODE JOINT VENTURE
 224 SOUTH MICHIGAN AVE
 SUITE 245
 CHICAGO, ILLINOIS 60604
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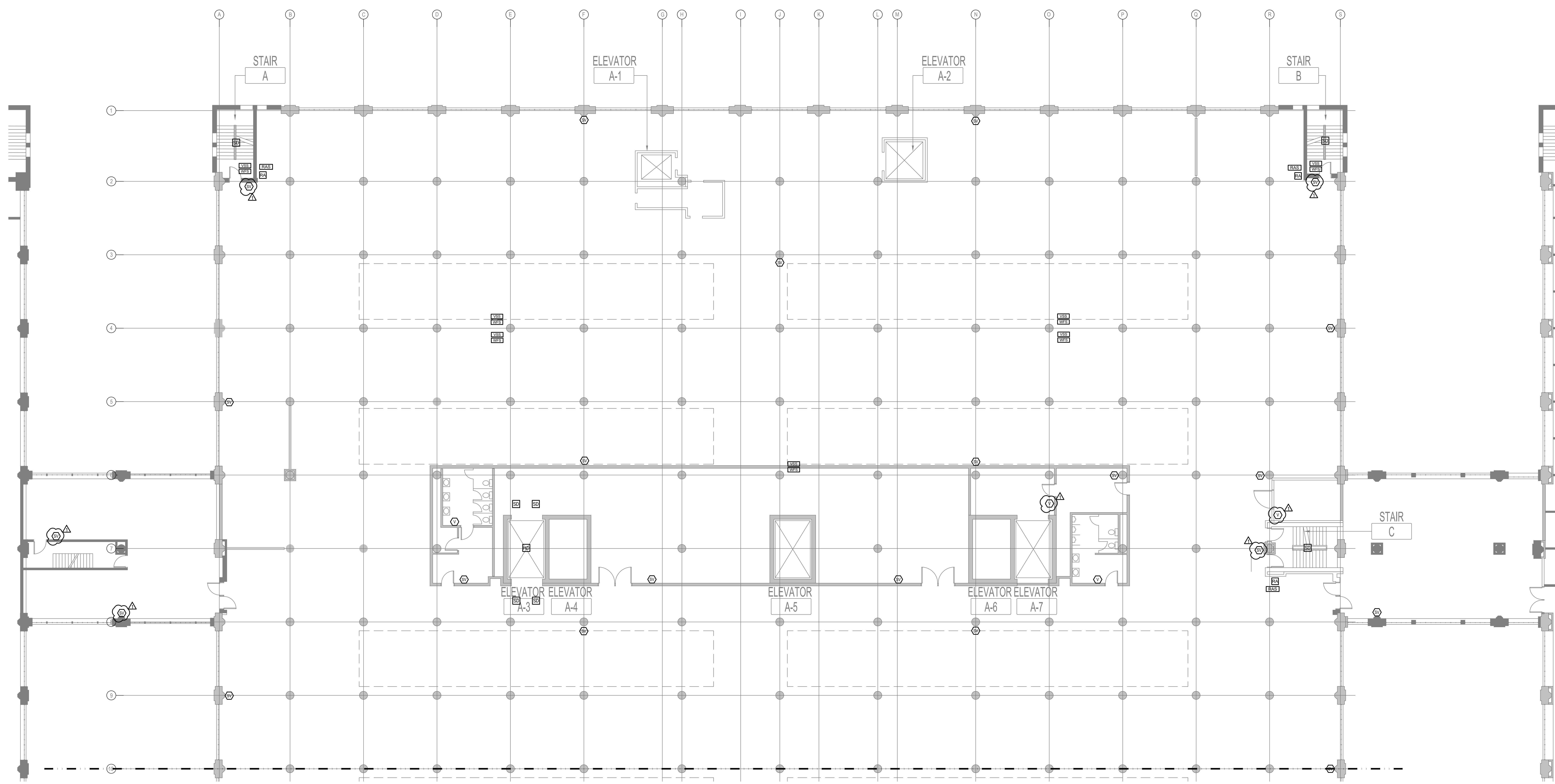
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PBC Project Name: 1819 W. Pershing Renovation
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 Project No: #04026
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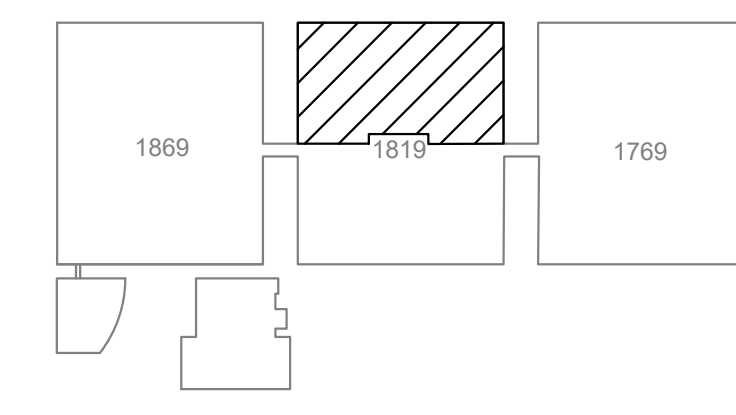
FIRE ALARM 6TH FLOOR PLAN - NORTH

Sheet
FA-106A



MATCHLINE - SEE DRAWING FA-106B FOR CONTINUATION

1 FIRE ALARM 6TH FLOOR PLAN - NORTH
 1/8" = 1'-0"



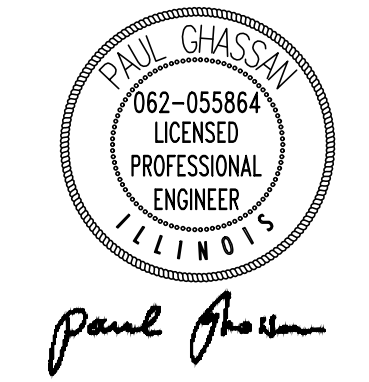
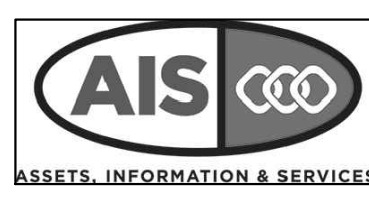

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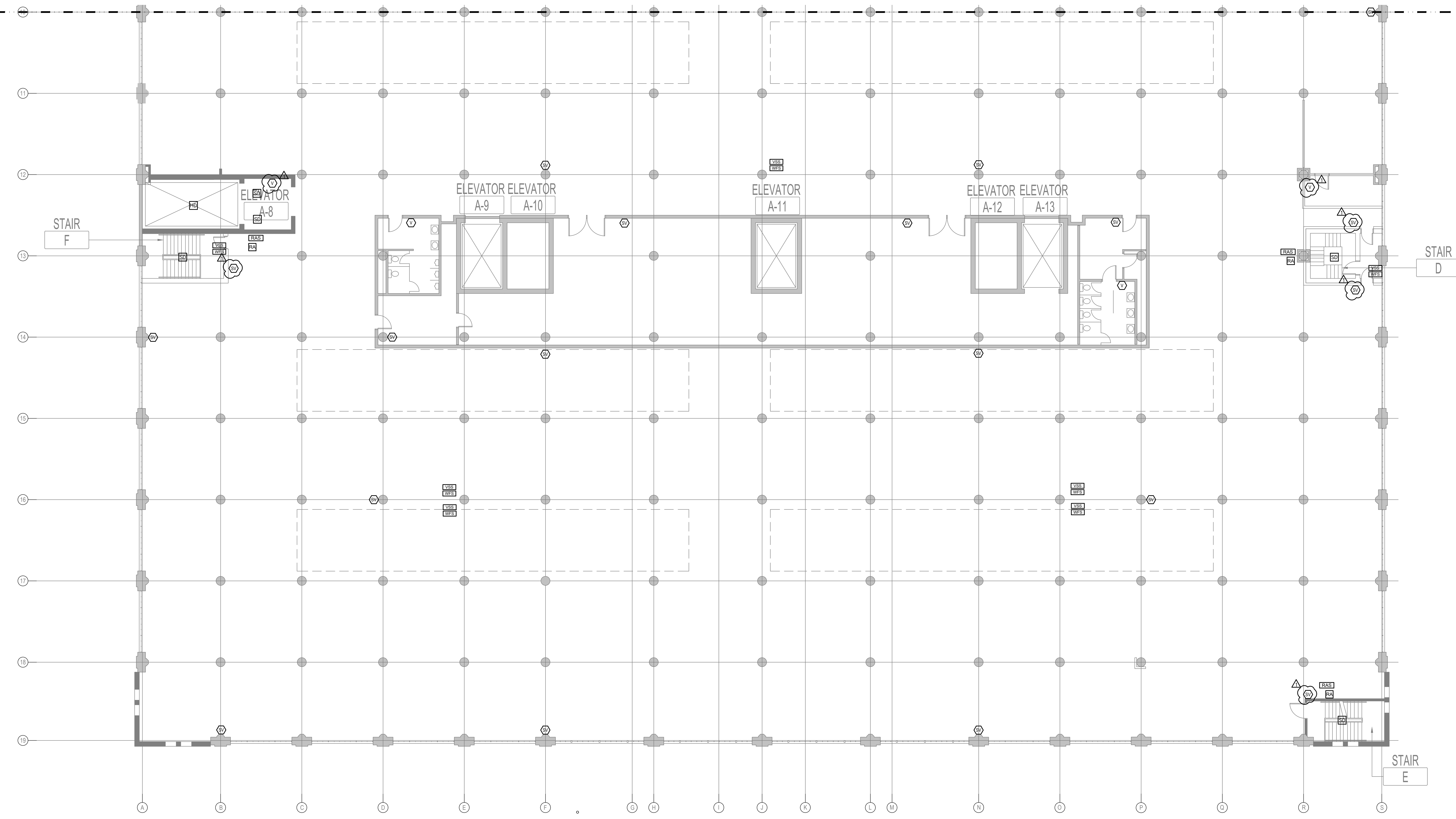
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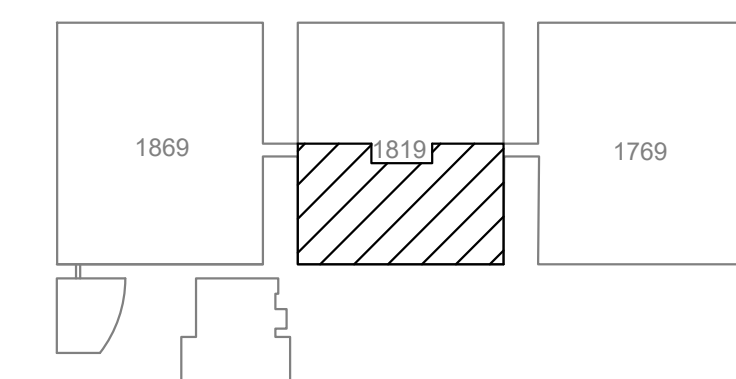
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FIRE ALARM 6TH FLOOR PLAN - SOUTH
 Sheet
FA-106B

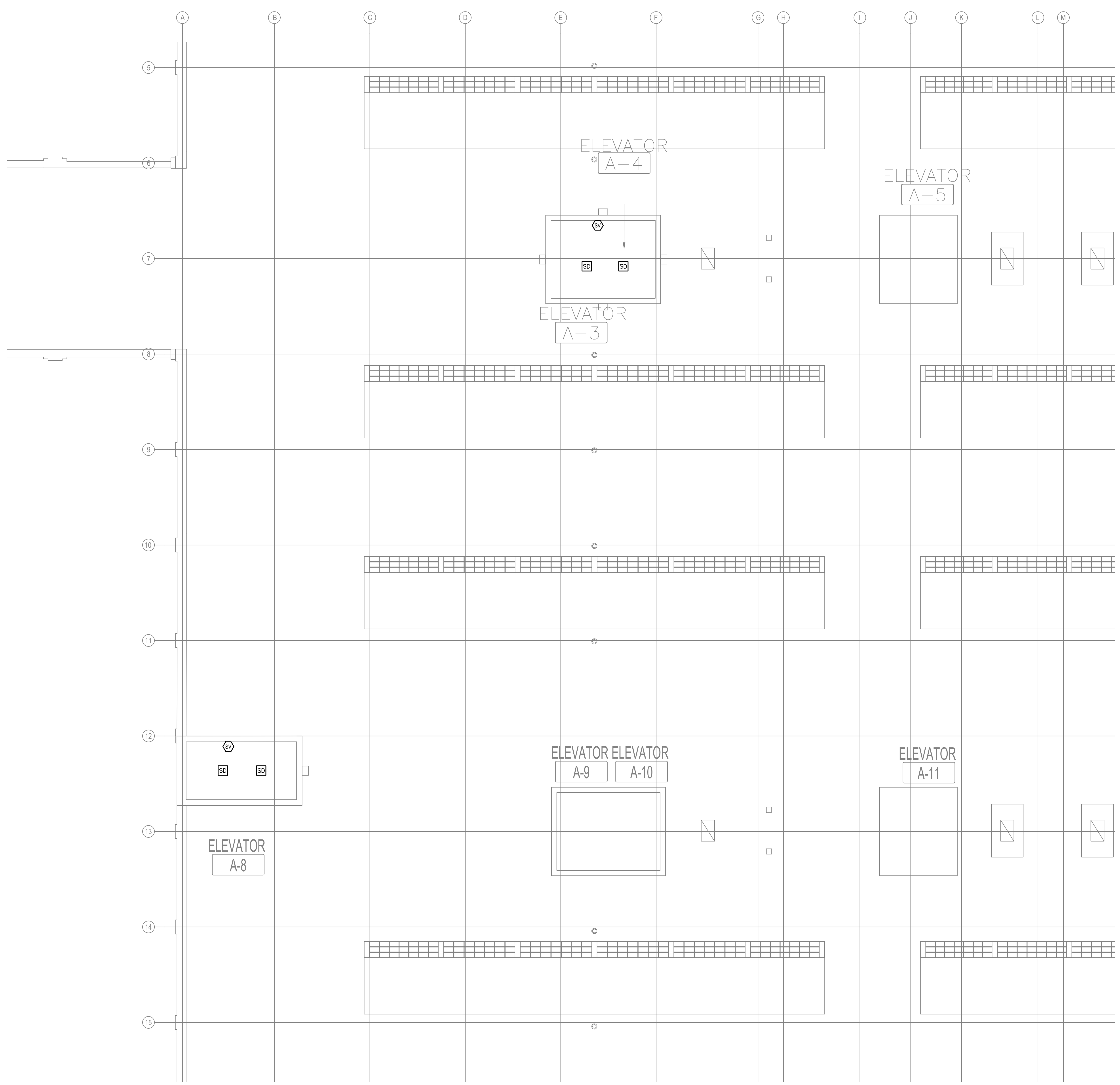
MATCHLINE - SEE DRAWING FA-106A FOR CONTINUATION



1 FIRE ALARM 6TH FLOOR PLAN - SOUTH
 1/8" = 1'-0"



- GENERAL NOTES:
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1 FIRE ALARM ROOF PLAN - PARTIAL
1/8" = 1'-0"

Environmental Notes

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Architect of Record:
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		ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation

PBC Contract No:

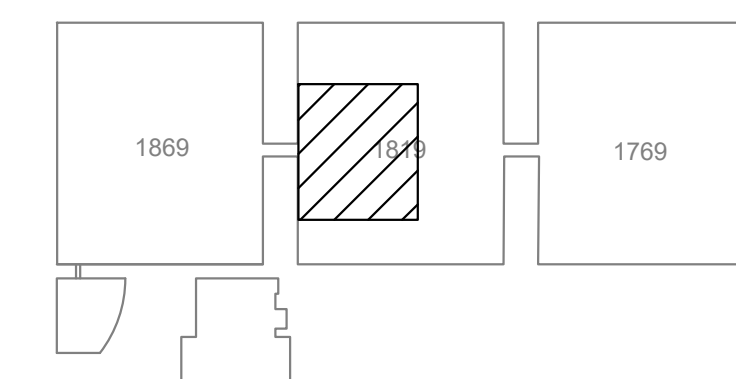
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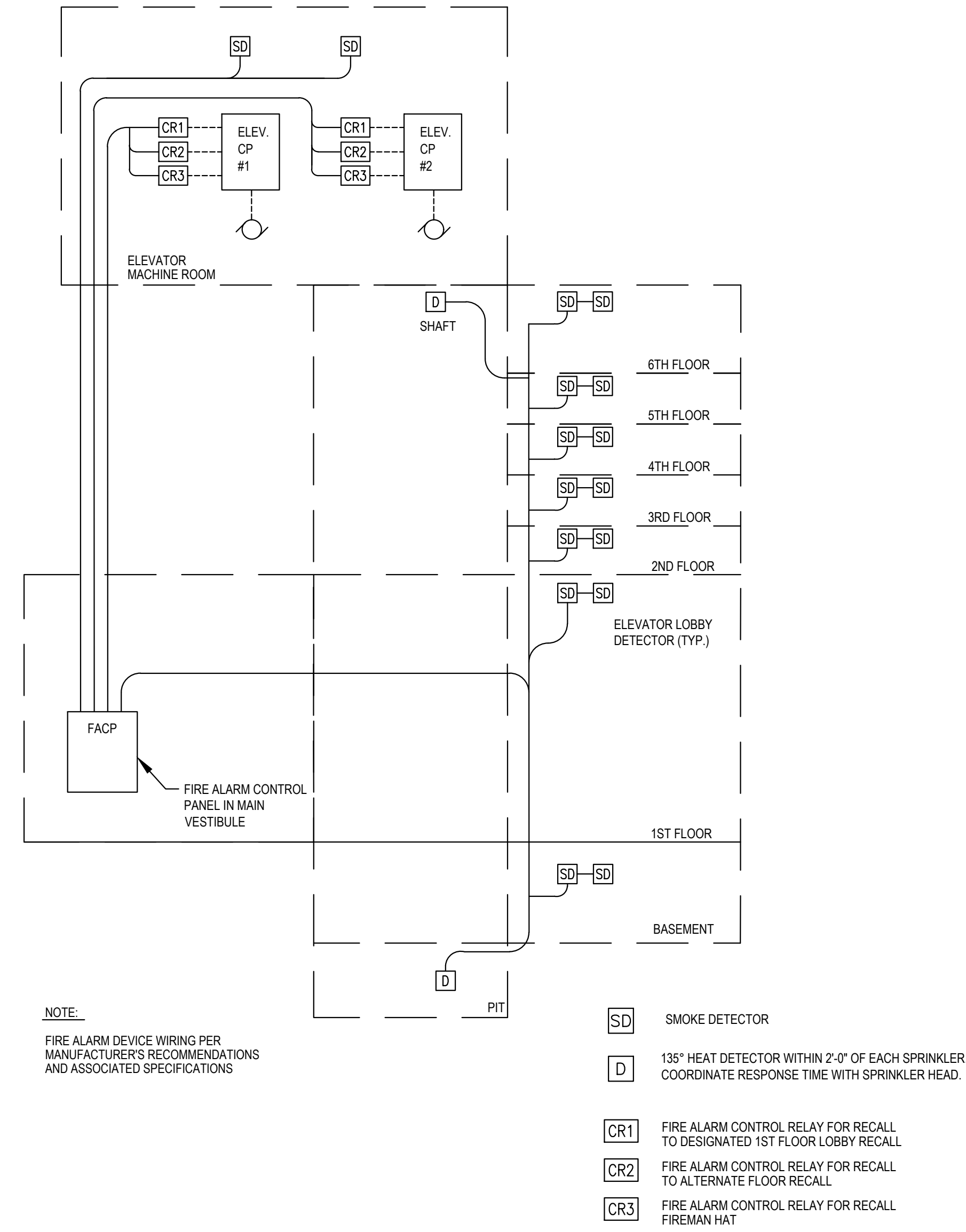
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FIRE ALARM ROOF PLAN - PARTIAL

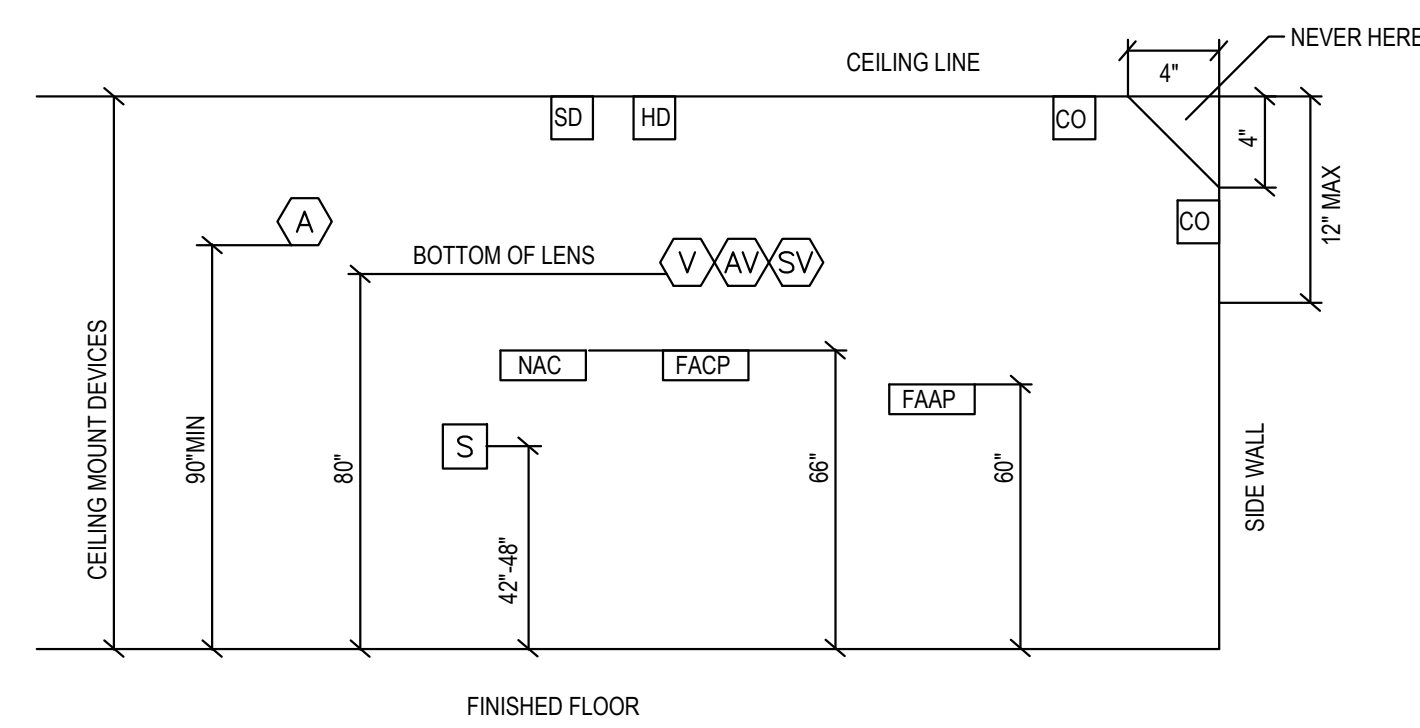
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FA-107

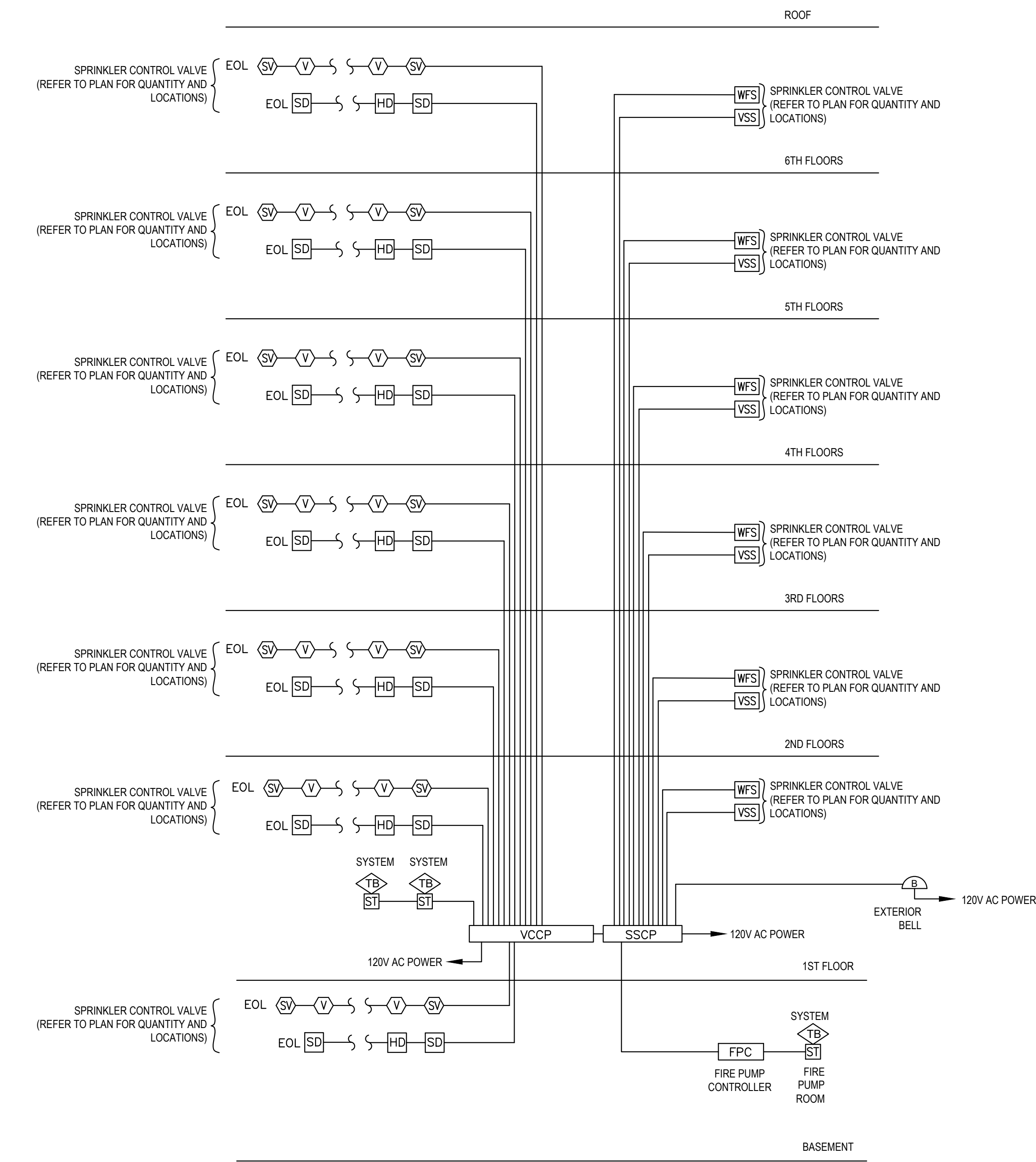




3 TYPICAL ELEVATOR RECALL DIAGRAM
NOT TO SCALE

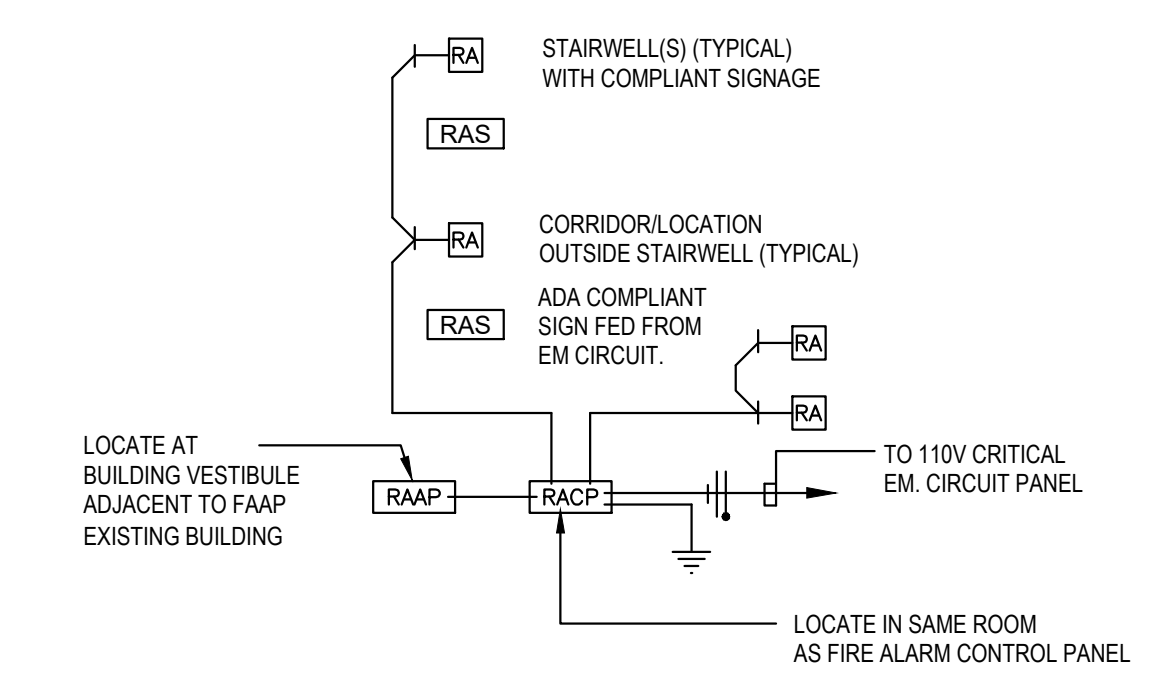


4 FIRE ALARM DEVICE MOUNTING HEIGHT DIAGRAM
NOT TO SCALE



ROSER DIAGRAM IS DIAGRAMMATIC AND IS SHOWN TO PROVIDE A GENERAL OVERVIEW OF MAJOR SYSTEM COMPONENTS AND THEIR INTERCONNECTION. THIS DIAGRAM IS NOT TO BE USED FOR FIELD INSTALLATION PURPOSES.
 FIRE ALARM CONTRACTOR IS RESPONSIBLE FOR PREPARING PERMIT SET DRAWINGS FOR CITY APPROVAL. ALL WORK SHALL COMPLY WITH NFPA AND CHICAGO FIRE PREVENTION BUREAU

1 FIRE ALARM SINGLE LINE DIAGRAM
NOT TO SCALE



- NOTES:**
- PROVIDE FOUR (4) 18 GAUGE (MINIMUM) CONDUCTORS BETWEEN EACH RESCUE ASSISTANCE ILLUMINATION (RA) AND THE RESCUE ASSISTANCE ANNUNCIATOR PANEL.
 - PROVIDE TWO (2) 18 GAUGE (MINIMUM) CONDUCTORS BETWEEN POWER SUPPLY AND ANNUNCIATOR PANEL.
 - PROVIDE A ZONE CONTROL AND ANNUNCIATOR PANEL AND BATTERY BACK-UP SIZED FOR NUMBER OF AREAS SPECIFIED.
 - DETAIL IS A DIAGRAMMATIC SCHEMATIC TO GENERALLY INDICATE SYSTEM COMPONENTS AND SYSTEM DISTRIBUTION. REFER TO DRAWING PLANS FOR LOCATION AND QUANTITIES.
 - MOUNT RESCUE ASSISTANCE ILLUMINATION DOUBLE FACE OR SINGLE FACE SIGNAGE FROM CEILING WHERE APPLICABLE OR WALL MOUNTED 87" AFF. PROVIDE POWER FOR SIGNAGE FROM LIFE SAFETY EMERGENCY POWER.

1 TYPICAL RESCUE ASSISTANCE SYSTEMS
NOT TO SCALE

Environmental Notes
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 ENGINEER
 ILLINOIS
Paul Ghassem

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Architect of Record:
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 224 SOUTH MICHIGAN AVE
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 312.922.2600 T
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PBC Project Name: 1819 W. Pershing Renovation
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 Project No: #04028
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FIRE ALARM DIAGRAMS

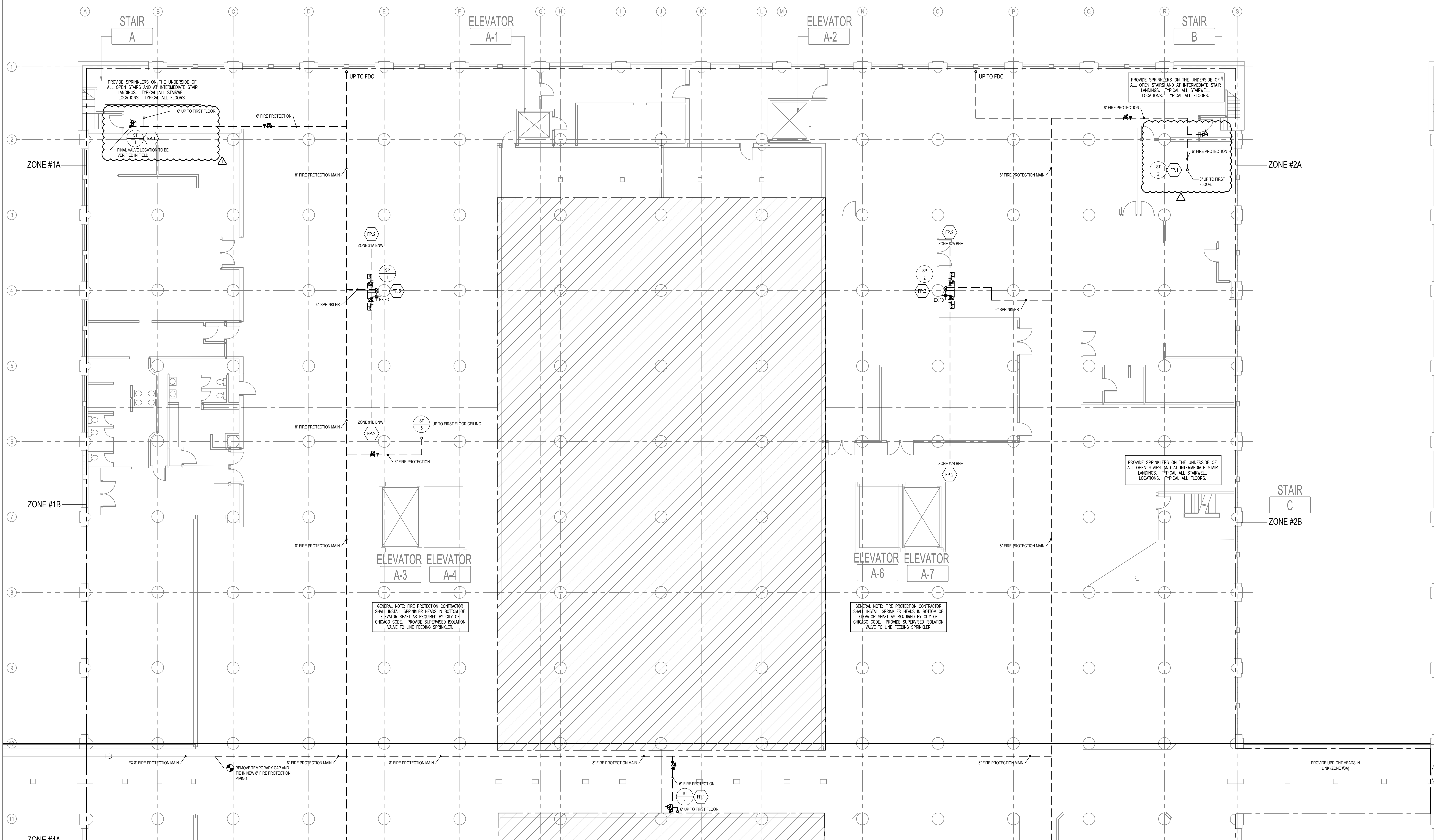
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FA-301

FIRE PROTECTION KEYED NOTES

FP.1 NEW STANDPIPE UP AND DN. PROVIDE 2-1/2" CITY OF CHICAGO APPROVED ANGLE VALVE, ARM OVER FROM RISER INTO STAIRWELL AT CORNER RISERS. LOCATE AT APPROVED HEIGHT. FINAL LOCATION OF STANDPIPE RISERS TO BE COORDINATED BY STRUCTURAL ANALYSIS OF CORE LOCATIONS. NO NEW CORING TO BE DONE WITHOUT PRIOR APPROVAL FROM A LICENSED STRUCTURAL ENGINEER.

FP.2 4" SPRINKLER MAIN. PROVIDE SPRINKLERS AND BRANCH PIPING PER HYDRAULIC CALCULATIONS. COORDINATE ROUTING WITH EXISTING/NEW EQUIPMENT AND STRUCTURE. PROVIDE NEW HANGERS. INSTALL ALL SPRINKLER PIPING AND HEADS AT MAXIMUM HEADROOM TO ALLOW FOR FORKLIFT OPERATION.

FP.3 NEW SPRINKLER RISER UP AND DN. REUSE EXISTING CORES. NEW MAIN DRAIN TO BE DROPPED AT EXISTING FLOOR DRAIN LOCATION.



1 FIRE PROTECTION BASEMENT PLAN - NORTH
1/8" = 1'-0"

Environmental Notes

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SUITE 245
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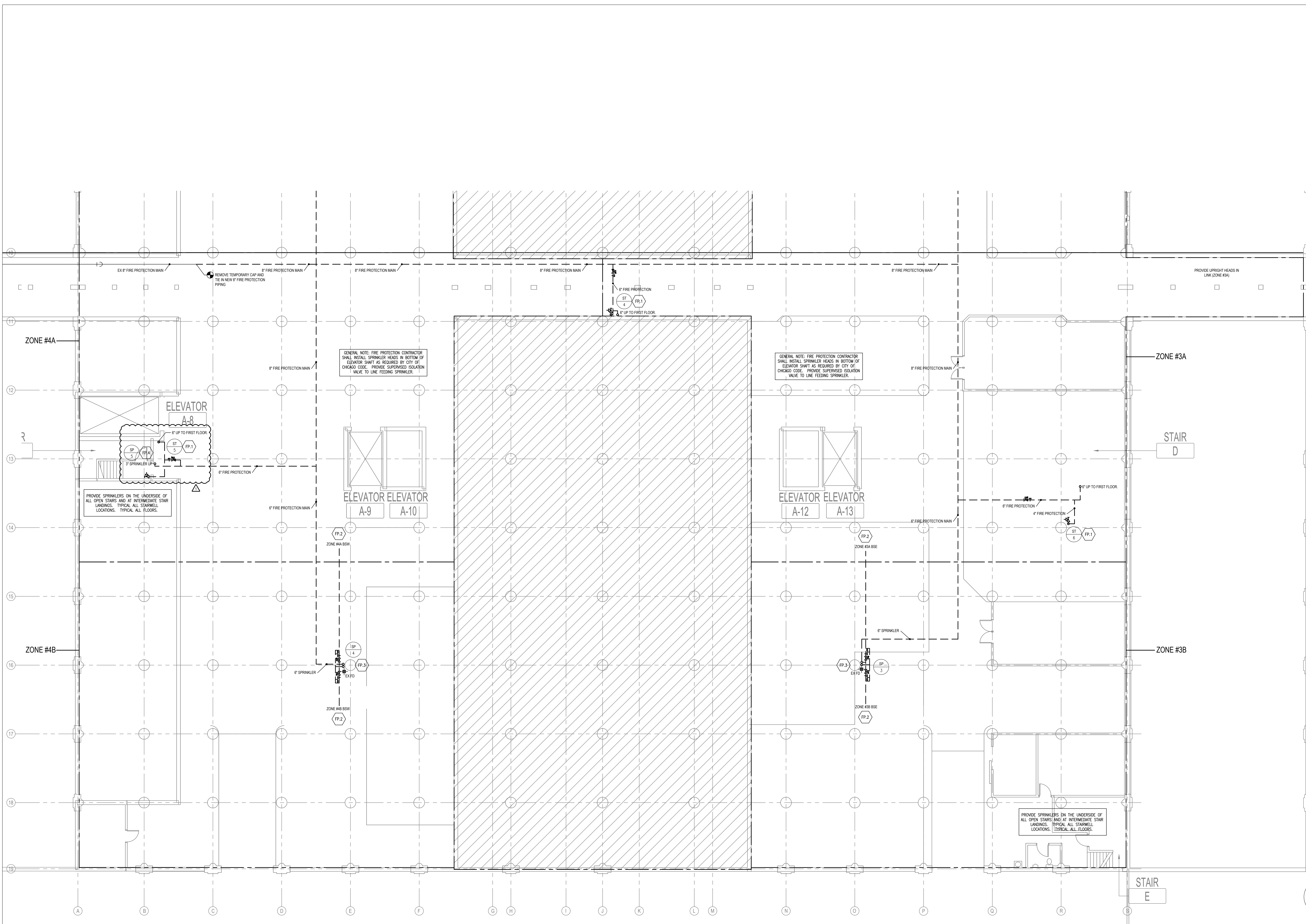
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FIRE PROTECTION BASEMENT PLAN - NORTH

Sheet
FP-100A



1 FIRE PROTECTION BASEMENT PLAN - SOUTH
 1/8" = 1'-0"

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FP.3 NEW SPRINKLER RISER UP AND DN. REUSE EXISTING CORES. NEW MAIN DRAWN TO BE DROPPED AT EXISTING FLOOR DRAIN LOCATION.

FP.4 3" SPRINKLER RISER UP TO NEW DRY VALVE.

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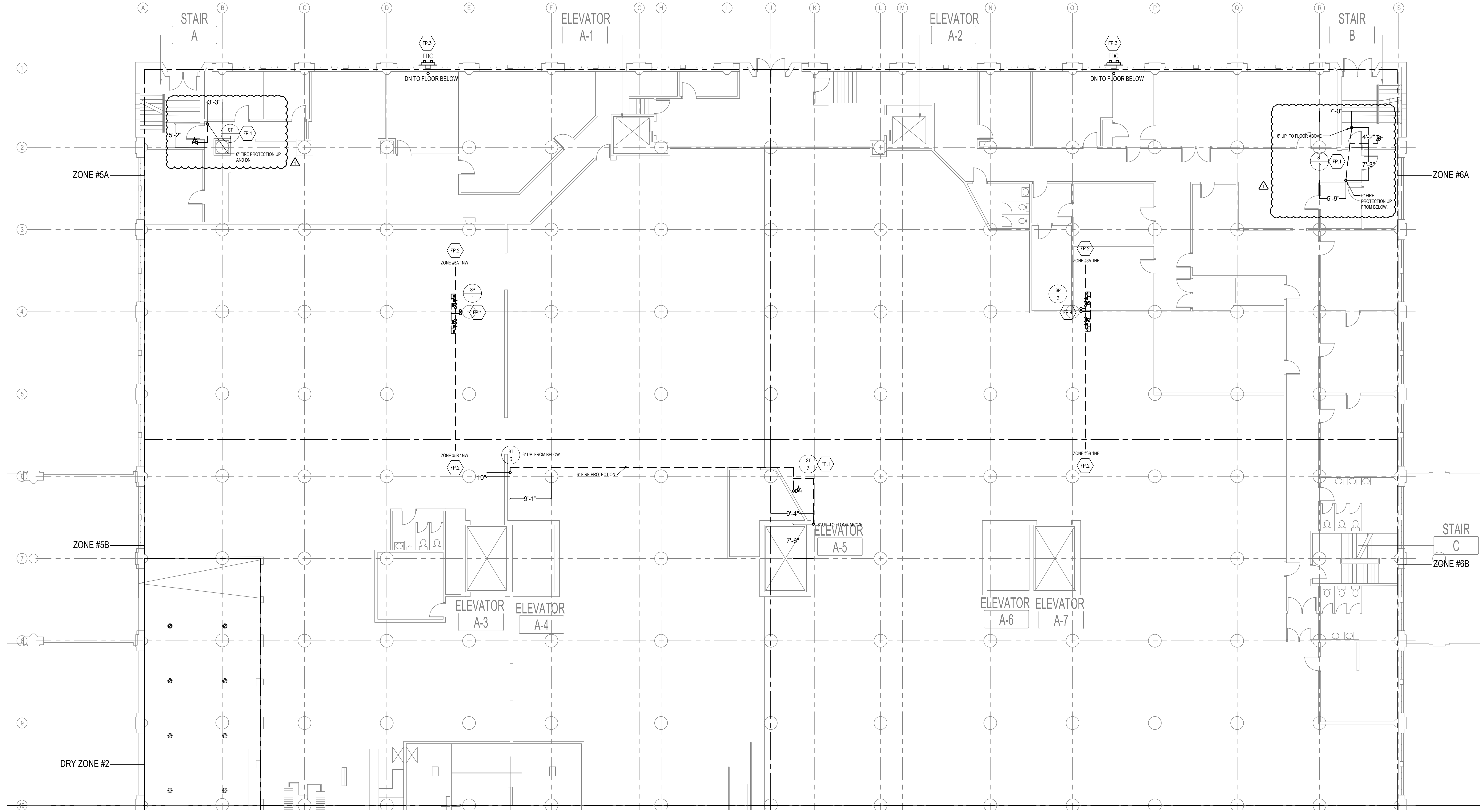
PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No: #04026
 Project No: #04026
 Title

FIRE PROTECTION BASEMENT PLAN - SOUTH

Sheet
FP-100B

FIRE PROTECTION KEY NOTES:

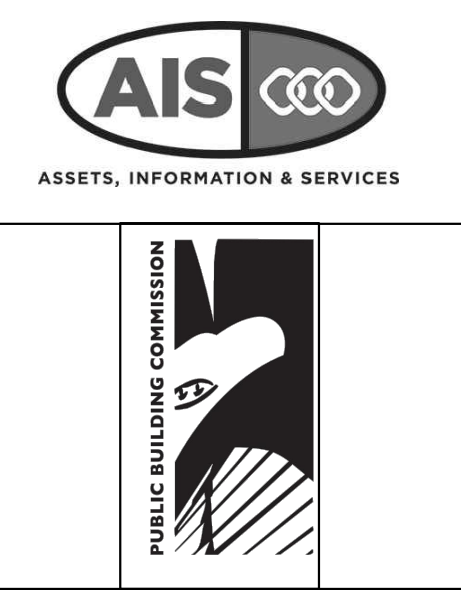
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- FP.3 PROVIDE NEW FIRE DEPARTMENT CONNECTION PER CITY OF CHICAGO STANDARDS.
- FP.4 NEW SPRINKLER RISER AND MAIN DRAIN UP AND DN. REUSE EXISTING CORES.



1 FIRE PROTECTION 1ST FLOOR PLAN - NORTH
1/8" = 1'-0"

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 Project No: #04026
 Title

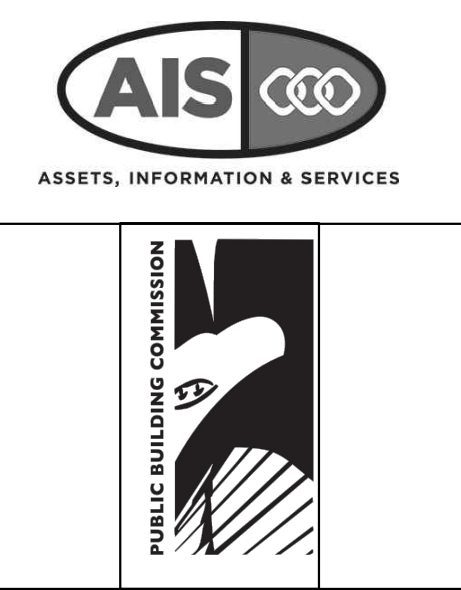
FIRE PROTECTION 1ST FLOOR PLAN - NORTH

Sheet
FP-101A

Environmental Notes
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Architect of Record:
HARDING MODE JOINT VENTURE

224 SOUTH MICHIGAN AVE
 SUITE 245
 CHICAGO, ILLINOIS 60604
 312.922.2600 T
 312.922.8222 F
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 303 East Wacker Drive, Suite 303
 Chicago, IL 60601
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 175 North Franklin Street, Suite 410
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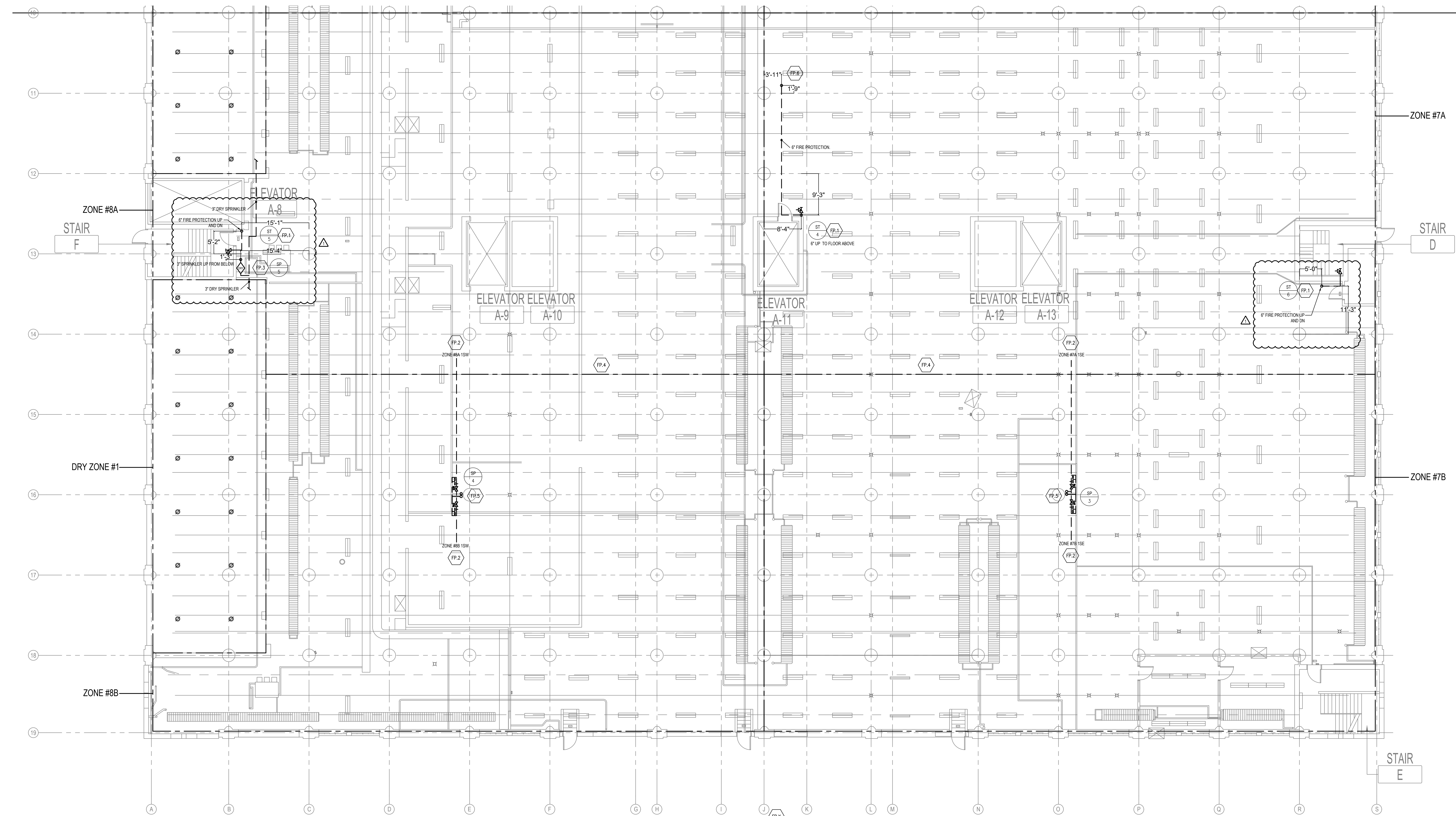
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Significance	Mark	Description	Date
		ISSUE FOR BID	10/25/22
Δ		ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation
 PBC Contract No:
 Project No: #04026
 Title

FIRE PROTECTION 1ST FLOOR PLAN - SOUTH

Sheet
FP-101B



- FIRE PROTECTION KEY NOTES**
- FP.1 NEW STANDPIPE UP AND DN. PROVIDE 2-1/2\" CITY OF CHICAGO APPROVED ANGLE VALVE, ARM OVER FROM RISER INTO STAIRWELL AT CORNER RISERS. LOCATE AT APPROVED HEIGHT. FINAL LOCATION OF STANDPIPE RISERS TO BE COORDINATED BY STRUCTURAL ANALYSIS OF CORE LOCATIONS. NO NEW CORING TO BE DONE WITHOUT PRIOR APPROVAL FROM A LICENSED STRUCTURAL ENGINEER.
 - FP.2 4\" SPRINKLER MAIN. PROVIDE SPRINKLERS AND BRANCH PIPING PER HYDRAULIC CALCULATIONS. COORDINATE ROUTING WITH EXISTING/NEW EQUIPMENT AND STRUCTURE. PROVIDE NEW HANGERS. LOCATE MAIN DRAIN TO MATCH EXISTING. INSTALL ALL SPRINKLER PIPING AND HEADS AT MAXIMUM HEADROOM TO ALLOW FOR FOLSPLIT OPERATION.
 - FP.3 PROVIDE DRY VALVE FOR LOADING DOCK HEADS. LOCATED DRY VALVE AND AIR COMPRESSOR AT SAME LOCATION OF EXISTING. PROVIDE APPROVED SPRINKLER HEADS AT LOADING DOCK.
 - FP.4 NEW WORK REFLECTED CEILING PLAN SHOWN AT SOUTH BAY FOR REFERENCE IN ROUTING NEW SPRINKLER HEADS AND BRANCH PIPING. COORDINATE NEW INSTALLATION WITH LIGHTING, DUCTWORK, ETC.
 - FP.5 NEW SPRINKLER RISER AND MAIN DRAIN UP AND DN. REUSE EXISTING CORES.
 - FP.6 6\" STANDPIPE UP FROM BELOW. PIPE ROUTE IS AWAY FROM COLUMN. PROTECT WITH BOLLARDS AND SECURE PIPE.

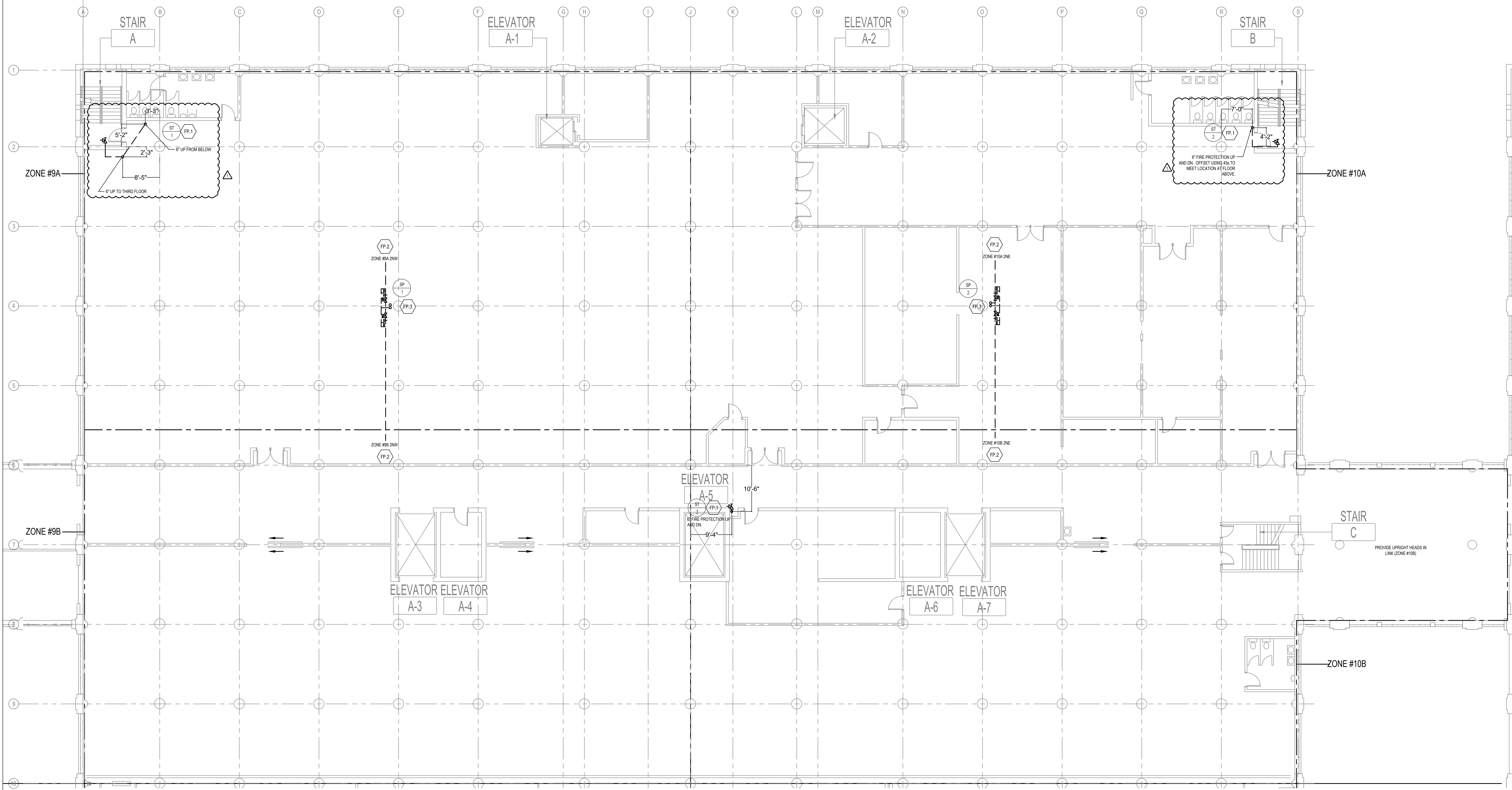
1 FIRE PROTECTION 1ST FLOOR PLAN - SOUTH
 1/8\" = 1'-0\"

FIRE PROTECTION REVISION NOTES

FP.1 NEW STANDPIPE UP AND DN. PROVIDE 2-1/2" CITY OF CHICAGO APPROVED ANGLE VALVE, ARM OVER FROM RISER INTO STAIRWELL AT CORNER RISERS. LOCATE AT APPROVED HEIGHT. FINAL LOCATION OF STANDPIPE RISERS TO BE COORDINATED BY STRUCTURAL ANALYSIS OF CORE LOCATIONS. NO NEW CORING TO BE DONE WITHOUT PRIOR APPROVAL FROM A LICENSED STRUCTURAL ENGINEER.

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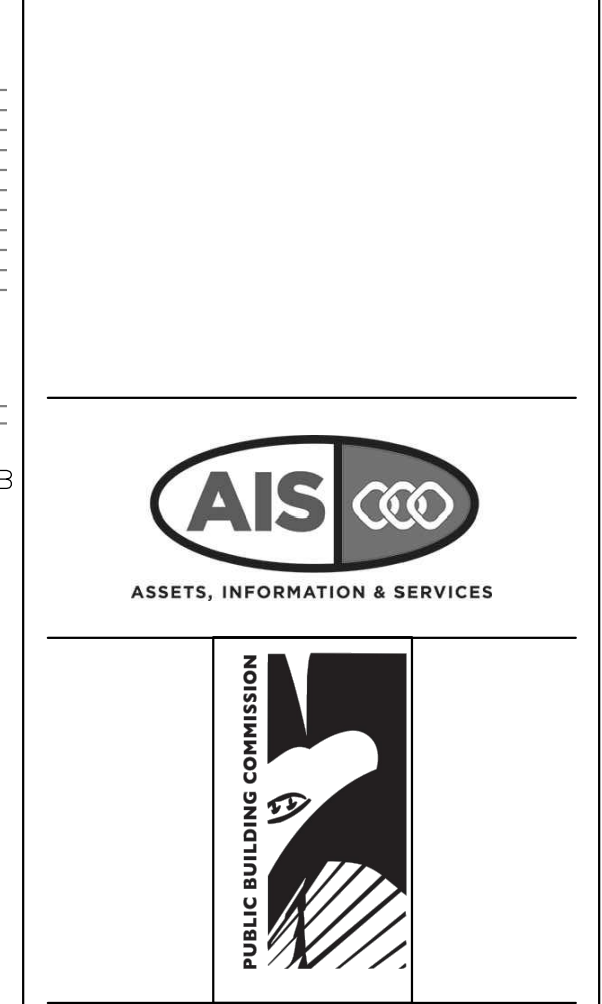
1 FIRE PROTECTION 2ND FLOOR PLAN - NORTH
1/8" = 1'-0"

Environmental Notes

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CITY OF CHICAGO, MAYOR LORI LIGHTFOOT

Architect of Record:
HARDING MODE JOINT VENTURE

224 SOUTH MICHIGAN AVE
SUITE 245
CHICAGO, ILLINOIS 60604
312.922.2800 T
312.922.8222 F
www.harding.com
www.modearchitectspc.com

CCJM ENGINEERS
303 East Wacker Drive, Suite 303
Chicago, IL 60601
MEPPF Engineers of Record

CEA&A STRUCTURAL ENGINEERS
175 North Franklin Street, Suite 410
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	ISSUE FOR BID	10/25/22
Δ	ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation
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Project No: #04026
Title

FIRE PROTECTION 2ND FLOOR PLAN - NORTH

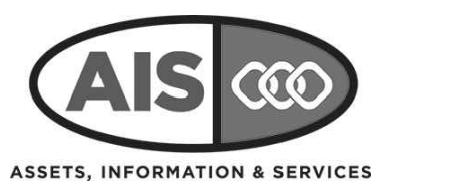
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 SUITE 245
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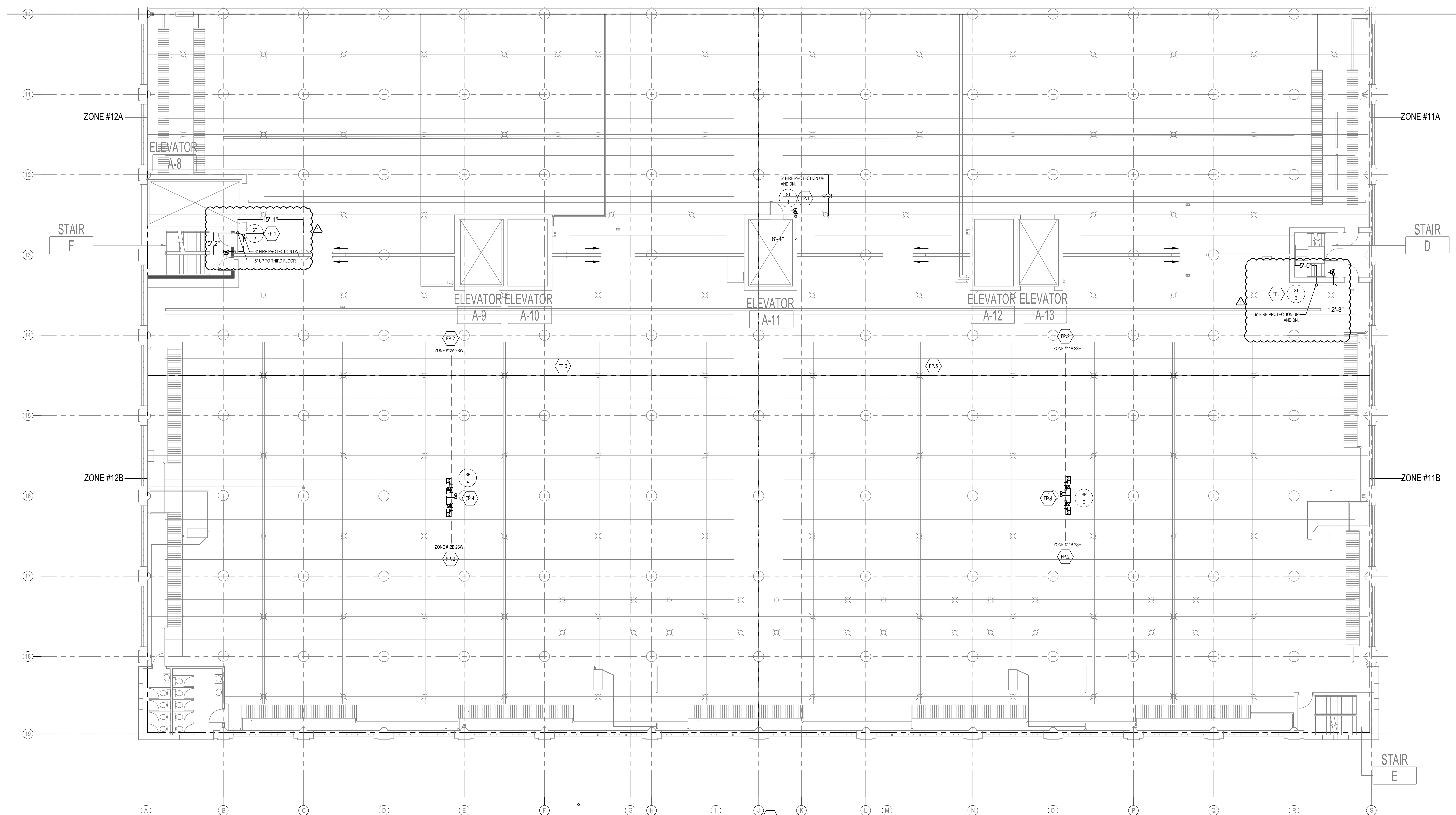
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**FIRE PROTECTION
 2ND FLOOR
 PLAN - SOUTH**

Sheet
FP-102B



FIRE PROTECTION KEYED NOTES

FP.1 NEW STANDPIPE UP AND DN. PROVIDE 2-1/2\"/>

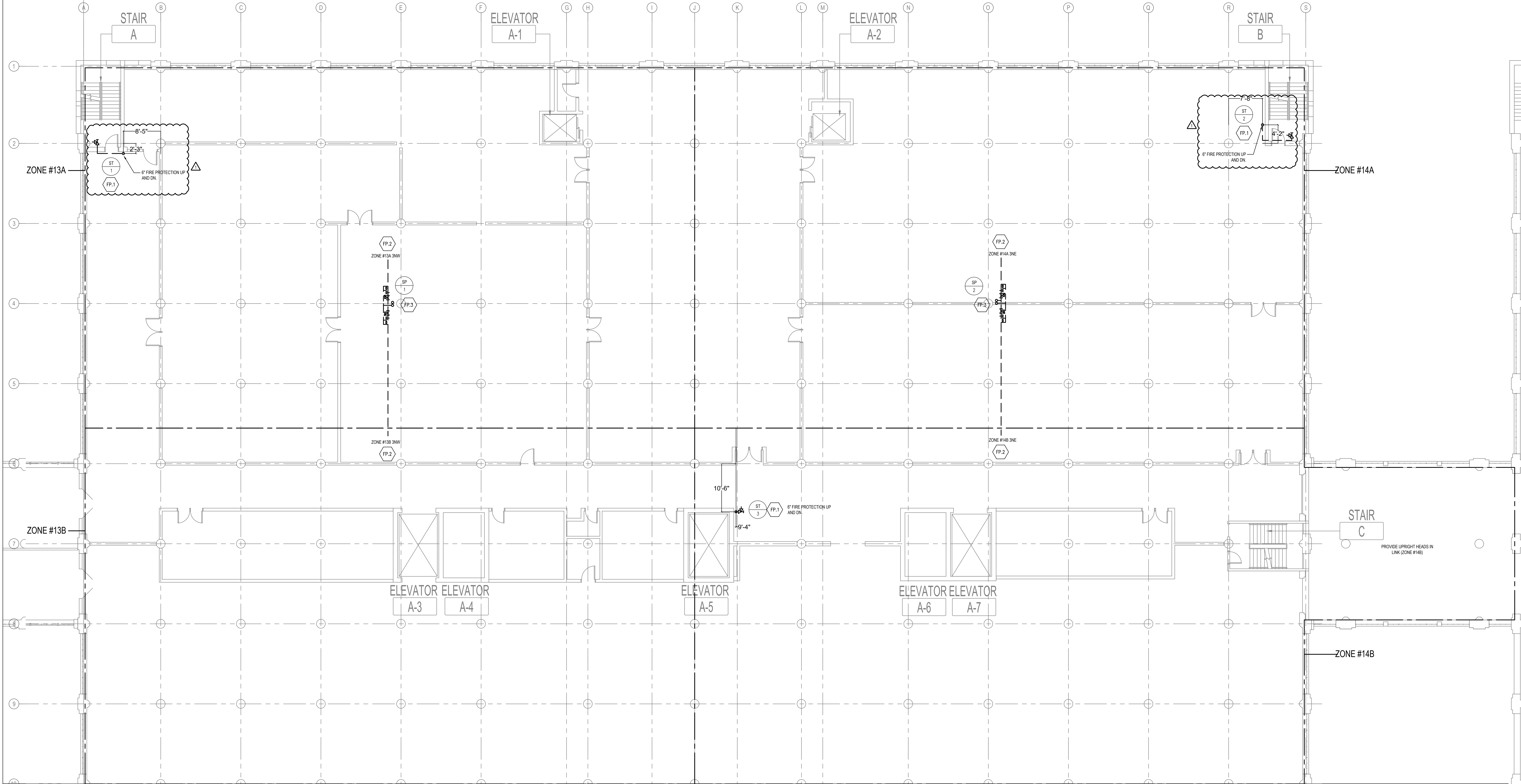
1 FIRE PROTECTION 2ND FLOOR PLAN - SOUTH
 1/8\"/>

FIRE PROTECTION KEYED NOTES:

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FP.3 NEW SPRINKLER RISER AND MAIN DRAIN UP AND DN. REUSE EXISTING CORES.



1 FIRE PROTECTION 3RD FLOOR PLAN - NORTH
1/8" = 1'-0"

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Architect of Record:
HARDING MODE JOINT VENTURE
224 SOUTH MICHIGAN AVE
SUITE 245
CHICAGO, ILLINOIS 60604
312.922.2800 T
312.922.2222 F
www.harding.com
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PBC Project Name: 1819 W. Pershing Renovation
PBC Contract No:
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FIRE PROTECTION 3RD FLOOR PLAN - NORTH

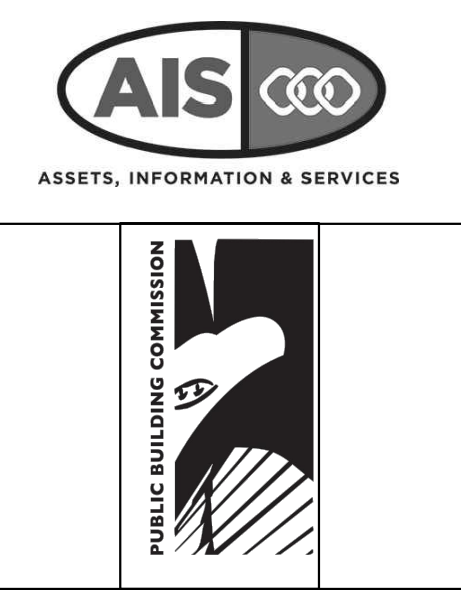
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FP-103A

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 CHICAGO, ILLINOIS 60604
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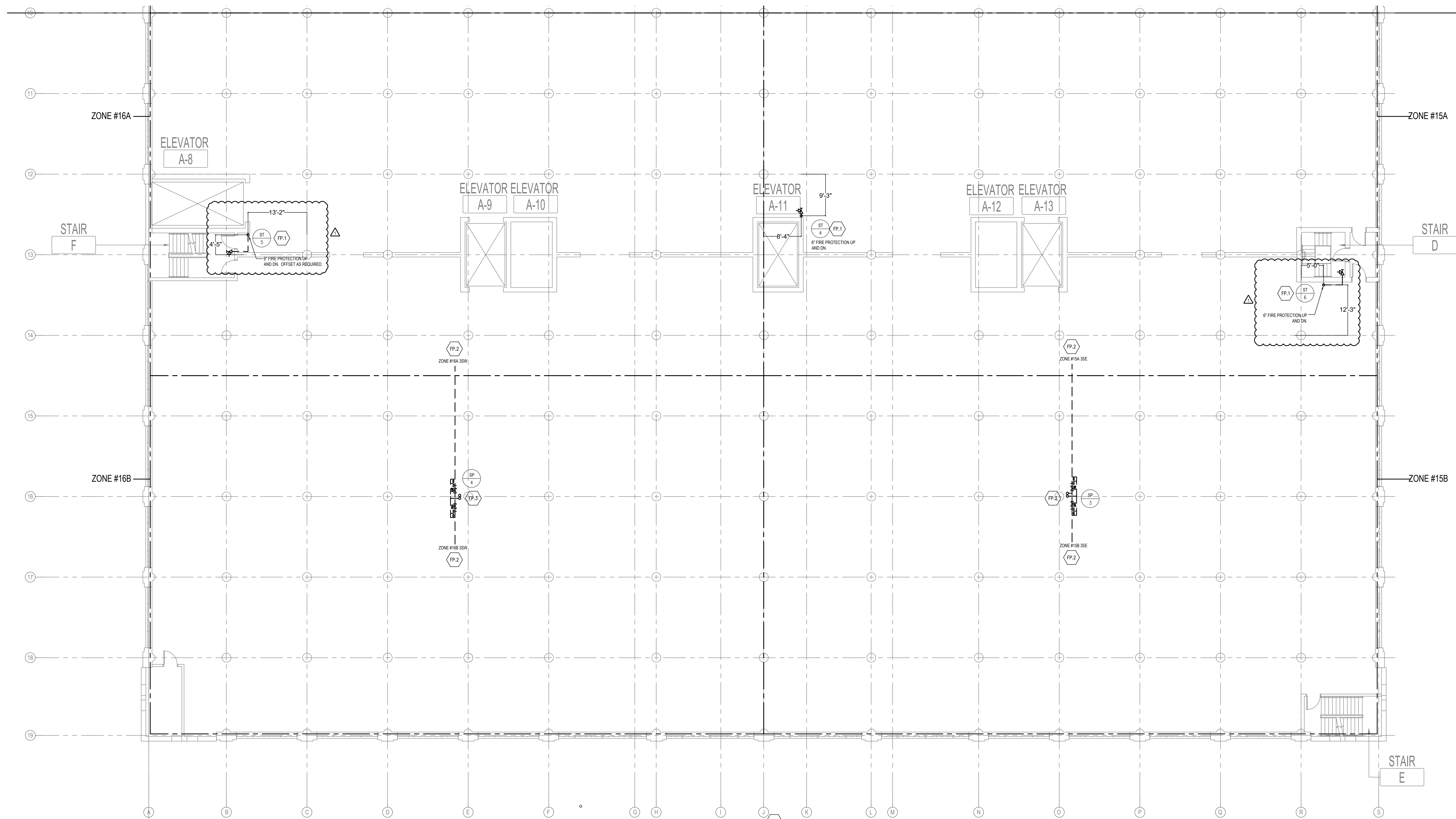
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 PBC Contract No:
 Project No: #04026
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FIRE PROTECTION 3RD FLOOR PLAN - SOUTH

Sheet
FP-103B



FIRE PROTECTION KEYED NOTES:

FP.1 NEW STANDPIPE UP AND DN. PROVIDE 2-1/2" CITY OF CHICAGO APPROVED ANGLE VALVE, ARM OVER FROM RISER INTO STAIRWELL AT CORNER RISERS. LOCATE AT APPROVED HEIGHT. FINAL LOCATION OF STANDPIPE RISERS TO BE COORDINATED BY STRUCTURAL ANALYSIS OF CORE LOCATIONS. NO NEW CORING TO BE DONE WITHOUT PRIOR APPROVAL FROM A LICENSED STRUCTURAL ENGINEER.

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FP.3 NEW SPRINKLER RISER AND MAIN DRAIN UP AND DN. REUSE EXISTING CORES.

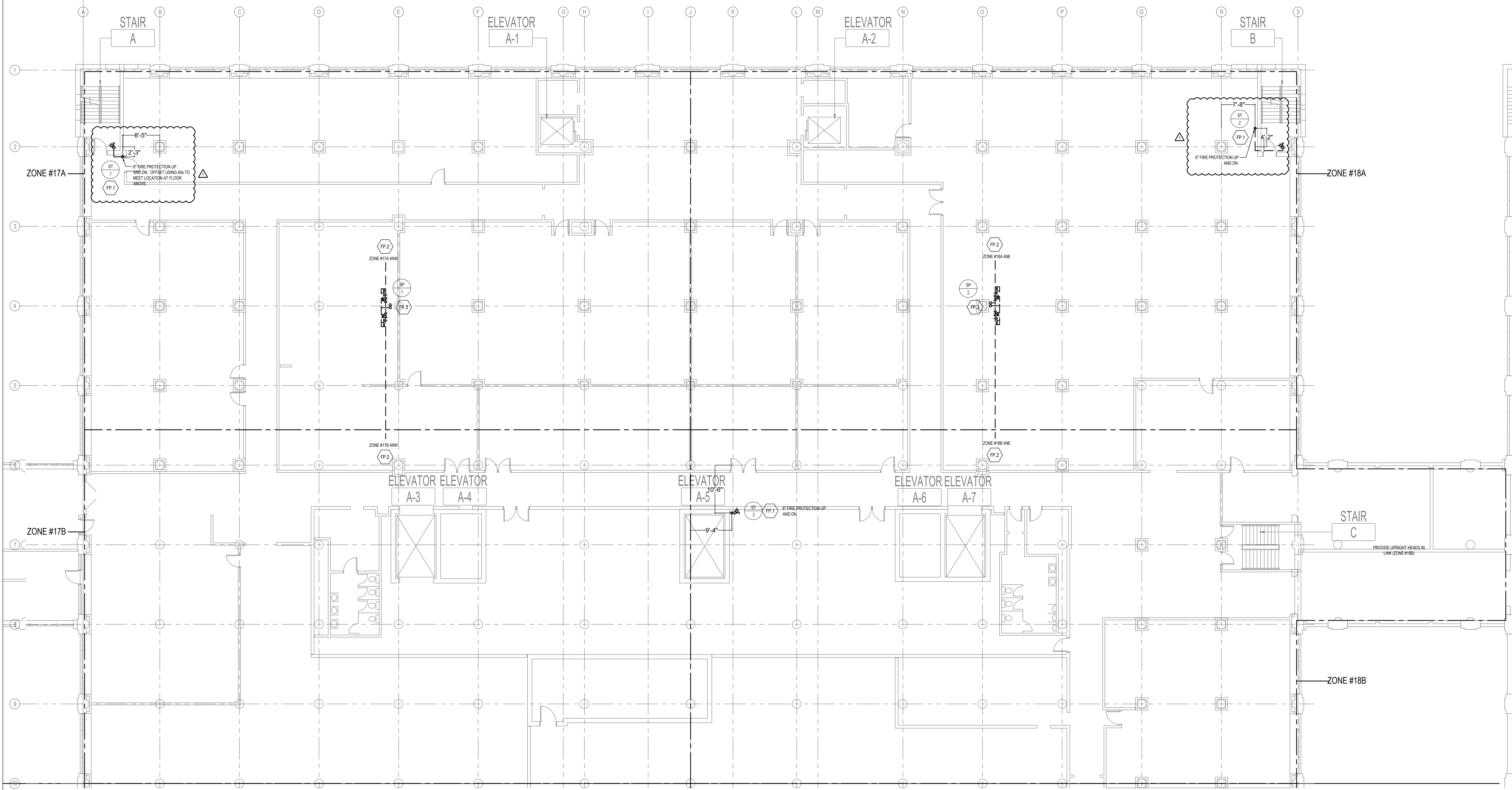
1 FIRE PROTECTION 3RD FLOOR PLAN - SOUTH
 1/8" = 1'-0"

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FP.3 NEW SPRINKLER RISER AND MAIN DRAIN UP AND DN. REUSE EXISTING CORES. SEE RISER DIAGRAM.



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HARDING MODE JOINT VENTURE
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CHICAGO, ILLINOIS 60604
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312.922.8222 F
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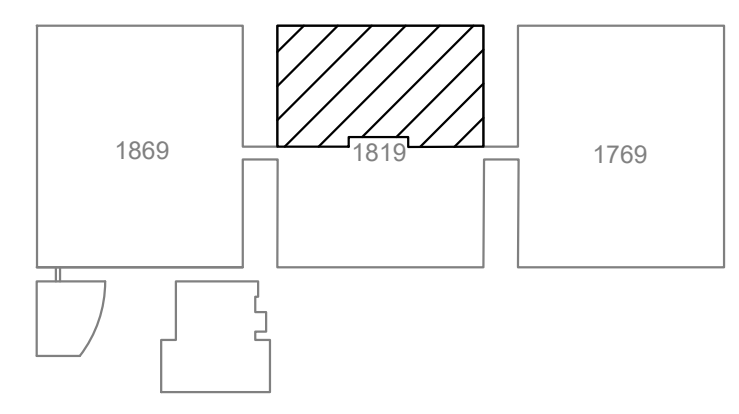
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PBC Project Name: 1819 W. Pershing Renovation
PBC Contract No:
Project No: #04026
Title

FIRE PROTECTION 4TH FLOOR PLAN - NORTH

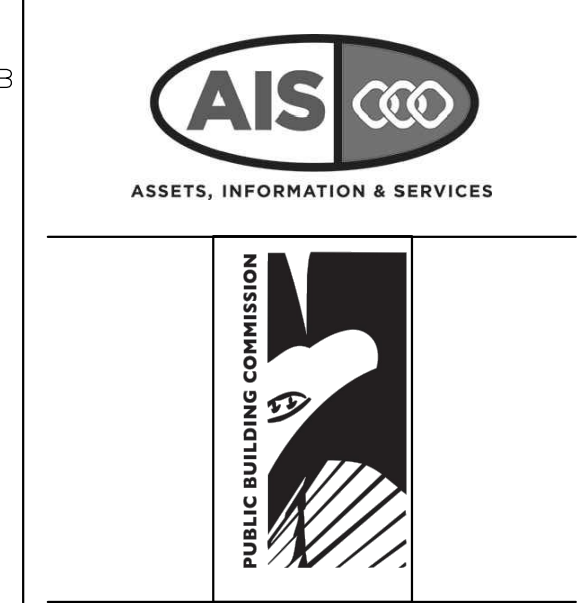
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FP-104A

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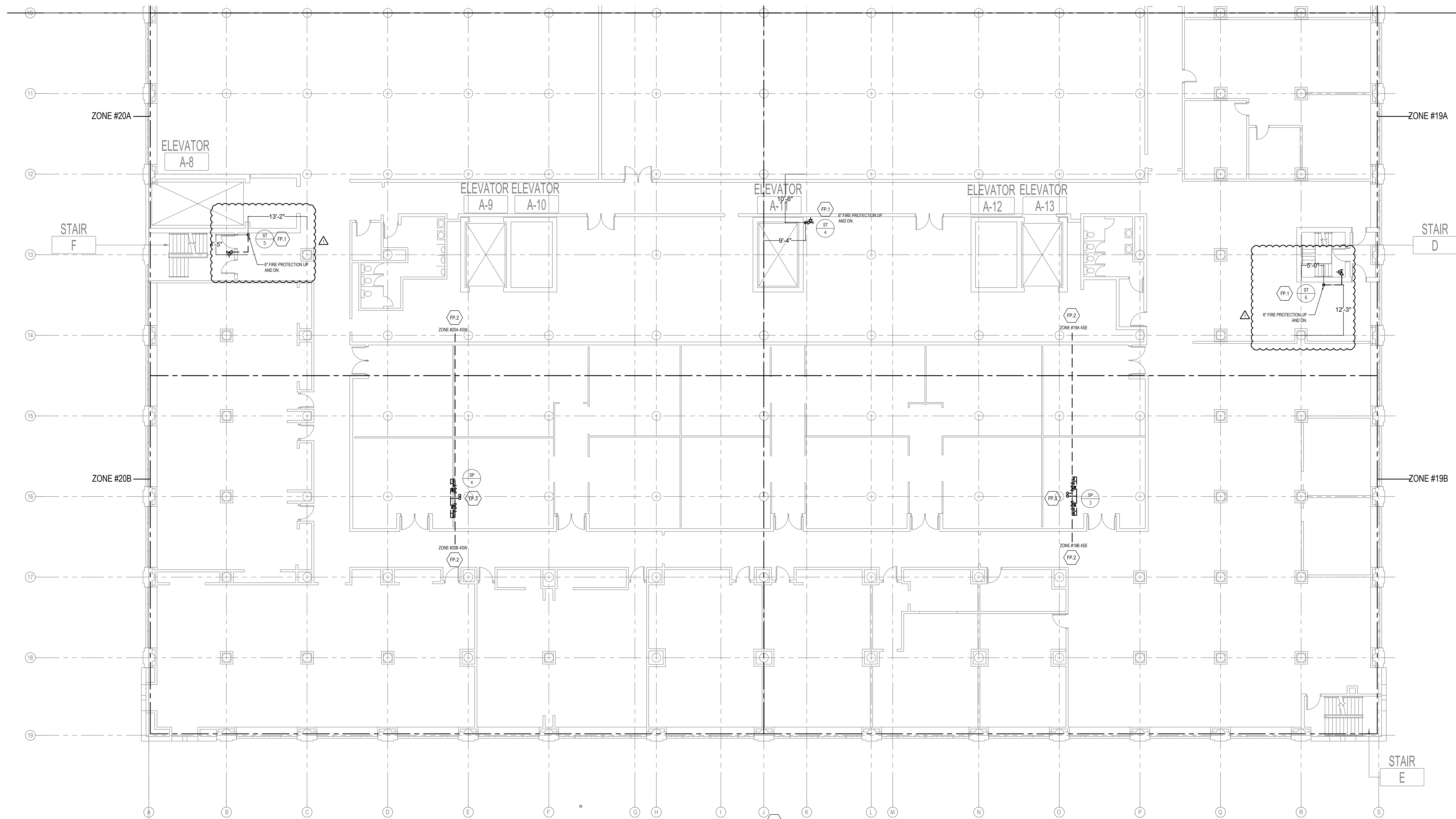
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2	Δ	ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation
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FIRE PROTECTION 4TH FLOOR PLAN - SOUTH

Sheet
FP-104B



FIRE PROTECTION KEYED NOTES
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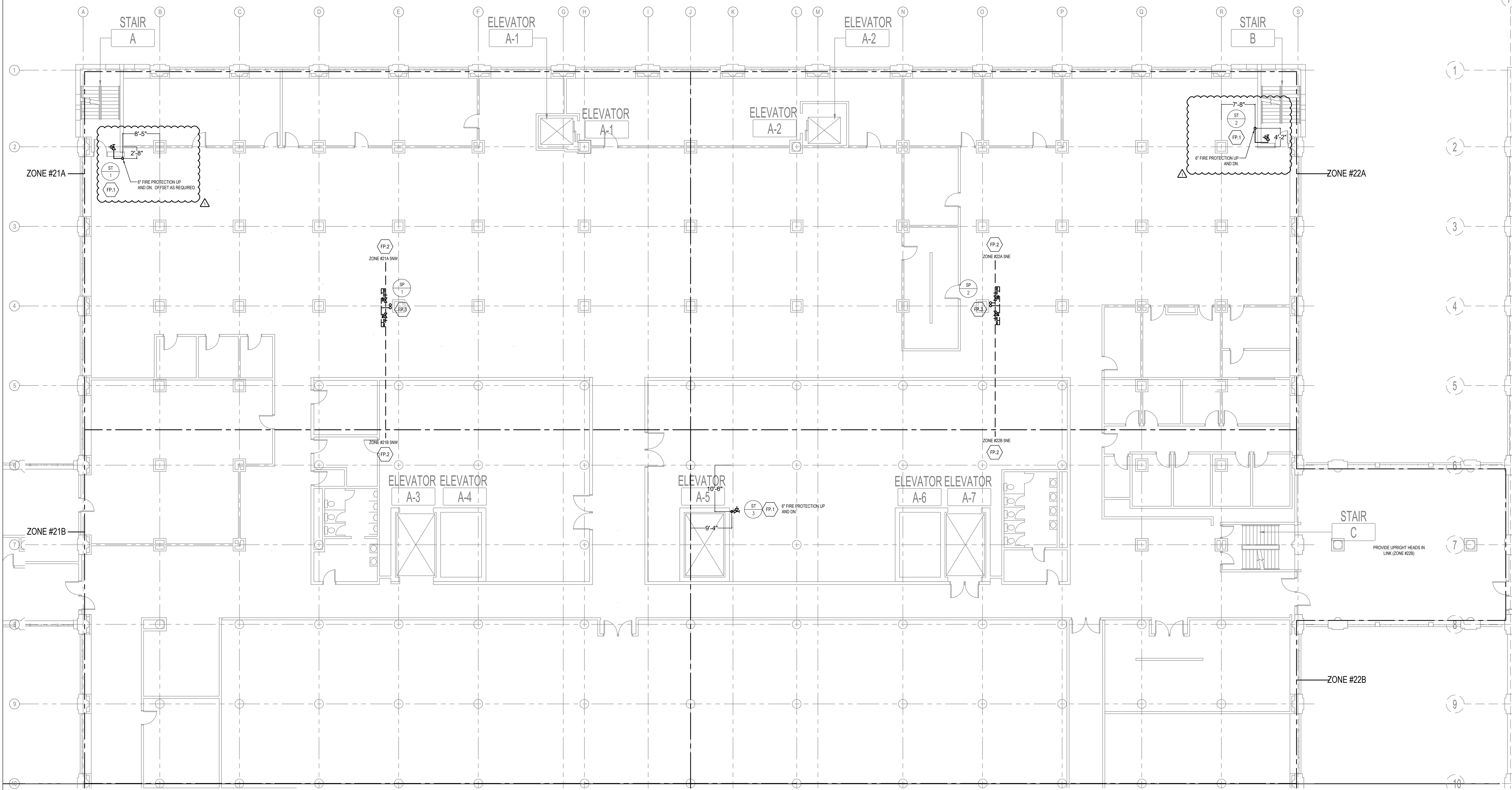
1 FIRE PROTECTION 4TH FLOOR PLAN - SOUTH
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FIRE PROTECTION NOTES

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1819 W PERSHING ROAD
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CITY OF CHICAGO, MAYOR LORI LIGHTFOOT

Architect of Record:
HARDING MODE JOINT VENTURE
224 SOUTH MICHIGAN AVE
SUITE 245
CHICAGO, ILLINOIS 60604
312.922.2600 T
312.922.8222 F
www.harding.com
www.modearchitectspc.com

CCJM ENGINEERS
303 East Wacker Drive, Suite 303
Chicago, IL 60601
MEPPF Engineers of Record

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Mark	Description	Date
	ISSUE FOR BID	10/25/22
Δ	ADDENDUM 3	12/07/22

PBC Project Name: 1819 W. Pershing Renovation
PBC Contract No:
Project No: #04026
Title

FIRE PROTECTION 5TH FLOOR PLAN - NORTH

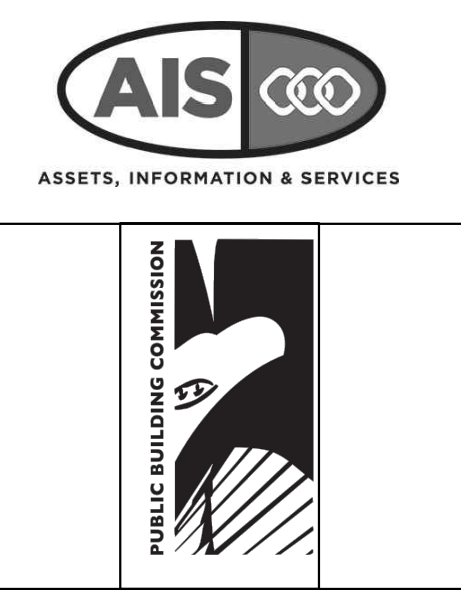
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FP-105A

Environmental Notes

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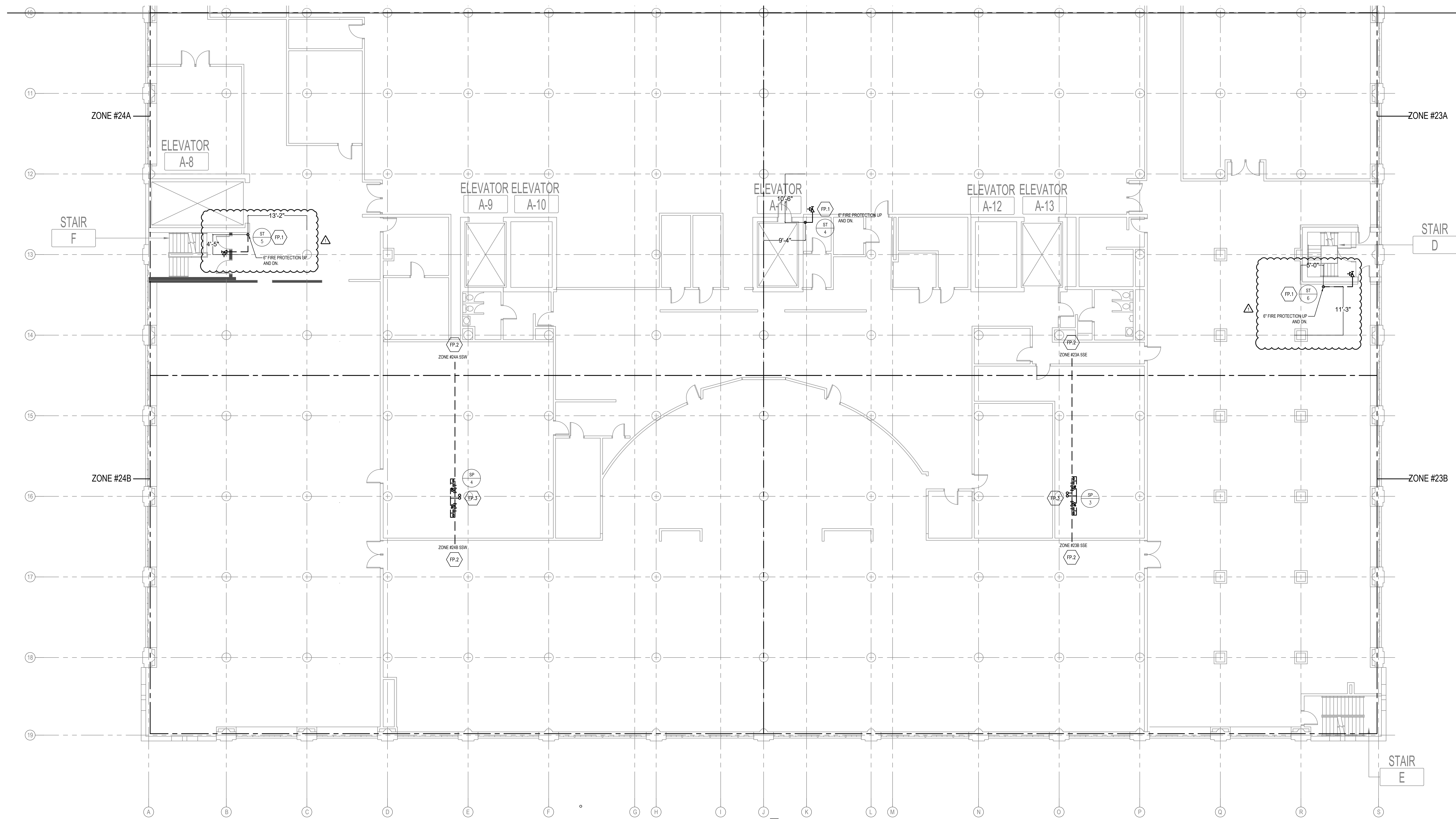
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FIRE PROTECTION 5TH FLOOR PLAN - SOUTH

Sheet
FP-105B



FIRE PROTECTION KEYED NOTES

FP.1 NEW SPRINKLER UP AND DN. PROVIDE 2-1/2" CITY OF CHICAGO APPROVED ANGLE VALVE, ARM OVER FROM RISER INTO STAIRWELL AT CORNER RISERS. LOCATE AT APPROVED HEIGHT. FINAL LOCATION OF SPRINKLER RISERS TO BE COORDINATED BY STRUCTURAL ANALYSIS OF CORE LOCATIONS. NO NEW CORING TO BE DONE WITHOUT PRIOR APPROVAL FROM A LICENSED STRUCTURAL ENGINEER.

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FP.3 NEW SPRINKLER RISER AND MAIN DRAIN UP AND DN. REUSE EXISTING CORES.

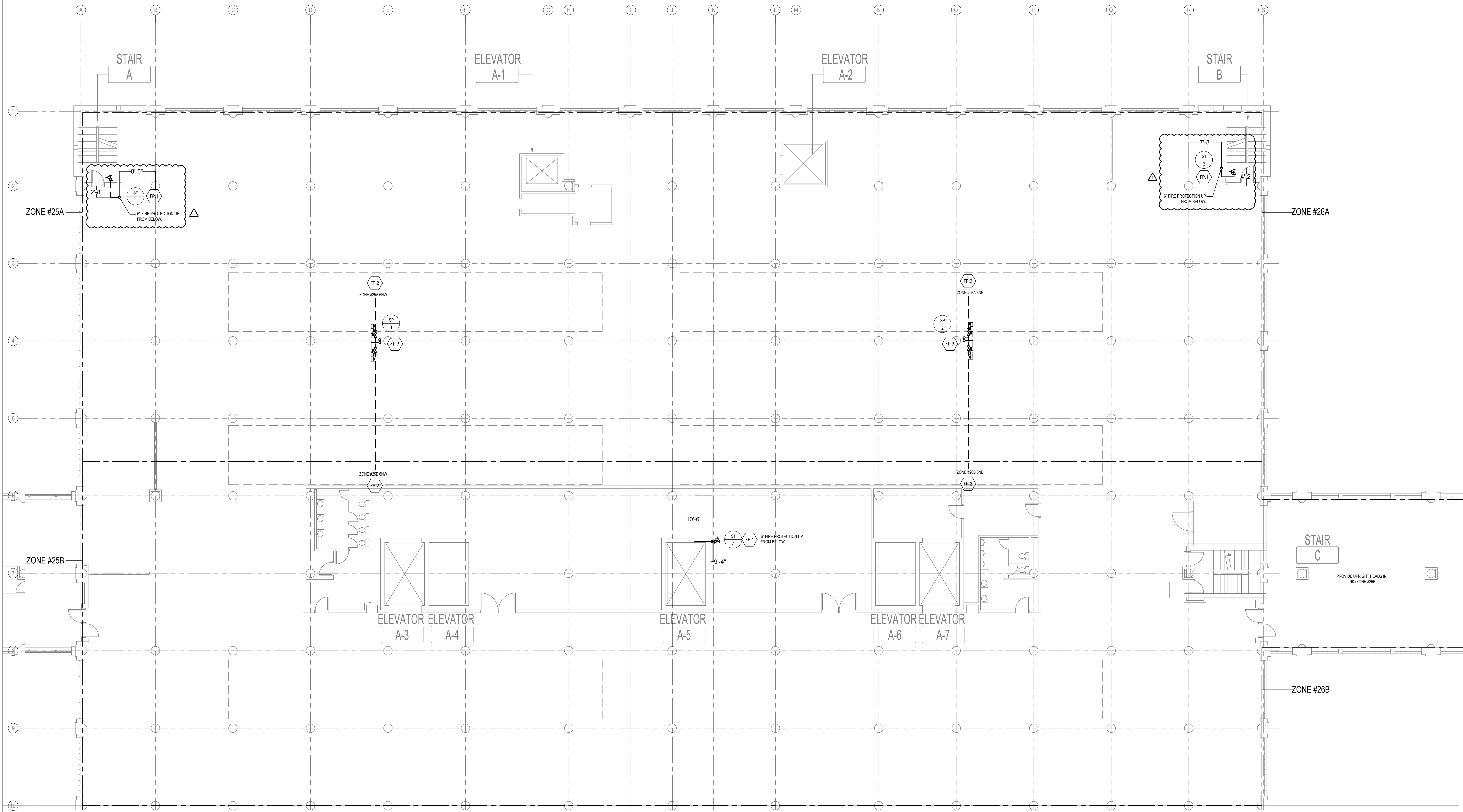
1 FIRE PROTECTION 5TH FLOOR PLAN - SOUTH
 1/8" = 1'-0"

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1 FIRE PROTECTIO 6TH FLOOR PLAN - NORTH
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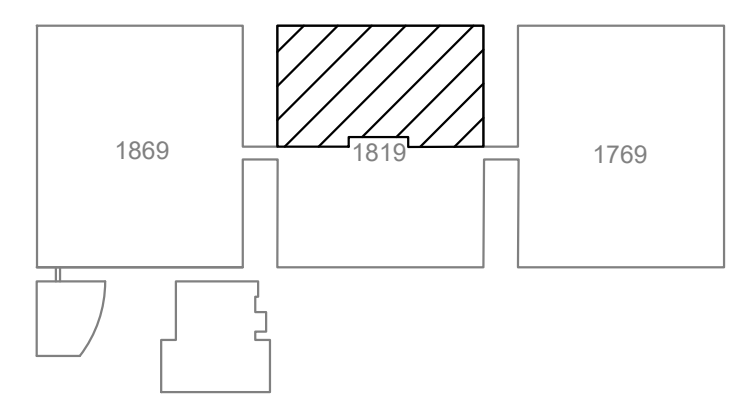
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FIRE PROTECTION 6TH FLOOR PLAN - NORTH

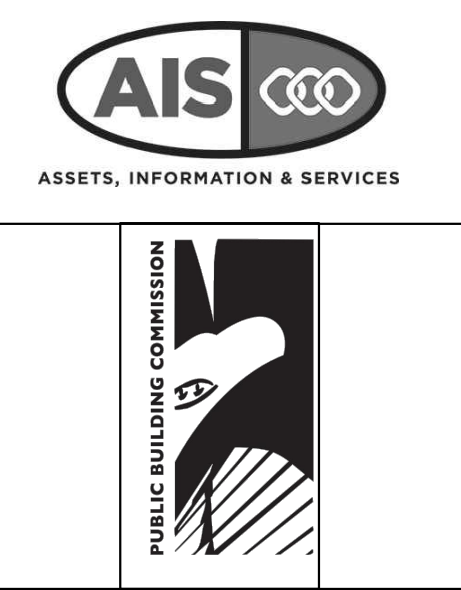
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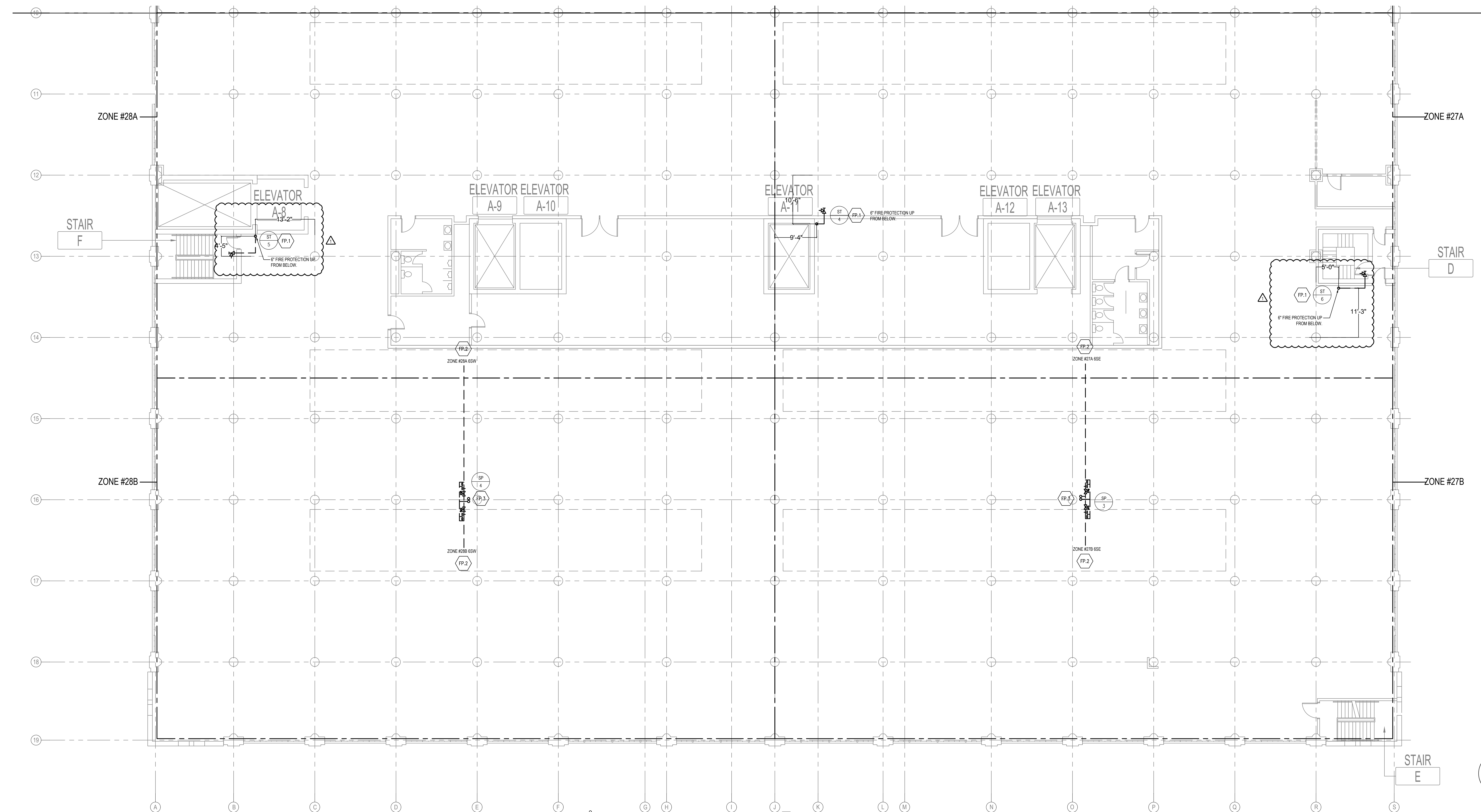
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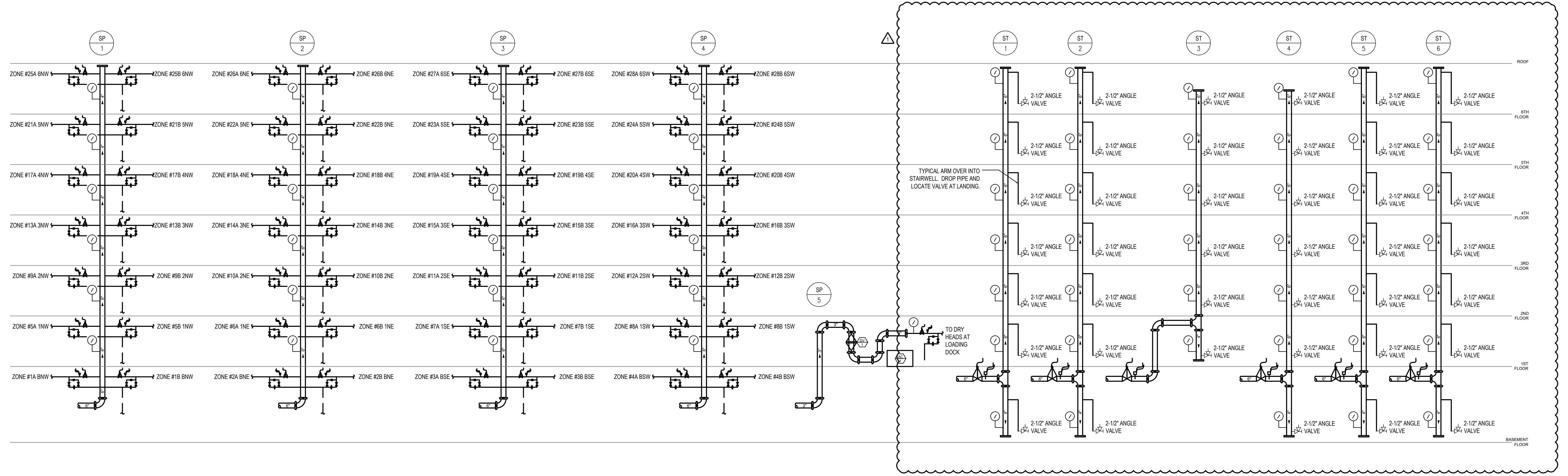
FIRE PROTECTION 6TH FLOOR PLAN - SOUTH

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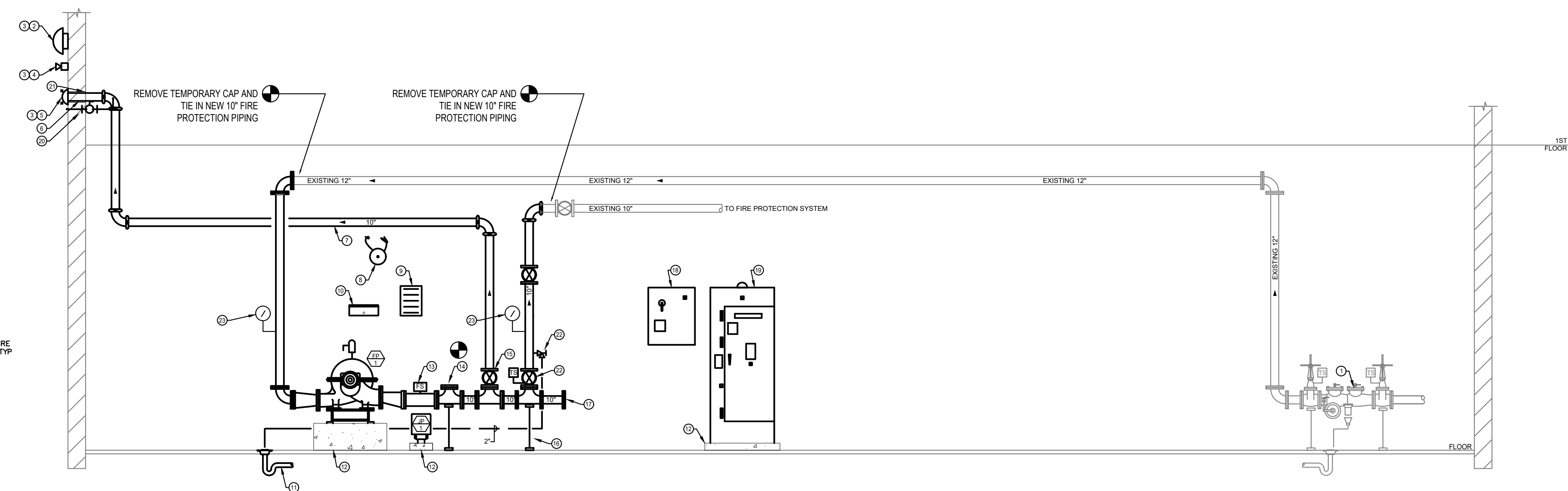


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1 FIRE PROTECTION 6TH FLOOR PLAN - SOUTH
 1/8" = 1'-0"



- ⊙ EXISTING 1/2" DOUBLE CHECK VALVE TO REMAIN.
- ⊙ 1/2" OUTSIDE BELL.
- ⊙ REFER TO ARCH DETAIL FOR ELEVATION.
- ⊙ SPRINKLE LIGHT (AND APPROVED TYPE).
- ⊙ FIRE PUMP TEST HEADER.
- ⊙ 1/2" GALVANIZED PIPING.
- ⊙ 1/2" TO FIRE PUMP TEST HEADER.
- ⊙ 6" INSIDE BELL.
- ⊙ HYDRAULIC FLAGCARDS.
- ⊙ SPARE FIRE SPRINKLER HEAD CABINET.
- ⊙ EXISTING FLOOR DRAIN TO REMAIN.
- ⊙ 4" (MAX) HOUSING/DRIP CONCRETE PAD.
- ⊙ FLOW SWITCH.
- ⊙ EXISTING DROP TO UNDERSLAB TO REMAIN. TIE INTO EXISTING FLANGE AT 90° ELBOW.
- ⊙ 1/2" GATE VALVE (TYP.).
- ⊙ PIPE STAND.
- ⊙ BAND FLANGE FOR FUTURE.
- ⊙ SOCKET PUMP CONTROLLER.
- ⊙ REVISED VOLTAGE AUTOMATIC FIRE PUMP CONTROLLER, FIRE AND INTERNAL TRANSFORMER SWITCH.
- ⊙ 1/2" BALL DRIP VALVE, DISCHARGE TO OUTSIDE (TYP.).
- ⊙ SLEEVE AND SEAL AROUND THE PIPE.
- ⊙ 3" MAIN DRAIN VALVE.
- ⊙ PRESSURE GAUGE (TYP.).
- ⊙ GATE VALVE.



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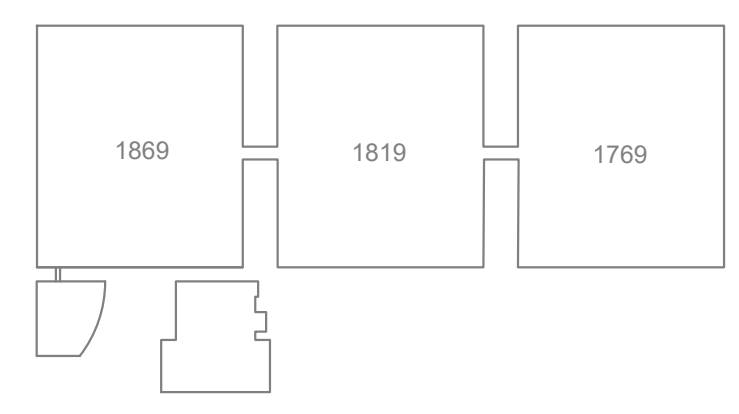
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FIRE PROTECTION RISER

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FP-201