Addendum No. 2

Four Rivers Sanitation Authority

Collection Systems Operations Facility Capital Project No. 2217

This Addendum No. 2, dated February 7, 2023, for the above referenced project, supersedes all contrary and conflicting information in the specifications and contract documents, which are hereby supplemented or revised as follows:

GENERAL

Mandatory Pre-Bid Conference

1. The minutes and attendance sheet from the mandatory Pre-Bid Conference held on February 1, 2023 are attached. Questions, comments, discussions, and clarifications included within the Minutes are hereby considered part of the Contract Documents.

PROJECT SPECIFICATIONS REVISIONS AND ADDITIONS

Section I Bidding Requirements, Subsection C. Contract Forms, Item 1. Proposal

1. DELETE Lump Sum Proposal and REPLACE with the attached revised Lump Sum Proposal.

Section II Project Manual, Subsection A. Procurement and Contracting Requirements

- Section 00 0102 Project Information, Part 1.05 Procurement Timetable
 REVISE Part H "Desired Final Completion Date" to December 15, 2023.
- Section 00 2113 Instructions to Bidders, Part 2.04 Contract Time
 REVISE Part A completion date to December 15, 2023.
- Section 00 2113 Instructions to Bidders, Part 7.01 Duration of Offer

 REVISE Part A to read as follows: "Bids shall remain open to acceptance and shall be
 irrevocable for a period of sixty (60) days after the bid closing date."
- 4. Section 00 2113 Instructions to Bidders, AIA Document A701-1997, Article 3.1.1
 i. DELETE "A Bidder receiving a Contract Award may retain the Bidding Documents and the Bidder's deposit will be refunded."
- 5. Section 00 7200 General Conditions
 - i. REVISE Supplementary Conditions Part 2.0 to read as follows: "Refer to Document 00 7300 Supplementary Conditions to these General Conditions."
- 6. Section 00 7301 Supplementary Conditions of the Contract for Construction
 - i. DELETE section in its entirety and REPLACE with the attached revised section.

Section II Project Manual, Subsection B. Specifications

- Section 01 1000 Summary, Part 1.02 Contract Description

 REVISE Part A to read "Contract Type: A single prime contract based upon a lump sum
 as described in Section I, Subsection C, Item 4 Agreement."
- Section 01 5000 Temporary Facilities and Controls, Part 1.09 Vehicular Access and Parking
 DELETE reference to Section 01 5500.

- Section 08 3613 Sectional Doors

 DELETE section in its entirety and REPLACE with the attached revised section.
- Section 23 0923 Direct Digital Control Systems for HVAC
 i. ADD section in its entirety.

PROJECT PLANS

- 1. Plan Sheet C102 Plan Overview: DELETE Sheet C102 in its entirety and REPLACE with the attached revised Sheet C102.
- 2. Plan Sheet C302 Utility Plan: DELETE Sheet C302 in its entirety and REPLACE with the attached revised Sheet C302.
- 3. Plan Sheet C303 Offsite Watermain Plan: DELETE Sheet C303 in its entirety and REPLACE with the attached revised Sheet C303.
- 4. Plan Sheet A101 Floor Plan: DELETE Sheet A101 in its entirety and REPLACE with the attached revised Sheet A101.
- 5. Plan Sheet A102 Roof Plan: DELETE Sheet A102 in its entirety and REPLACE with the attached revised Sheet A102.
- 6. Plan Sheet A103 Enlarged Floor Plans: DELETE Sheet A103 in its entirety and REPLACE with the attached revised Sheet A103.
- 7. Plan Sheet A104 Schedules: DELETE Sheet A104 in its entirety and REPLACE with the attached revised Sheet A104.
- 8. Plan Sheet A201 Building Elevations: DELETE Sheet A201 in its entirety and REPLACE with the attached revised Sheet A201.
- 9. Plan Sheet A202 Building Sections: DELETE Sheet A202 in its entirety and REPLACE with the attached revised Sheet A202.
- 10. Plan Sheet A501 Wall Sections: DELETE Sheet A501 in its entirety and REPLACE with the attached revised Sheet A501.
- 11. Plan Sheet A503 Wall Details: DELETE Sheet A503 in its entirety and REPLACE with the attached revised Sheet A503.
- 12. Plan Sheet A504 Large Plan Details: DELETE Sheet A504 in its entirety and REPLACE with the attached revised Sheet A504.
- 13. Plan Sheet S002 Schedules: DELETE Sheet S002 in its entirety and REPLACE with the attached revised Sheet S002.
- 14. Plan Sheet S101A Foundation Plan Area A: DELETE Sheet S101A in its entirety and REPLACE with the attached revised Sheet S101A.
- 15. Plan Sheet S101B Foundation Plan Area B: DELETE Sheet S101B in its entirety and REPLACE with the attached revised Sheet S101B.
- 16. Plan Sheet S300 Concrete Sections & Details: DELETE Sheet S300 in its entirety and REPLACE with the attached revised Sheet S300.
- 17. Plan Sheet ES101 Lighting Site Plan: DELETE Sheet ES101 in its entirety and REPLACE with the attached revised Sheet ES101.
- 18. Plan Sheet ES103 Electrical Ductbank Site Plan: DELETE Sheet ES103 in its entirety and REPLACE with the attached revised Sheet ES103.

- 19. Plan Sheet E101 Lighting Overall Floor Plan: DELETE Sheet E101 in its entirety and REPLACE with the attached revised Sheet E101.
- 20. Plan Sheet E102 Power & Systems Floor Plan: DELETE Sheet E102 in its entirety and REPLACE with the attached revised Sheet E102.
- 21. Plan Sheet E103 Electrical Specifications & Symbols: DELETE Sheet E103 in its entirety and REPLACE with Sheet E103 Electrical Specifications & Riser Diagram.
- 22. Plan Sheet E104 Electrical Specifications & Riser Diagram: DELETE Sheet E104 in its entirety.
- 23. Plan Sheet FP101 Fire Protection Overall Floor Plan: DELETE Sheet FP101 in its entirety and REPLACE with the attached revised Sheet FP101.

BIDDER QUESTIONS

1. Viewing the prints and understanding the specifications, I'm assuming the deck will be structurally sloped and no tapered insulation will be needed, except for the saddles/crickets between the drains? In other words, there'll be no additional tapered insulation required on either side of the drains, east and west towards the outside of the structure because if so additional wood blocking would be needed to accommodate that extra height of insulation. Should we figure mechanically fastening both layers of insulation, instead of fastening one and foam adhering the top? I'm not seeing specifications referring to any walkways/protective padding on this roof or around any of the units, so I'll need not include any of them?

Response: Yes, structure slopes to drains. Yes, just center crickets. Reference revised Plan Sheet A102 for walk pad locations. Screw insulation (2) layers is acceptable provided it meets roofing manufacturer specifications for warranty and wind loads.

2. Are bidders required to submit a Schedule of Values with their bids?

Response: Only the three (3) lowest responsible and responsive bidders will be required to submit a Schedule of Values. Schedule shall utilize the AIA G703 form and be received by FRSA no later than 5:00 PM on Monday February 20, 2023.

3. Provide clarification on any incidental structural steel items that are to be included in the bid.

Response: All heavy gauge steel girts (including 2"-18-gauge straps) are to be furnished and installed by the Contractor. Bolts are to be provided by the girt manufacturer; holes to be prepunched by manufacturer or field drilled. All heavy gauge framing for doors, windows, and openings through exterior walls are to be furnished and installed by the Contractor.

4. Supplementary conditions 11.4 deletes the requirement for a performance bond. Please confirm no performance bond?

Response: Please see revised Section 00 7301 Supplementary Conditions of the Contract for Construction. A performance bond is required in accordance with Section I Bidding Requirements, Subsection C. Contract Forms, Item 6 Performance Bond.

5. Supplementary conditions 11.3 is labeled Project Management Protective Liability Insurance. 11.3 is labeled Property Insurance in the contract. Please confirm if the supplementary conditions label is incorrect or if another type of insurance is being referenced and also confirm responsibility for Builders Risk insurance?

Response: Please see revised Section 00 7301 Supplementary Conditions of the Contract for Construction. Item 11.3 has been removed in full. Insurance requirements for this Contract shall be in accordance with Section I Bidding Requirements, Subsection B. Instructions to Bidders,

Item 6 General Instructions as well as Article 11 of Section 00 7301 Supplementary Conditions of the Contract for Construction.

6. Will utility use costs from permanent services be paid for by owner?

Response: All costs associated with temporary facilities and utilities are the responsibility of the Contractor per provisions stipulated in Section 01 5000 Temporary Facilities and Controls and Section 01 5100 Temporary Utilities. Upon connection and termination of the permanent utility services to their final waterproof locations within the building, FRSA will assume utility expenses provided the utilities are utilized for construction purposes only and are used only to a reasonable extent.

7. Confirm if interior control and sawn concrete joints require joint sealant, if so clarify required sealant.

Response: Please reference Section 07 9005 Joint Sealers for joints requiring sealant and material specifications.

8. Confirm if exterior pavement/roadway pavement control and sawn joints require joint sealant, if so clarify required sealant.

Response: *PCC* pavement longitudinal joints are to be sealed in accordance with IDOT Highway Standard 420001-10 (as shown on Plan Sheet C401). Please reference Section 32 1313 Concrete Paving for joint filler material specifications.

9. Please confirm the air barrier system. Plans state STO gold coat, while Section 07 2500 is a Parex product. Confirm if Detail 6 on Sheet A503 is to include an air barrier?

Response: Omit all references to STO "gold coat" and provide the Parex system as specified in Section 07 2500 Weather Barriers. Reference revised Plan Sheet A503 for inclusion of air barrier system.

10. Is there any chain link fence work required in the project? C102 appears to show existing fence through new improvements.

Response: A 6' high chain link fence with barbed wire has been installed around the site perimeter. Should the bidder determine that sections of this existing fence need to be temporarily relocated to accommodate construction operations then all costs associated with this work should be included in their bid. Reference Plan Sheet C302 for further direction regarding temporary removal of existing fence for gas service installation.

11. Detail 3 on Plan Sheet A201 shows a railing but don't see any other details or notes on this. Was this picked up on the previous steel bid?

Response: This railing was not included in the previous structural steel contract and should be included in this bid. Reference revised Plan Sheets A101 and A201 for additional details on the guardrail system.

12. The Damo Shield product on Plan Sheet A101is no longer manufactured.

Response: Reference revised Plan Sheet A101 for an alternative column protection system.

13. In the masonry specification for this project, you have the sill listed as "Cast Stone" but on the elevation it calls out "Limestone." The elevation also shows the sill being rock-faced without a drip. Is this correct?

Response: Reference revised Plan Sheet A503 for clarification.

14. The Basis of Design (Raynor TC200) does not match Section 08 3613 Sectional Doors.

Response: Reference revised Section 08 3613 Sectional Doors for clarification.

15. Door panels: steel construction; outer steel sheet of 20 gage, 0.0359 inch 0.015 inch minimum thickness, flushstucco profile; inner steel sheet of 20 gage, 0.0359 inch 0.015 inch minimum thickness, flatstucco profile; core reinforcement manif. std. inch sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; polyurethane insulation. But Raynor TC200 is 26/26 with polystyrene?

Response: Reference revised Section 08 3613 Sectional Doors for clarification.

- 16. Glazing: Annealed float glass; single pane; clear; 1 inch thick.
 Response: Reference revised Section 08 3613 Sectional Doors for clarification.
- Please provide Door Schedule Spring Cycle count requirement? "Max Cycle."
 Response: Reference revised Section 08 3613 Sectional Doors for clarification.
- 18. Info for Door Schedule Tandem Shaft?
 Response: Reference revised Section 08 3613 Sectional Doors and revised Plan Sheet A104.
- 19. Is Overhead Door Corp. Thermacore 591 an approved alternate?
 Response: Reference revised Section 08 3613 Sectional Doors for added approved alternate.
- 20. Provide rebar requirements at the trench drains. **Response:** See detail below.



21. Please confirm the hazard classification for the fire sprinkler system.

Response: Ordinary Hazard Group 1.

22. Will HVAC controls for this building be connected into FRSA's existing building automation platform?

Response: Bids should include an HVAC direct digital control system in accordance with Section 23 0923 Direct Digital Control Systems for HVAC (as provided in this Addendum No. 2). Connection to FRSA's platform is not a part of this Contract.

23. All of the lighting (high bays, wall packs, outside pole lights) are called out as going to Panel 1, which is 120 volt. Is this correct?

Response: The lighting is 277V and is circuited to Panel "MECH". Reference revised Panel Schedule on revised Plan Sheet E103.

24. None of the lighting circuits are shown on any of the panel schedules.

Response: Reference revised Panel Schedule on revised Plan Sheet E103.

25. Is the lighting to be 120V, 208V, or 277V?

Response: The lighting is 277V.

26. Site plan shows voltage drop for outdoor lighting, is there any consideration for voltage drop on interior lighting depending on voltage?

Response: This has been revised, please reference revised electrical plan sheets.

27. Clarify Ductbank and phone conduit.

Response: *Reference revised Plan Sheet ES103 for ductbank clarification. Conduit for telephone has been removed.*

28. Ductbank shows pipes going to a junction box. What type of junction box? Above ground or in-ground?

Response: The Contractor shall provide and install in-ground quazite junction boxes as shown on the revised plan sheets.

29. Plans show a 400 Amp 277/480 feed to the main disconnect. What size conductors and pipe sizes are required and where are they going?

Response: Reference revised Riser Diagram on Plan Sheet E103.

30. Plans show a 400 Amp outdoor disconnect – is this to be fused or unfused and 3R or stainless?

Response: Reference revised Plan Sheet E102 – this will be a NEMA 3R Fused Disconnect Switch.

31. Ductbank details are missing.

Response: *Reference revised Plan Sheets ES103 and E103 for revised ductbank alignment and details.*

32. Transformer hanging details show 15 to 112.5 KVA transformer; plans call for 150 KVA transformer.

Response: The hanging 15 to 112.5 KVA transformer detail has been removed. The 150 KVA transformer is now floor-mounted adjacent to the "MECH" panel. Reference revised Plan Sheet E103.

33. Does the fire protection system need to be monitored?

Response: A fire alarm system along with flow switches and tamper switches to monitor the fire protection system has been provided; reference revised Plan Sheet FP101.

34. Fixture Schedule does not include Fixture F10.

Response: This has been corrected – reference revised Plan Sheet E103.

35. Verify circuiting for Panel 1.

Response: Reference revised Panel Schedule on Plan Sheet E103.

36. The F4 Wall Packs are noted as fed from Panel 1, Circuit 15 on Plan Sheet ES101 but are noted as fed from Panel 1, Circuit 10 on Drawing E101 – clarify.

Response: The lighting is 277V and circuiting has been revised to Panel "MECH." All circuits shown on Plan Sheet ES101 for the site lighting have been revised to be circuited to panel "MECH."

37. Drawings ES101 and E101 indicate that all the lighting is being fed from Panel-1, circuits 13 through 20 and 22. The associated panel schedule on E104 indicates those circuits are either unused spaces or for receptacles and vehicle loops. Please confirm those circuits are being shared and the breakers are sized appropriately.

Response: The revised Panel Schedule shows all of the revised circuiting for both plan sheets. Vehicle detection loops have been removed.

38. Panel Schedule for "MECH" has a lot of loads listed that are 120/208V.

Response: *Reference revised Panel Schedule "MECH" – this is a 277/480V panel. All loads have been revised.*

39. What is the AIC rating of the panelboards?

Response: Panel "MECH" - 65K, Panel 1 - 10K, Panel 2 - 10K, and Panel 3 - 10K.

40. The Wall Mount Transformer detail on Sheet E103 indicates it is for 15 thru 112.5 KVA transformers, but the transformer on the One-Line is 150KVA. Please confirm that we are to still use that detail or provide a new detail.

Response: Wall-mounted detail has been omitted, reference revised Plan Sheet E103.

41. Please clarify the scope regarding the ductbanks shown on drawing ES103.

Response: See revised plan sheets ES103 and E103 for clarification of ductbank sizes and number of conduits.

42. Quantity, size, and fill for conduits to each of the Junction Box locations?

Response: See revised plans for clarification.

43. Does the entire run of conduit need to be in a reinforced concrete ductbank per the generic detail provide on E103?

Response: Yes, unless noted as empty conduit only.

44. Does the 4" empty conduit for telephone service need to be in a reinforced concrete ductbank per the generic detail provide on E103?

Response: This conduit has been omitted.

45. Please confirm the 4" empty conduit for telephone service only needs to be installed to the extent shown on ES103 and any additional conduit required to extend the run will be the responsibility of the service provider.

Response: This conduit has been omitted.

46. Please clarify the scope regarding the primary feed to the 400A Disconnect shown on the One-Line on Sheet E104.

Response: Reference revised Plan Sheet ES103 for ductbank distribution and revised Plan Sheet E103 for the Riser Diagram.

47. Is one of the runs shown on drawing ES103 for the disconnect's primary feed?

Response: Yes, reference revised Plan Sheet.

48. Who is responsible for providing, installing, and terminating the primary and secondary wiring?

Response: The Contractor – this work scope is included in this Contract.

49. Should the disconnect be a combination CT/Disconnect?

Response: No.

50. Where is the utility transformer?

Response: There is not a utility transformer.

51. Where is the meter?

Response: There is no meter.

52. What security systems do they want? Access Control, Video Surveillance, Intrusion?? We need some direction regarding these questions. If they want any or all of these systems, do they currently have a standard for which platforms they use or is this open to our discretion to propose the solution we feel is best?

Response: The Contractor will install junction boxes and empty conduits at locations shown for card access as part of this Contract. Any additional systems are not part of this Contract.

53. Are there any specific areas related to security that are a priority?

Response: Not applicable.

This information shall be taken into consideration when preparing your bid. Bidders shall acknowledge all project addenda. This addendum will be emailed to all plan holders as well as posted to FRSA's website at <u>fourrivers.illinois.gov</u>.

End of Addendum No. 2

Issued February 7, 2023

Four Rivers Sanitation Authority

Christopher T. Baer.

Director of Engineering

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FOUR RIVERS SANITATION AUTHORITY COLLECTION SYSTEMS OPERATIONS FACILITY Capital Project No. 2217 Bid Doc. No. 22-420

MANDATORY PRE-BID CONFERENCE MINUTES 10:00 AM, February 1, 2023 Graceffa Administration Building 3501 Kishwaukee Street, Rockford IL

I. General

- A. Attendance: see attached attendance sheet.
- B. The Collection Systems Operations Facility (Capital Project No. 2217) consists of building construction, sitework, and landscaping for a new operations facility, including concrete slab-on-grade, steel frame, insulated metal wall panels, erection of previously bid structural steel package, low slope membrane roofing, plumbing, electrical, mechanical systems, earthwork, storm sewer, sanitary sewer, watermain, PCC and HMA pavement, and site lighting.
- C. Project Design Team
 - i. Architect: Blakemore Architects, Inc.
 - ii. Structural Engineer: CORE 4 Engineering, Inc.
 - iii. MEP Engineer: Legacy Designs Inc.
 - iv. Stormwater Engineer: Fehr Graham Engineering & Environmental
 - v. Civil Engineer: Four Rivers Sanitation Authority
 - vi. Landscape Architect: Arc Design Resources, Inc.
- D. All questions during the bidding phase shall be directed to Tyler Nelson of FRSA (tnelson@fourrivers.illinois.gov; 815-387-7651).

II. Bidding

- A. Bids are due no later than 2:00 P.M. on Friday February 17, 2023, at FRSA's Administration Building (3501 Kishwaukee Street, Rockford, Illinois), at which time they will be publicly read aloud. Bids must be placed in the bid box (located in the lobby of the Administration Building) prior to that time; no electronically submitted bids will be accepted. Per State Procurement Code, any bids delivered past the deadline shall be deemed not responsive and will not be opened or publicly read.
- B. All submitted Bids shall include the following:
 - i. Completed Lump Sum Proposal with all Addenda acknowledged. Bids that do not acknowledge all Addenda will not be considered and read.
 - ii. Completed FRSA Bid Bond form with an acceptable Bid Security in the amount of five percent (5%) of the total bid price. Bids that are not accompanied by a bid security will not be read.
 - iii. Fair Employment Practices Affidavit of Compliance.
 - iv. Contractor Statement of Qualifications per Instructions to Bidders, Section 3.8 of the Bid Documents.
- C. Bids will be considered upon the basis of the lowest sum responsive and responsible bid. Bidder's responsiveness will be based upon the timely receipt of the bid; responsibility will be based upon the Statement of Qualifications and the correct submission and execution of all required documents in accordance with the bid documents.
- D. The Lump Sum Proposal shall include unit prices for the Adjustment Unit Price Work. Adjustment Prices will not be considered when evaluating lump sum bid amounts.

Mandatory Pre-Bid Conference Agenda / Page 1 of 3

- E. Addendum No. 1 (clarifying date and time of the Pre-Bid Conference) was released on January 18, 2023.
 - i. Addendum No. 2 will be released after the Pre-Bid Conference and will contain Conference information (minutes and attendance) plus clarifications on questions received to-date. Revised plan sheets will also be included in Addendum No. 2.
 - ii. The final date FRSA will receive questions on the bid documents is February 10, 2023. The final Addendum (if necessary) will be issued no later than February 13, 2023.
- F. The project will be awarded, if at all, to a single bidder. FRSA reserves the right to reject any and all bids and to ultimately accept the bid deemed most favorable to FRSA after all Proposals have been examined.
- G. Tentative award date is the FRSA Board Meeting scheduled for February 27, 2023.

III. Contract

- A. Insurance and Bonding documentation shall be provided to FRSA no more than 10 calendar days after the Notice of Award is issued.
- B. Completion date for this Contract is December 15, 2023. There are some references to a completion date of December 1, 2023 in the specifications; there were in error and will be corrected in the forthcoming Addendum.
- C. Pay requests should be submitted electronically to FRSA by the 5th day of the month for consideration at that month's Board Meeting. If approved, payment will be made before the 5th day of the following month. Retainage will be 10% until completion.
- D. The Adjustment Unit Prices will only apply should the quantities encountered during construction exceed the estimated quantities included already in the Lump Sum Proposal.
- E. Contractor shall submit a Schedule of Values showing amounts and quantities allocated to various items in the Contract. Pay Requests shall be based upon percentage completed of the Schedule of Values.

IV. Permits

- A. City Building Permit: FRSA has submitted permit application to the City, Contractor is responsible for permit fees.
- B. IEPA NPDES Permit: FRSA has submitted Notice of Intent to IEPA and paid all fees.
- C. City Stormwater Management Permit: FRSA has submitted application to the City and paid all fees.
- D. IEPA Public Water Supply Permit: FRSA has submitted application to the City and paid all fees.
- E. FRSA Industrial/Commercial Connection Permit: Contractor's responsibility to submit application and pay all required fees.

V. General and Project Specific Construction

- A. All structural steel for this project has been previously procured by FRSA. Steel was fabricated by Rockford Ornamental Inc. (ROI) and is currently stored at their facility. ROI's contract includes delivery of steel to the project site.
 - i. Electronic link to access the Steel Shop Drawings is provided in Section 00 3100 AVAILABLE PROJECT INFORMATION.
 - ii. The successful Contractor shall coordinate delivery of steel directly with ROI.
- F. Perimeter fence has been installed around the project site with access gates at Martin Road and Grant Park Boulevard. The access gates are currently locked, if any bidders would like to visit the site please contact FRSA to arrange for access.

G. Contractor shall be responsible for all temporary utilities (including water, power, heating/cooling), sanitary facilities, temporary lighting, and waste removal facilities.

VI. Clarification on Questions Received During the Pre-Bid Conference

- A. It was further clarified that the structural steel that was previously procured by FRSA does not include the girts, those are to be furnished and installed by the Contractor. The girt clips were installed on the structural steel members by ROI.
- B. Per Section I, Subsection C, Agreement Item 4.11 Liquidated Damages in the Bid Documents, liquidated damages for this project will be \$300.00 per calendar day beyond December 15, 2023.
- C. Regarding a question about soils at the project site, a Geotechnical Report is provided in SECTION 00 3100 AVAILABLE PROJECT INFORMATION.
- D. Plans revisions are forthcoming in Addendum No. 2 to address questions received to-date and City of Rockford permit review comments.
- E. Approximate locations of the demolished single-family homes and accessory structures are identified on Plan Sheet C101. Bidders should anticipate encountering buried foundations in areas where underground construction activities overlap with these locations. These underground impediments shall be classified as "Unsuitable Soils" and be removed and replaced requirements stipulated in SECTION 31 2000 EARTH MOVING. A quantity of 200 CY of Unsuitable Soils removal and replacement with Select Engineered or Granular Fill shall be included in the Bid; if field measured quantities exceed this amount then the Adjustment Prices itemized in the Proposal will be used.
- F. The 8' PCC aprons adjacent to the north and south faces of the building will be fully reinforced. Revised plan sheets showing details of the reinforcement will be sent with Addendum No. 2.
- G. The exterior detector loops proposed at the overhead doors will be removed; revised plan sheets will be sent with Addendum No. 2.
- H. This project will be fully funded by FRSA funds and no federal, state, or grant funds will be utilized.

Collection Systems Operations Facility, Capital Project No. 2217 Mandatory Pre-Bid Conference Attendance

Date and Time: <u>Wednesday, February 1, 2023 at 10:00 a.m.</u>

Company	Mailing Address	Phone Number
FRSA	3501 Kishwaukee Street, Rockford, IL 61109	815-387-7660
FRSA	3501 Kishwaukee Street, Rockford, IL 61109	815-387-7651
FRSA	3501 Kishwaukee Street, Rockford, IL 61109	815-387-7660
FRSA	3501 Kishwaukee Street, Rockford, IL 61109	815-387-7662
FRSA	3501 Kishwaukee Street, Rockford, IL 61109	815-871-0787
FRSA	3501 Kishwaukee Street, Rockford, IL 61109	815-621-2932
Legacy Designs, Inc.	6116 Mulford Village Drive, Rockford, IL 61107	815-484-4708
Legacy Designs, Inc.	6116 Mulford Village Drive, Rockford, IL 61107	815-484-4708
Scandroli Construction Co.	1321 Capital Drive, Rockford, IL 61109	815-962-4037
Schmeling Construction	315 Harrison Avenue, Rockford, IL 61104	815-399-7800
Rockford Ornamental Iron Inc.	1817 Michigan Avenue, Rockford, IL 61102	815-968-5357
Stenstrom General Contracting	2420 20th Street, Rockford, IL 61104	815-398-2420
FRSA	3501 Kishwaukee Street, Rockford, IL 61109	815-387-7660
Sjostrom & Sons, Inc.	1129 Harrison Avenue, Rockford, IL 61104	815-566-1989
Sjostrom & Sons, Inc.	1129 Harrison Avenue, Rockford, IL 61104	815-243-2212
Special Power	1226 18th Avenue, Rockford, IL 61104	815-262-1352
Larson and Larson Builders	5612 Industrial Avenue, Loves Park, IL 61111	815-633-1773
	CompanyFRSAFRSAFRSAFRSAFRSAFRSALegacy Designs, Inc.Legacy Designs, Inc.Scandroli Construction Co.Schmeling ConstructionRockford Ornamental Iron Inc.Stenstrom General ContractingFRSASjostrom & Sons, Inc.Special PowerLarson and Larson Builders	CompanyMailing AddressFRSA3501 Kishwaukee Street, Rockford, IL 61109FRSA3501 Kishwaukee Street, Rockford, IL 61107Legacy Designs, Inc.6116 Mulford Village Drive, Rockford, IL 61107Legacy Designs, Inc.6116 Mulford Village Drive, Rockford, IL 61107Scandroli Construction Co.1321 Capital Drive, Rockford, IL 61109Schmeling Construction315 Harrison Avenue, Rockford, IL 61104Rockford Ornamental Iron Inc.1817 Michigan Avenue, Rockford, IL 61102Stenstrom General Contracting2420 20th Street, Rockford, IL 61104FRSA3501 Kishwaukee Street, Rockford, IL 61104Sjostrom & Sons, Inc.1129 Harrison Avenue, Rockford, IL 61104Special Power1226 18th Avenue, Rockford, IL 61104Larson and Larson Builders5612 Industrial Avenue, Loves Park, IL 61111

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Proposal

Project: Collection Systems Operations Facility Capital Project No. 2217

Location: The Operations Facility will be constructed on FRSA-owned properties north of FRSA's treatment plant (3333 Kishwaukee Street) and adjacent to Martin Road and Lyle Street.

Completion Date: December 15, 2023

Liquidated Damages: \$300/ per calendar day beyond December 15, 2023

To: Board of Trustees Four Rivers Sanitation Authority 3501 Kishwaukee Street Rockford, IL 61109

From:

(Individual, Partnership or Corporation, as case may be)

(Address of Individual, Partnership or Corporation)

Gentlemen:

I (We), the undersigned, hereby propose to furnish all materials, equipment, tools, services, labor, and whatever else may be required to construct and place in service the above subject Sanitary Sewer for the Four Rivers Sanitation Authority all in accordance with the plans and specifications, provided by Four Rivers Sanitation Authority. The undersigned also affirms and declares:

- 1. That I (we), have, examined and am (are) familiar with all the related contract documents and found that they are accurate and complete and are approved by the undersigned.
- 2. That I (we), have carefully examined the site of the work, and that, from my (our) investigation, has satisfied myself (ourselves) as to the nature and location of the work, the character, quality, and quantity of materials and the kind and extent of equipment and other facilities needed for the performance of the work, the general and local conditions and all difficulties to be encountered, and all other items which may, in any way, effect the work or its performance.
- 3. That this bid is made without any understanding, agreement or connection with any other person, firm, or corporation making a bid for the same purposes, and is in all

respects fair and without collusion or fraud; and that I (we) are not barred from bidding as a result of a bid-rigging or bid-rotating conviction.

- 4. That accompanying the Proposal is a Bidder's Bond in the amount specified in Article 1, Notice to Bidders, payable to the Board of Trustees of the Four Rivers Sanitation Authority, which it is agreed, shall be retained as liquidated damages by said Four Rivers Sanitation Authority if the undersigned fails to execute the Contract in conformity with the contract documents incorporated in the contract documents and furnish bond as specified, within ten (10) days after notification of the award of the contract to the undersigned.
- 5. The Bidder is of lawful age and that no other person, firm or corporation has any interest in this Proposal or in the Contract proposed to be entered into.
- 6. The Bidder is not in arrears to the Four Rivers Sanitation Authority, upon debt or contract, and is not a defaulter, as surety or otherwise, upon any obligation to the Four Rivers Sanitation Authority.
- 7. No officer or employee or person whose salary is payable in whole or in part by the Four Rivers Sanitation Authority is, shall be or become interested, directly or indirectly as a contracting party, partner, stockholder, surety of otherwise, in this Proposal, or in the performance of the Contract, or in the work to which it is relates, or in any portion of the profits thereof.
- 8. The Bidder which I represent complies with all applicable requirements of the Americans with Disabilities Act (ADA) and the Occupational Safety and Health Act (OSHA) and that if said bidder is awarded a contract, it will complete all OSHA-required or ADA-required employee and customer training, will make available all required information, and will hold harmless and indemnify the Four Rivers Sanitation Authority and the Four Rivers Sanitation Authority and the Four Rivers.

In regard to participation in an approved Apprenticeship program, upon request, Contractor will be required to provide written proof of participation.

- 9. The undersigned, as Bidder, declares that he has adopted and promulgated written sexual harassment policies in accordance with Public Act 101-0221 and will make this information available upon request.
- 10. The undersigned, as Bidder, declares he will comply with prevailing wages in accordance with the Illinois Department of Labor Standards. The State of Illinois requires contractors and subcontractors on public works projects (including Four Rivers Sanitation Authority) to submit certified payroll reports via the State's Certified Transcript of Payroll Portal found at www2.illinois.gov/idol/Laws-Rules/CONMED/Pages/certifiedtranscriptofpayroll.aspx.
- 10. The undersigned, as Bidder, declares he will comply with the Federal Drug Free Workplace Act.
- 12. The undersigned, as Bidder, declares he will comply with Public Act 83-1030 entitled "Steel Products Procurement Act".
- 13. The undersigned, as Bidder, declares he will comply with Public Act 96-929 (30 ILCS 570) regarding Illinois residents' employment.

- 14. The undersigned, as Bidder, declares he will comply with non-discrimination in employment in accordance with the Illinois Fair Employment Practices Commissions Rules & Regulations.
- 15. The undersigned, as Bidder, declares that he currently participates in an apprenticeship or training program that is registered with the United States Department of Labor's Bureau of Apprenticeship and Training or other acceptable State of Illinois Department of Labor monitored program.

In submitting this bid, it is understood that the right is reserved by the Four Rivers Sanitation Authority to reject any and all bids. It is agreed that this bid may not be withdrawn for a period of thirty (30) days from the opening thereof.

The undersigned further declares that he (they) has (have) carefully examined the following items of work and that the cost of all the work to complete this project is given in this Proposal.

Lump Sum Bid Amount

Total Amount of Lump Sum Bid, expressed in figures, for providing all materials, equipment, warranty, and labor to complete this project in conformity with all specifications in this Invitation to Bid.

\$

Adjustment Unit Price Work

Bidder has included in the Lump Sum Bid price the cost for the quantities of work described by the Adjustment Prices at the unit price as indicated below. The Adjustment Unit Prices will apply in the event that the final measured quantities exceed the estimated quantities included in the Lump Sum Bid. A single price shall be bid for each item.

ADJUSTMENT PRICES					
No.	ltem	Unit	Unit Price	Amount	Total Price
1	Removal of Unsuitable Soils (Section 31-2000)	CY		200	
2	Select Engineered Fill or Granular Fill to Replace Unsuitable Soils (Section 31-2000)	CY		200	

The undersigned acknowledges that he has received Addendum numbers _____, ____ _____, ____, and realizes that all Addenda are considered part of the Contract.

Date:

Bidder:

(Printed Name of Firm)

(Printed Street Address)

(Printed City, State, Zip)

(Area Code and Phone Number)

By: ______ (Authorized Rep's Signature)

By: _______(Printed Authorized Rep's Name)

By: ______ (Printed Authorized Rep's Title)

By: _____ (Fax Number)

(Authorized Rep's Email Address)

SECTION 00 7301

SUPPLEMENTARY CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

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ARTICLE 1 GENERAL PROVISIONS

A. The "General Conditions of the Contract for Construction" AIA Document A201, 2007 Edition; Articles 1 through 14, is a part of the Contract Documents attached herein.

B. The aforementioned AIA General Conditions shall remain in effect except for such modifications or deletions and such supplementary conditions as specified in this Section. Unaltered portions of the General Conditions shall remain in affect.

1.1BASIC DEFINITIONS

A. Section 1.1 of the General Conditions is supplemented as follows:

1.1.3 The term "General Work" shall mean the work, other than Mechanical and Electrical Work, specified in any or all Sections of Divisions 1 through 14.

The term "Mechanical Work" shall mean the Plumbing, Heating and Ventilating Work specified in any or all Sections of Divisions 1 and 15 and other Divisions specified. The term "Electrical Work" shall mean the Electrical Work specified in any or all Sections of Divisions 1 and 16 and other Divisions specified.

1.1.4 Where the word "building", "project" or "work" occurs herein or in the Specifications, it shall be construed as applying to all buildings. In all cases where device, material, units or part of equipment is referred to as singular in number, it is intended that such reference shall apply to as many such devices as are required to complete project and/or work on the project.

1.1.5 "Provide" wherever used in the specifications or on the drawings shall mean "furnish and install in place".

1.1.6 "Provide" wherever used in the specifications or on the drawings shall mean "furnish and install in place".

1.1.7 The term "Project Manual" shall mean the volume that includes the Bidding Requirements, Conditions of the Contract and the Specifications and other technical data and soil boring reports.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

A. Subparagraph 1.2.1 of the General Conditions is supplemented as follows:

1.In the case of an inconsistency between drawings and specifications or within either document, not clarified by addenda, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation.

2. The Contractor shall provide all work and materials which any Section or part of the drawings, specifications or conditions require him to provide regardless of whether such requirement is or is

not faithfully repeated in other parts of documents thereof to which the provision might be appropriate.

3.Where new rooms are shown on the floor plans but are not listed in the Room Finish Schedule, those rooms shall be finished the same as other rooms of a similar nature as listed in the Room Finish Schedule. Where new doors are designated on the floor plans but are not listed in the Door Schedule, provide doors, frames and hardware of the same type as are to be provided for rooms of a similar nature.

B. Sub-paragraph 1.2.2 of the General Conditions is supplemented as follows:

1.Project Manual Explanation:

a. Project Manual is composed of Title Page, Index, Bidding Requirements and Forms, Conditions of the Contract and Specifications. Divisions and Sections are arranged in format conforming to the 16 Division System of the CSI.

b. Where Sections contain "Work Includes" list, it merely serves as a table of contents for items described in the Section and is not intended to limit or restrict volume or type of work required by the Section of Specifications.

c. Imperative language is used generally in the specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by the Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe the responsibilities which must be fulfilled indirectly by the Contractor or, when so noted, by others.

C. Subparagraph 1.2.3 of the General Conditions is supplemented as follows:

1. Where materials or devices are specified in these documents by reference to Government, Manufacturer's Association or Professional Society Standards, the pertinent sections of the latest edition of such standards, unless otherwise specified, shall have the same force and effect as if set forth in full in these specifications. The following abbreviations will be used as indicated for the principal societies:

AASHTO American Association of State Highway & Transportation Officials

ACI American Concrete Institute

AIA American Institute of Architects

AIEE American Institute of Electrical Engineers

AISC American Institute of Steel Construction

AMCA Air Moving and Conditioning Association

ANSI American National Standards Institute

ASCE American Society of Civil Engineers

ASME American Society of Mechanical Engineers

ASTM American Society of Testing Materials

AWI Architectural Woodwork Institute

AWS American Welding Society

NEC National Electric Code

NFPA National Fire Protection Association

SMACNA Sheet Metal and Air Conditioning Contractors National Association UL Underwriter's Laboratories

OL Underwhier's Laboratories

1.5 EXECUTION OF CONTRACT DOCUMENTS

A.Subparagraph 1.5.2 of the General Conditions is supplemented as follows:

1.Site Investigation:

a. By executing the Contract, the Contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, including those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, ground water table or similar physical conditions of the ground, the character, quality and quantity of surface and sub-surface materials to be encountered, the character of equipment and facilities needed prior to and during the execution of the work and all other matters which can in any way affect the work or the cost thereof under this Contract. Any failure by the Contractor to

acquaint himself with all the available information concerning these conditions will not relieve him from any obligation with respect to his Contract.

ARTICLE 3 CONTRACTOR

3.1 GENERAL

A. For the purpose of definition under Article 3 CONTRACTOR, Paragraph 3.1 of the General Conditions is supplemented as follows:

3.1.1 Contractor: The word "Contractor" is recognized as a party to the contract. The term "Contractor" unless otherwise modified, shall mean the Contractor to whom the contract has been awarded to perform the work required by all drawings and all 16 Divisions of the specifications and all Addenda issued. The terms General Contractor, Plumbing Contractor, Heating Contractor, Electrical Contractor, etc., may appear in certain Sections for clarity of describing the responsibilities which must be fulfilled as part of their respective Divisions of work.

3.4 LABOR AND MATERIALS

A. Paragraph 3.4 of the General Conditions is supplemented as follows:

1. In order that ready availability of materials, parts or components for repair, replacement or expansion may be assured, all such materials, parts and components shall be obtained where feasible from sources that maintain a regular domestic stock. Foreign produced materials and components shall be used only with Architect's prior written approval.

2. Materials: Substitution, Acceptance. Materials are specified in the following ways:

a. Where materials are listed by manufacturer and trade name with no qualifying statement, comparable materials of other manufacturers complying with or exceeding the specification for the intended use, and as approved by the Architect, may be furnished. Such approved materials will be included in the bidding documents by Addendum or may be submitted on the substitution sheet of the Bid Form.

b. Where more than one material or manufacturer and trade name are listed, Contractor has the option of selecting any one of the manufacturers or materials named. Within 30 days after award of contract and before ordering material and equipment, contractor shall submit in quadruplicate to Architect, listing of manufacturers or materials contractor proposes to use.

c. Where material is listed by description or by SATM or Fed Spec numbers, any product meeting or exceeding requirements of such specification will be acceptable if material does not alter details as shown on drawings. If requested by Architect, evidence shall be furnished showing that material meets requirements of specifications.

d. Materials shall be new and of the weights, grades, thickness and quality specified.
Manufactured items or equipment shall be based on names specified. In substituting items or equipment Contractor assumes responsibility for any changes in system or for modifications required in other work to accommodate such substitution, despite Architect's acceptance of the substitution, either in the specifications or in an Addendum, and shall coordinate with other contractors whose work may be affected by such substitution.
e. After the award of the Contract, substitutions will be considered only under one or more

e. After the award of the Contract, substitutions will be considered only under one or more of the following conditions:

(1) Required for compliance with subsequent interpretation of code requirements or insurance regulations.

(2) Unavailability of specified products, through no fault of the Contractor.

(3) Subsequent information discloses inability of specified products to perform properly or to fit into designated space.

(4) When it is clearly seen, in the judgment of the Architect that a substitution would be substantially to the Owner's best interest, in terms of cost, time or other considerations.

f. Unless otherwise specifically provided for in the specifications, all workmanship, equipment, materials and articles incorporated in the work covered by this contract are to be of the best grade of their respective kinds for the purpose. When required by the Specifications, or when called for by the Architect, the Contractor shall furnish to the Architect for his review the name of the manufacturer of materials, machinery, mechanical and other equipment which he contemplates incorporating in the work, together with their respective performance capacities and other pertinent information. Samples of materials shall be submitted for review when and as directed. Machinery or equipment materials and articles installed or used without such review shall be at the risk of subsequent rejection.

3. Anchors and/or Fasteners: Use of fibrous braid or non-metallic expansion shields will not be permitted for fastening any material or fabricated items.

4. Labor: Contractors and subcontractors employed upon work shall be required to conform to labor laws of the State and various acts amendatory and supplementary thereto and to other laws, ordinances and legal requirements applicable thereto.

a. Work shall be performed by trained experienced personnel, skilled in their various crafts, under full time supervision of an approved engineer or foreman.

3.5 WARRANTY

A. Subparagraph 3.5.1 of the General Conditions is supplemented as follows:

1. The Contractor is obligated to correct, at his own expense for a period of one year or such longer period as may be specified, all work found defective or not in accordance with the contract documents. This shall not establish a period of limitation with respect to any other obligation that the Contractor might have under the contract.

3.6 TAXES

A. Subparagraph 3.6.1 of the General Conditions is supplemented as follows:

1. The Contractor shall also pay unemployment and social security taxes or other taxes imposed by Local, City, State or Federal governmental bodies. If the tax laws are subsequently amended by legislation during the life of the contract, the Contractor shall provide the net change caused by such amendment.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

A. Subparagraph 3.10.1 of the General Conditions is supplemented as follows:

1. As soon as possible, the Contractor shall develop a construction Schedule for his work and make copies for Architect's information. The contractor shall issue a copy of his schedule to the subcontractors for mechanical and electrical, who, in turn, shall promptly prepare construction schedules for their work. The General Contractor shall then make a combined Horizontal Bar Chart of Work for all parties involved, which will be used throughout construction to keep this project on schedule.

2. The Horizontal Bar Chart for the Work shall be posted in the project construction office and shall be brought up to date monthly by the General Contractor. Updated charts shall include schedule changes for the work of all prime contractors involved. Copies of updated bar charts shall be sent to the Owner and the Architect monthly.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

A. Subparagraph 3.11.1 of the General Conditions is supplemented as follows:

1. The Contractor shall maintain record drawings throughout the construction of the project and shall be held solely responsible for their accuracy in accordance with Section 01700. The contractor shall update all modifications in the general site and building construction and shall require that all subcontractors update their respective record drawings one or more times each week. Contractor payment is contingent upon receipt of updated as built drawings and specifications.

2. Record drawings shall be turned over to the Architect at completion of the project.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Subparagraph 3.12.1 of the General Conditions is supplemented as follows:

1. Only shop drawings that have been reviewed by Contractor and Architect shall be used at the jobsite and all copies shall bear the stamps of both the Contractor and Architect indicating general conformance to the design concept and contract documents. The contractor is required to review the shop drawings in detail for compliance with all applicable code requirements. The review made by the architect is advisory only and applies to the design arrangment and

interpetion. This review shall not be construed as relieving the Contractor from compliance with the contract documents nor does it relieve the contractor (or theire sub-contractors) of responsibility for accruacy of details, dimensions or quanities. Changes on contract requirments cannot be made via shop drawing review but only by a properly executed change order.

3.18 INDEMNIFICATION

A. Paragraph 3.18 of the General Conditions is supplemented as follows:

1. Add a new subparagraph numbered 3.18.3 as follows: "None of the foregoing provisions shall deprive the Owner or the Architect of any action, right or remedy otherwise available to them or either of them at common law".

2. Add a new subparagraph numbered 3.18.4 as follows: "In the event that any party is requested but refuses to honor the indemnity obligation hereunder, then the party indemnifying shall, in addition to all other obligations, pay the cost of bringing any such action, including attorneys fees, to the party requesting indemnity.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.2 MUTUAL RESPONSIBILITY

A. Subparagraph 6.2.2 of the General Conditions is supplemented as follows:

1.Each contractor shall perform work in proper sequence in relation to that of other contractors. Mechanical contractors shall fit their piping and ductwork into structure as job conditions may demand. Final decision as to right-of-way and run of pipes, ducts etc., shall be made by Architect or his representative at project coordination meetings.

2.Each contractor and subcontractor shall obtain complete data at site and inspect surfaces that are to receive his work before proceeding with his work; shall be solely responsible for accuracy of measurements and laying out of work; shall correct errors or defects due to faulty measurements taken, information obtained, layout or due to failure to report discrepancies. Work of previous contracts found to be unacceptable to receive work of this contract shall be reported to the Architect by contractors finding such conditions prior to beginning of the work.

3.Each contractor shall give due notice and proper information to other contractors of any special provision necessary for the placing and setting of his work coming in contact with work of other contractors. Failing to do so in proper time, he shall be held responsible and shall pay for any and all alterations and repairs necessitated by such neglect.

4.Each contractor shall cooperate in every way possible to allow for installation of equipment that is to be provided by Owner or Equipment Contractors during the course of the construction. 5.Each contractor shall furnish and install during the progress of construction all necessary sleeves, hangers etc., required for his work. Installation must be done at such time and in such a manner as not to delay or interfere with any other building operation. Where any such work has not been done, or coordinated with the other trades, and where the proper installation of all apparatus and materials included in the specification is governed thereby, or where correction of defective work or where additional work is ordered, which requires cutting or fitting, the Contractor responsible for such defective or ill-timed work shall, at his own expense, do all such cutting, fitting, patching or repairing.

6.The fire protection contractor shall meet with all other subcontractors, and the General Contractor to assure that the fire protection systems in now way hinder any other trade or sub contractor or systems.

ARTICLE 7 CHANGES IN THE WORK

7.1 CHANGES

- A. Subparagraph 7.1.1 of the General Conditions is supplemented as follows: No contractor shall have the right to prosecute or a suit-at-law to recover for an extra, unless his claim is based upon written change order signed by Owner.
- B. Subparagraph 7.2.1 of the General Conditions is supplemented as follows: In addition to information required by the General Conditions, Change Orders shall include itemized costs of related accessories separate from the cost of each item.

ARTICLE 8 TIME

8.2 PROGRESS AND COMPLETION

A. Subparagraph 8.2 of the General Conditions is supplemented as follows:

1.It is hereby understood and mutually agreed by and between Contractor and Owner that date of beginning, rate of progress and time for completion of work to be done hereunder are essential conditions of this contract.

2.Work shall proceed regularly, diligently and uninterrupted at such rate of progress as will insure the substantial completion of the work within the estimated completion time stated by Contractor or as otherwise established in the contract.

ARTICLE 9 PAYMENTS AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT

1. Payments for this project will follow standard FRSA process – progress payments prepared for signature in first 5 days of the month, signed copy returned to FRSA no later than the 10th of the month, payment to occur after approval at Board meeting which is the 4th Monday of the month. Retainage to be 10% until project completion.

9.8 SUBSTANTIAL COMPLETION

A. Subparagraph 9.8 of the General Conditions is supplemented and modified as follows:

1. When the Architect determines that the work or designated portions thereof are substantially complete, the Architect will establish the date of substantial completion, as defined hereafter, and the date of acceptance of work by the Owner, through the use of a Certificate of Substantial Completion (AIA Document G704) and through other closing procedures which the Architect may direct. In any case, the Architect will prepare for submission to the Contractor a list of items to be completed or corrected hereafter referred to as the "punch list". The failure to include any item on the punch list does not alter the responsibility of the Contractor to complete all work in accordance with the Contract Documents. The Architect will recommend final payment to the Contractor when the work on all punch lists is satisfactorily completed, all record drawings and guarantees are provided, and the Contractor meets all other requirements of the contract documents and paragraph 9.8 of the General Conditions.

2. Substantial Completion:

The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Architect when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy the Work or designated portion thereof for the use for which it is intended.

On the Certificate of Substantial Completion, a time shall be fixed, not to exceed sixty (60) days, within which the Contractor shall finish all items on the final punch list accompanying the Certificate.

9.9 PARTIAL OCCUPANCY OR USE

A. Subparagraph 9.9.1 of the General Conditions is supplemented as follows:

1.In addition to all other precautions required by the Contract, such as barricades, signs, warning lights, etc., to make project completely safe for public use, the Contractor should provide and maintain dust tight barriers in the event of partial occupancy before substantial completion. Cost of barriers shall be paid by Contractor if project is behind schedule and by Owner if project is ahead of schedule.

2. Moving of equipment into building under other contracts or by the Owner will not constitute partial occupancy.

9.10 FINAL COMPLETION AND FINAL PAYMENT

A. Subparagraph 9.10.2 of the General Conditions is supplemented as follows:

1.Liens:

a. Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, delivers to the Owner a complete release of all liens arising out of this contract, or receipts in full in lieu thereof and if required in either case, an affidavit

that, so far as he has knowledge or information, the releases and receipts include all labor and material for which a lien could be filed; but the Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Owner, to indemnify him against any lien. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such a lien, including all costs and attorneys' fees.

ARTICLE 11 INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

A.Subparagraph 11.1.1 of the General Conditions is supplemented as follows:

 During the term of the contract, the Contractor shall, at his own expense, purchase and maintain the following insurance in companies properly licensed and satisfactory to the Owner:

 a. Workmen's Compensation including Occupational Disease and Employer's Liability Insurance.

1) State: Statutory amounts and coverage as required by Workman's Compensation Laws.

2) Worker's compensation insurance with statutory limits and employer's liability insurance with limits of not less than \$500,000 per occurrence, per employee for disease and \$500,000 aggregate for disease.

b. Comprehensive General Liability: Including coverage for direct operations, sublet work, contractual liability, completed operations and products liability, with limits not less than those stated below, which insurance shall fully protect him from claims for damages for bodily injury including accidental death, as well as claims or property damage and loss of use of property which may arise from activities under or incidental to the Contract, whether such activities be by himself or any of his subcontractors, or by anyone directly or indirectly employed or otherwise contracted by any of them.

1) Commercial general liability insurance with:

a)Limits of not less than \$1,000,000.00.

b)Coverage to include:

i.Projects/completed operations to be maintained for a period of not less than three (3) years following the completion and final acceptance of the work;

ii. Project specific limits of liability;

iii. Contractual liability, specifically referring to the indemnity obligations in this Contract;

iv. Broad form property damage, including products/completed operations.

v.Personal injury liability with employee and contractual exclusions deleted.

vi. Deletion of explosion, collapse and underground (XCU) exclusions;

vii. Sever ability of interest and cross liability endorsements with copies attached to the certificate of insurance.

c)(Regarding Completed Operations and Products Liability - Continue coverage in force for one year after completion of the work and acceptance by the Owner.) c.Personal Injury with Employment Exclusion Deleted:

1) \$500,000 aggregate

2. Comprehensive automobile liability insurance with limits of \$1,000,000.00 combined single limit covering owned, non-owned and hired vehicles.

B. Add a new subparagraph to General Conditions numbered 11.1.1.1, immediately prior to subparagraph 11.1.2 as follows:

1. The contractor shall also purchase and maintain such insurance as will protect the Owner (and his appointed "Owner's Representative") and the Architect and their agents and employees from and against all claims, damages, losses and expenses including attorneys' fees arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting there from, and (2) is caused in whole or in part by any negligent act or omission of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts

any of them may be liable, regardless of whether or not it is caused in part by a party to whom insurance is afforded pursuant to this paragraph.

2.In any and all claims against the Owner (and his appointed " Owner's Representative") or the Architect or any of their agents or employees by an employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the insurance obligation under this Paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workman's compensation acts, disability benefit acts or other employee benefit acts.

3. The insurance obligations of the Contractor under this Paragraph shall not extend to the liability of the Architect, his agents or employees arising out of (1) the preparation of approval of maps, drawings, opinions, reports, surveys, Change Orders, designs, or specifications, or (2) the giving of or the failure to give directions or instructions by the Architect, his agents or employees provided such giving or failure to give is the primary cause of the injury or damage.

4. This insurance shall be for the same limits stated for the Contractor's other liability insurance.

C. Change the first line of subparagraph 11.1.2 of General Conditions to read as follows: "The insurance required by subparagraphs 11.1.1 and . . ."

D. All policies and certificates of insurance shall expressly provide that no less than sixty (60) days prior notice shall be given to Owner in the event of material alteration, cancellation or intent to non-renew the coverage evidenced by such policies or certificates of insurance.

E. Contractor shall carry sufficient comprehensive insurance on his equipment at site of work and en route to and from site to fully protect him; Contractor shall require the same coverage of his subcontractors. It is expressly understood and agreed that Owner and/or Architect shall have no responsibility therefore.

F. A certificate of insurance shall be filed with the Owner evidencing the coverage set forth above and including: An additional insured endorsement naming Owner, and any owned, affiliated or subsidiary company or corporation that is a party to this Contract and their board members, officers, employees, agents and consultants as additional insured. Any insurance maintained by the additional insureds shall be in excess of any coverage provided by the Contractor or its Subcontractors.

H. Intentionally left blank -

I. Contractors shall procure and maintain during the life of the Agreement, including any extensions thereof, the type of insurance specified, with insurance companies rated according to the most recent edition of A.M. Best, but not less than A (X).

1. Delete the semicolon at the end of Clause 11.1.1.1 and add:

including private entities performing Work at the site and exempt from the coverage on account of number of employees or occupation, which entities shall maintain voluntary compensation coverage at the same limits specified for mandatory coverage for the duration of the Project;

J. Delete the semicolon at the end of Clause 11.1.1.2 and add:

or persons or entities excluded by statute from the requirements of Clause 11.1.1.1 but required by the Contract Documents to provide the insurance required by that Clause;

K. Add the following clauses 11.1.1.9:

1.Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:

a.Premises Operations (including X, C and U coverage as applicable).

b.Independent Contractors' Protective.

c.Products and Completed Operations.

d.Personal Injury Liability with Employment Exclusion deleted.

e.Owned, non-owned and hired motor vehicles.

f.Broad Form Property Damage including Completed Operations.

g.Completed operations coverage for two years after completion of the Work or for such longer period of time as described in the Contract Documents.

h.Waiver of Subrogation in favor of the additional insureds.

i.All policy or endorsements limitations relating specifically to operations pertaining to railroad property shall be eliminated. This is required only if the Work is on or within railroad property.

L. Add the following Clause 11.1.2.1 to 11.1.2:

1. The Contractor's Liability Insurance required by Subparagraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:

a.State Statutory

b.Applicable Federal Statutory

c.Employer's Liability: \$1,000,000 per Accident \$1,000,000 Each Occurrence d.Disease Policy Limit \$1,000,000 Disease Each Employee

2.Commercial General Liability (including Premises Operations; Independent Contractor's Protective, Products and completed operations, Broad Form Property Damage): The limits of liability shall be written on an occurrence basis and shall provide coverage for not less than the following amounts:

a.Bodily Injury: \$1,000,000 Each Occurrence, \$1,000,000 Aggregate

b.Property Damage: \$1,000,000 Each Occurrence, \$1,000,000 Aggregate

c.Products and Completed Operations to be maintained for three (3) years after final payment: \$1,000,000 Each Occurrence, \$1,000,000 Aggregate

d.Property Damage Liability Insurance shall provide X, C and U coverage.

e.Broad Form Property Damage Coverage shall include Completed Operations.

f.Fire Legal Liability: \$100,000 Each Occurrence

Note: Owner is added as an Additional Insured by Endorsement on the commercial general liability policy.

3.Broad Form Contractual Liability

a.Bodily Injury: \$1,000,000 Each Occurrence, \$1,000,000 Aggregate

b.Property Damage: \$1,000,000 Each Occurrence, \$1,000,000 Aggregate

c.Personal Injury with Employment Exclusion deleted: \$1,000,000 Aggregate

4.Personal Injury Liability with Employment Exclusion deleted: \$1,000,000 Aggregate

5. Business Auto Liability (including owned, non-owned and hired vehicles):

a.Bodily Injury: \$1,000,000 Each Occurrence, \$1,000,000 Aggregate

b.Property Damage: \$1,000,000 Each Occurrence

Note: Owner is added as an Additional Insured by Endorsement on the automobile liability policy.

6.Umbrella Excess Liability

a.\$2,000,000 Occurrence

b.\$2,000,000 Aggregate

c.\$10,000 for self insured hazards each occurrence

7.Aircraft Liability (owned and un-owned) when Aircraft are used in the performance of the Contract: \$10,000,000 each occurrence combined single limit for bodily injury and property damage.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

12.2 CORRECTION OF WORK

A. Subparagraph 12.2.1 of the General Conditions is supplemented as follows:

1. Approval of any material or work at any stage of construction will not prevent its subsequent rejection for cause.

2. Guarantees and Warranties:

a.Nothing herein intends or implies that warranties or guarantees shall apply to work which has been abused or neglected by Owner or his successor in interest, or which has been subject to usual wear and tear or accidental damage not chargeable to Contractor or his agents.

b.Guarantee and Warranty time periods shall commence with the date of acceptance by Owner of the Certificate of Substantial Completion except as related to items of incomplete or uncorrected work noted on the Certificate's Punch List. The guarantee and warranty time periods for Punch List item shall commence with the date of Final Completion established by the Architect's issuance of the final certificate of payment.

c.The Contractor is obligated to correct at his own expense for a period of one year or such longer period as may be specified, all work found defective or not in accordance with the contract documents. This shall not establish a period of limitation with respect to any other obligation, which the Contractor might have under the contract.

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.5 TESTS AND INSPECTIONS

A.Subparagraph 13.5.2 of the General Conditions is supplemented as follows:

1. The laboratory or inspection agency will be contracted by the General Contractor to perform, or cause to be performed, tests necessary to determine if specified results have been obtained. Contractor shall call for and schedule testing.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

A.Subparagraph 14.1.1 if the General Conditions is supplemented as follows:

1. If the work should be stopped under an order of any court, or other public authority for a period of thirty (30) days, through no act or fault of the Contractor or of anyone employed by him, then the contractor may, upon twenty-one (21) days written notice to the Owner and the Architect, terminate this Contract and recover from the Owner payment for all work executed and any proven loss sustained for any materials and reasonable profit and damages.

2.If the Architect, or Owner if the architect is not reviewing payment requests under design build projects, has not issued a certificate for payment, through no fault of the Contractor, within twenty-one (21) days after the contractor's formal request for payment, or if the Owner has not made payment to the Contractor within twenty-one (21) days of its maturity and presentation, then the Contractor may, upon twenty-one (21) days written notice to the Owner and Architect, stop the work or terminate this Contract as set out in the preceding paragraph.

ARTICLE 15 CLAIMS AND DISPUTES

15.1 CLAIMS AND DISPUTES

A. Subparagraph 15.1 of the General Conditions is supplemented as follows:

1. Whenever any employee, agent or other representative of Contractor, or any employee, agent or other representative of a subcontractor, whose activities on or about the site arise out of the work of a contractor, shall cause or be a substantial factor in causing any damage (including but not limited to breaking, burning, overheating, freezing, exposing disconnecting, misconnecting, failing to guard or protect, and depriving of support) to the work, materials or property of a third party (including but not limited to the Owner, other contractors, subcontractors, material suppliers, delivery persons, frequenters, security holders, adjacent land owners, bodies politic, utilities or members of the public) such Contractor or Subcontractor shall promptly proceed to remedy and correct such damage and to pay all costs, expenses and damages involved. To the extent that such Contractor or Subcontractor shall fail to do so, he shall be accountable, under his contract with the Owner, for all damages to the Owner directly or consequentially arising there from whether liquidated or not, and whether certain or contingent, including but not limited to costs of renovation, repair, replacement or relocation, vicarious liabilities, losses by delays, charges for architectural or their services, and extra costs, charges, work or materials of every description. Upon certification by the Architect of the identity of the responsible party and of the extent of such damage so cause. Owner shall be entitled for its security, to withhold or deduct from payments otherwise due such contractor any sum reasonably estimated to be required to secure Owner's right to such account, until Owner shall otherwise be fully indemnified and made whole. Such liability to account shall be deemed contractual and shall arise regardless of whether or not circumstances of conventional tort are present or proven, and shall bind the sureties and indemnitors of such Contractor or Subcontractor but the Owner shall not be deemed to have waived, released, settled or otherwise impaired its right to full account by reason of any payment,

withholding, deduction, failure to withhold or deduct, or other form of claim or failure to claim; and in no event shall exercise or non-exercise of the Owner's right to be deemed or implied to impose on the Owner any liability toward any other person; or to affect, except as expressly provided, the rights or liabilities of any of the parties arising independently of this provision.

2. Whenever the Contractor or Subcontractors whose activities cause any such damage cannot in the opinion of the Architect, be specifically ascertained, or whenever a Contractor's or Subcontractor's proportionate responsibility to account therefore according to the foregoing provisions cannot, in the opinion of the Architect, be finally determined, the party to whose work sections the damage pertains shall proceed promptly to remedy and correct such damage, as extra work, and the reasonable charges for so doing, together with the amounts of any further damages which may so arise, shall be certified by the Architect to the Owner, with authorization to charge the aggregate sum to the respective accounts of all contractors who, directly or through subcontractors, material suppliers or delivery persons were engaged in any activity at the site of the damage when it arose, in proportion to the gross amounts of their respective contracts. Such allocated accountability shall continue as security to the Owner, until a different accountability is ascertained, in the opinion of the Architect or until the Owner is otherwise fully indemnified and made whole.

END OF SECTION

SECTION 08 3613 SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Overhead sectional doors, electrically operated.
- B. Operating hardware and supports.
- C. Electrical controls.

1.02 RELATED REQUIREMENTS

- A. Section 05 5000 Metal Fabrications: Steel channel opening frame.
- B. Section 06 1000 Rough Carpentry: Rough wood framing for door opening.
- C. Section 07 9005 Joint Sealers: Perimeter sealant and backup materials.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 Safety Standard for Architectural Glazing Materials; current edition.
- B. ANSI Z97.1 American National Standard for Safety Glazing Materials Used in Buildings -Safety Performance Specifications and Methods of Test; 2015.
- C. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- D. ASTM C1172 Standard Specification for Laminated Architectural Flat Glass; 2014.
- E. ASTM E330/E330M Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- F. DASMA 102 American National Standard Specifications for Sectional Overhead Type Doors; 2011.
- G. ITS (DIR) Directory of Listed Products; current edition.
- H. NEMA ICS 2 Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).
- I. NEMA MG 1 Motors and Generators; 2017.
- J. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- K. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL (DIR) Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- C. Product Data: Show component construction, anchorage method, and hardware.
- D. Samples: Submit two panel finish samples, 6 by 6 inch in size, illustrating color and finish.
- E. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.
- F. Operation Data: Include normal operation, troubleshooting, and adjusting.
- G. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.
- H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer: Company specializing in performing the work of this section with minimum 5 years of experience.
- C. Comply with applicable code for motor and motor control requirements.
- D. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction, as suitable for purpose specified.

1.06 WARRANTY

- A. See Section 01 7800 Closeout Submittals for warranty requirements.
- B. Correct defective Work within a 10 year warrnty period after Date of Substantial Completion.
- C. Warranty: Include coverage for electric motor.
- D. Provide 3 year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: ThermaSeal TM220 manufactured by Raynor.
 - 1. ThermaSeaITM220 Commercial Sectional Garage Doors manufactured by Raynor.

2.02 STEEL DOORS

- A. Steel Two Sided Sectional Doors: Flush steel, insulated; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.
 - 1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
 - 2. Door Nominal Thickness: 2 inches thick.
 - 3. Exterior Finish: Factory finished with standard factory finish; Manufacturer Standard White color.
 - 4. Interior Finish: Factory finished with standard factory finish; White color.
 - 5. Glazed Lights: Full panel width, one row; set in place with resilient glazing channel.
 - 6. Operation: Electric.
- B. Door Panels: Steel construction; outer steel sheet of 20 gage, 0.0359 inch minimum thickness, flushstucco profile; inner steel sheet of 26 gage, .018 inch minimum thickness, flatstucco profile; core reinforcement manufacture standard inch sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; expanded polystyrene (EPS) insulation.
- C. Window Frame: Manufacturers standard, finish to match.
- D. Glazing: Annealed float glassAnnealed float glass; single panesingle pane; clearclear; 1 inch overall thickness.
- E. Warrantee; 10 year rust through and delamination.

2.03 COMPONENTS

- A. Heavy Duty Track: Rolled galvanized steel, 13 gauge thick; 2 inch wide, continuous one piece per side; galvanized steel mounting brackets 13 gauge galvanized thick.
- B. Heavy Duty Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.
- C. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.
- D. Sill Weatherstripping: Resilient hollow neoprene 3" EPDM strip, one piece; fitted to bottom of door panel, full length contact.

- E. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.
- F. Head Weatherstripping: EPDM rubber seal, one piece full length.
- G. Panel Joint Weatherstripping: Raynor Standard, one piece full length.
- H. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.
- I. Provide galvanized steel stiffeners screwed to in inner panels. Minimum, 3 per 8' h. door and 5 per 14' door minimum, manufacturer shall provide more if requiredby thier in house enginnering.

2.04 MATERIALS

- A. Sheet Steel: Hot-dipped galvanized steel sheet, <u>ASTM A653/A653M</u>, with <u>Raynor Standard</u> <u>coating, stucco pencil groove surface.</u>
- B. Laminated Safety Glass: ASTM C1172 with at least 0.030 inch thick polyvinyl butyral (PVB) interlayer, and in compliance with safety criteria 16 CFR 1201 Categories 1 and 2, and ANSI Z97.1.
- C. Insulation: Rigid polyurethane.
 - 1. R value of 18.3.
 - 2. Same thickness as core framing members.

2.05 ELECTRICAL OPERATION

- A. Electric Operators:
 - 1. Mounting: Side mounted on cross head shaft.
 - 2. Motor Enclosure:
 - 3. 1 hp; manually operable in case of power failure, transit speed of 8 to 12 inches per second.
 - 4. Motor Voltage: 480 volts, three phase, 60 Hz.
 - 5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
 - 6. Controller Enclosure: NEMA 250, Type 1.
 - 7. Opening Speed: 12 inches per second.
 - 8. Brake: Adjustable friction clutch type, activated by motor controller.
 - 9. Manual override in case of power failure.
 - 10. 25 amperes maximum.
 - 11. Coordinate with Electrical Contractor on power requirments
- B. Motor: NEMA MG1, Type 1, belt drive.
- C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.
- D. Disconnect Switch: Factory mount disconnect switch in control panel.
- E. Safety Edge: At bottom of door panel, full width; electro-mechanical sensitized type, wired to reverse door upon striking object; hollow neoprene covered to provide weatherstrip seal.
- F. Control Station: Standard three button (open-close-stop) type control for each electric operator. 1. Surface mounted.
 - Locate at inside door jamb.
- G. Provide safety reverse feature.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
- B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

- A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.
- B. Apply primer to wood frame.

3.03 INSTALLATION

- A. Install door unit assembly in accordance with manufacturer's instructions.
- B. Anchor assembly to wall construction and building framing without distortion or stress.
- C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- D. Fit and align door assembly including hardware.
- E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.
- F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 9005.
- G. Install perimeter trim.

3.04 TOLERANCES

- A. Maximum Variation from Plumb: 1/16 inch.
- B. Maximum Variation from Level: 1/16 inch.
- C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.
- D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

- A. Adjust door assembly for smooth operation and full contact with weatherstripping.
- B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.06 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.
- B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

SECTION 23 0923

DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC

PART 1 – GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Building Automation System (BAS), utilizing Direct Digital Controls (DDC) and electronic controls as described herein. The systems shall be capable of total integration of the facility infrastructure systems with user access to all system data either locally over a secure Intranet within the building or by secure remote access by a standard Web Browser over the Internet. This shall include HVAC control, energy management, alarm monitoring, and all trending, reporting and maintenance management functions related to normal building operations all as indicated in this specification.
- B. The Building Automation System shall include:
 - 1. Programmable Controllers.
 - 2. Input/Output Modules as required.
 - 3. Individual BACNet Routers or Building Controller with routing capabilities.
 - 4. Other components required for a complete and working BAS.
- C. Control wiring and power wiring between field installed controls, indicating devices and unit control panels for temperature control systems, is work of this Section to be installed in accordance with Division 26. Line or low voltage power wiring required for control devices including, but not limited to motor operated dampers, sensors, control valves, and thermostats that are not powered by equipment served shall receive power from the nearest temperature control panel (TCP) as work of this Section. Coordinate total ampere load in panel with Electrical Contractor to determine total number of circuits required at the TCP.
- D. All equipment and wiring located in areas designated as Class I, Division 1, Group D Hazardous Classified Location, shall be suitable for this rating and installed in accordance with Division 26.

1.2 DEFINITIONS AND ABBREVIATIONS

A. Definitions:

1.	BACnet Interoperability Building Blocks (BIBB)	A BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBS are combined to build the BACnet functional requirements for a device in a specification.
2.	BACnet/IP	An approved BACnet network type which uses an Ethernet carrier and IP addressing.
3.	BACnet MS/TP	An approved BACnet network type which uses a Master- Slave Token Passing configuration. MS/TP networks are unique to BACnet and utilize EIA485 twisted pair topology running at 9600 to 76,800 bps
4.	BACnet over ARCNET	An approved BACnet network type which uses an ARCNET (attached resource computer network) carrier. ARCNET is an industry standard that can utilize several speeds and wiring standards. The most common configuration used by BACnet controllers is an EIA485 twisted pair topology running at 156,000 bps

5.	BACnet/BACnet Standard	BACnet communication requirements as defined by the latest version of ASHRAE/ANSI 135 and approved addenda.
6.	Control Systems Server	A computer(s) that maintain(s) the systems configuration and programming database.
7.	Controller	Intelligent stand-alone control device. Controller is a generic reference to building controllers, custom application controllers, and application specific controllers.
8.	Direct Digital Control	Microprocessor-based control including Analog/Digital conversion and program logic.
9.	Gateway	Bi-directional protocol translator connecting control systems that use different communication protocols.
10.	Local Area Network	Computer or control system communications network limited to local building or campus.
11.	Master-Slave/Token Passing	Data link protocol as defined by the BACnet standard.
12.	Point-to-Point	Serial communication as defined in the BACnet standard.
13.	Primary Controlling LAN	High speed, peer-to-peer controller LAN connecting BCs and optionally AACs and ASCs. Refer to System Architecture below.
14.	Protocol Implementation Conformance Statement (PICS)	A written document that identifies the particular options specified by BACnet that are implemented in a device.
15.	Router	A device that connects two or more networks at the network layer.
16.	Smart Actuator (SA)	An actuator which is controlled by a network connection rather than a binary or analog signal. (0-10v, 4-20mA, relay, etc.)
17.	Smart Sensor (SS)	A sensor which provides information to the BAS via network connection rather than a binary or analog signal. (0-10000 ohm, 4-20mA, dry contact, etc.)
18.	Web Services	Web services are a standard method of exchanging data between computer systems using the XML (extensible markup language) and SOAP (simple object access protocol) standards. Web services can be used at any level within a Building Automation System (BAS), but most commonly they are used to transfer data between BAS using different protocols or between a BAS and a non-BAS system such as a tenant billing system or a utility management system
19.	Wiring	Raceway, fittings, wire, boxes and related items.

1.3 SYSTEM DESCRIPTION

- A. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers, a control system Supervisory Server, and a web-based operator interface.
- B. Contractor shall implement a Niagara Framework based open system that will allow products from various suppliers to be integrated into a unified system in order to provide flexibility for

expansion, maintenance, and service of the system. The Owner shall be the named license holder of all software associated with any and all incremental work on the Contract. Only Niagara Framework based products running on Version 4 or newer are acceptable.

- C. The Owner shall receive ownership of all job specific configuration documentation, data files and application-level software developed for the Contract. This shall include all custom, job specific software code, databases and documentation for all configuration and programming that is generated for the Contract and/or configured for use with the NAC, FMCS Server(s), and any related LAN / WAN / Intranet and Internet connected routers and devices. Any and all required IDs and passwords for admin and programming level access to any component or software program shall be provided to the Owner.
- D. It is the Owner's intent to purchase an open system capable of being serviced and expanded by any acceptable system integrator that has and maintains certification (TCP) to work on Niagara Framework systems. The Niagara Compatibility Statement (NICS) for all Niagara Software shall allow open access and be set as follows: accept.station.in="*" accept.station.out="*" accept.wb.out="*" accept.wb.in="*". In any case, the Owner shall maintain the right to direct Contractor to modify any software license, regardless of supplier, as desired by the Owner. The Contractor shall not install any "brand specific" software, applications or utilities on Niagara Framework based devices.
- E. All hardware installed for the Contract shall not be limited in their ability to communicate with a specific brand of Niagara Framework device. They shall also be constructed in a modular fashion to permit the next generation and support components to be installed in replace of or in parallel with existing components.
- F. System shall use the BACnet protocol for communication to the web server and for communication between control modules. I/O points, schedules, setpoints, trends and alarms specified in Control Sequences shall be BACnet objects.

1.4 SYSTEM PERFORMANCE

- A. Performance Standards. System shall conform to the following minimum standards over network connections.
 - 1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.
 - 2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec. and shall automatically refresh every 15 sec.
 - 3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.
 - 4. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.
 - 5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 45 sec.
 - 6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.
 - 7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.
 - 8. Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.
 - 9. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed below:

Measured Variable	Reported Accuracy
Space Temperature	±1°F
Ducted Air	±1°F
Outside Air	±2°F
Dew Point	±3°F
Delta-T	±0.25°F
Air Pressure (ducts)	±0.1 in. w.g.
Air Pressure (space)	±0.01 in. w.g.
Electrical	±1% of reading (not including Utility meters)

10. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed below:

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±0.2 in. w.g.	0–6 in. w.g.
Airflow	±10% of full scale	0.1 to 0.1 m. w.g.
Space	±2.0°F	
Temperature		
Duct	±3°F	
Temperature		
Humidity	±5% RH	

1.5 SUBMITTALS

- A. General:
 - 1. Submit Product Data in sufficient detail to confirm compliance with requirements of this Section. Submit Product Data and Shop Drawings in one complete submittal package. Partial submittals are unacceptable.
- A. Installer Experience: Submit documentation that installer has a minimum of 5-years of experience in installations with the proposed Manufacturer's equipment and Niagara certification.
- B. Product Data and Shop Drawings: Contractor shall provide shop drawings or other submittals on hardware, software, and equipment to be installed or provided. No work may begin on any segment of this project until submittals have been approved for conformity with design intent. Provide drawings as AutoCAD 2012 (or newer) compatible files on magnetic or optical disk (file format: .DWG, .DXF, .VSD, or comparable) and three 11" x 17" prints of each drawing. When manufacturer's cutsheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawing shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cutsheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work. Submittal approval does not relieve Contractor of responsibility to supply sufficient quantities to complete work. Submittals shall include:
 - 1. DDC System Hardware:
 - a. A complete bill of materials to be used indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.

- b. Manufacturer's description and technical data such as performance curves, product specifications, and installation and maintenance instructions for items listed below and for relevant items not listed below:
 - 1) Direct digital controllers (controller panels)
 - 2) Transducers and transmitters
 - 3) Sensors (including accuracy data)
 - 4) Actuators
 - 5) Valves
 - 6) Relays and switches
 - 7) Control panels
 - 8) Power supplies
 - 9) Batteries
 - 10) Operator interface equipment
 - 11) Wiring
- c. Wiring diagrams and layouts for each control panel. Show termination numbers.
- d. Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware. Riser diagrams showing control network layout, communication protocol, and wire types.
- 2. Central System Hardware and Software:
 - a. A complete bill of material of equipment used indicating quantity, manufacturer, model number, and relevant technical.
 - b. Manufacturer's description and technical data such as product specifications and installation and maintenance instructions for items listed below and for relevant items furnished under this contract not listed below:
 - 1) Power supplies
 - 2) Battery backups
 - 3) Interface equipment between server and control panels
 - 4) Operator interface software
 - 5) Color graphic software
 - 6) Third-party software
 - c. Schematic diagrams for all control, communication, and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show interface wiring to control system.
 - d. Network riser diagrams of wiring between central control unit and control panels.
- 3. Controlled Systems:
 - a. Riser diagrams showing control network layout, communication protocol, and wire types.
 - b. A schematic diagram of each controlled system. The schematics shall have all control points labeled with point names shown or listed. The schematics shall graphically show the location of all control elements in the system.
 - c. A schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic, use the same name.
 - d. An instrumentation list (Bill of Materials) for each controlled system. List each control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.
 - e. A mounting, wiring, and routing plan-view drawing. The design shall take into account HVAC, electrical, and other systems' design and elevation requirements. The drawing
shall show the specific location of all concrete pads and bases and any special wall bracing for panels to accommodate this work.

- f. A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.
- g. A point list for each control system. List all I/O points and software points. Indicate alarmed and trended points.
- 4. Quantities of items submitted shall be reviewed but are the responsibility of the Contractor.
- 5. Description of process, report formats, and checklists to be used for Control System Demonstration and Acceptance.
- 6. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface.
- C. Project Record Documents. Upon completion of installation, submit three copies of record (asbuilt) documents of the documents shall be submitted for approval prior to final completion and shall include:
 - Project Record Drawings. As-built versions of submittal shop drawings provided as AutoCAD 2012 (or newer) compatible files on magnetic or optical media (file format: .DWG, .DXF, .VSD, or comparable) and as 11" x 17" prints.
 - 2. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of Control System Demonstration and Acceptance.
 - 3. Operation and Maintenance (O&M) Manual.
 - 4. As-built versions of submittal product data.
 - 5. Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.
 - 6. Operator's manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
 - 7. Programming manual or set of manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
 - 8. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
 - Documentation of programs created using custom programming language including setpoints, tuning parameters, and object database. Electronic copies of programs shall meet this requirement if control logic, setpoints, tuning parameters, and objects can be viewed using furnished programming tools.
 - 10. Graphic files, programs, and database on magnetic or optical media.
 - 11. List of recommended spare parts with part numbers and suppliers.
 - 12. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
 - 13. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation or web server software, and graphics software.
 - 14. Licenses, guarantees, and warranty documents for equipment and systems.
 - 15. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
- D. Training Materials: Provide course outline and materials for each class at least six weeks before first class. Training shall be furnished via instructor-led sessions, computer-based training, or web-based training. Engineer will modify course outlines and materials if necessary to meet

Owner's needs. Engineer will review and approve course outlines and materials at least three weeks before first class

- E. Submit in accordance with Section 01 33 00.
- F. Operation and Maintenance (O&M) Data:
 - 1. Maintenance Data Submit maintenance data and spare parts lists for each type of control device. Include this data in maintenance manual. At a minimum include:
 - a. Maintenance instructions and schedule of recommended maintenance for pieces of equipment that require routine maintenance.
 - b. Sequence of Operation.
 - c. Logic diagrams.
 - d. Wiring Diagram.
 - e. Recommended spare parts list.
 - 2. Operation and Maintenance Manuals:
 - a. Preparation and submittal of operation and maintenance data shall be in accordance with Section 01 78 23. Contractor is advised that Section 01 78 23 contains specific information related to the submission of O&M data in an electronic version. The Owner will be compiling both a paper and a computer-based O&M manual, and the vendor will need to provide a CD version of the O&M manual information.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of electric, and digital control equipment of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. The Manufacturer of the DDC controllers shall provide documentation supporting compliance with ISO-9001 (Model for Quality Assurance in Design/Development, Production, Installation and Servicing). Product literature provided by the FMCS digital controller manufacturer shall contain the ISO-9001 Certification Mark from the applicable registrar.
- C. Installer:
 - 1. Provide documentation showing a minimum of 5-years of experience installing submitted Manufacturer's equipment for projects of similar size and scope.
 - 2. Provide documentation showing Niagara 4 certification and a minimum of 2-years of experience with Niagara 4 Supervisory Server integration.
- D. Electrical Standards: Provide electrical products which have been tested, listed and labeled by Underwriters' Laboratories (UL) and comply with NEMA standards.
- E. NEMA Compliance: Comply with NEMA standards pertaining to components and devices for electric-electronic temperature control systems.
- F. NFPA Compliance: Comply with NFPA No. 90A where applicable to controls and control sequences.
- G. Single-Source Responsibility: Obtain DDC components from single manufacturer with responsibility for entire system.

- H. Regulatory Requirements:
 - 1. Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to the receipt of bids of the following codes:
 - a. National Electric Code (NEC)
 - b. International Building Code (IBC)
 - c. International Mechanical Code (IMC)
 - d. ANSI/ASHRAE Standard 135, BACnet A Data Communication Protocol for Building Automation and Control Systems

1.7 DELIVERY, STORAGE, AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment, and control device. Maintain cartons through shipping, storage and handling as required to prevent equipment damage, and to eliminate dirt and moisture from equipment. Store equipment and materials inside and protected from weather.

1.8 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to insure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features

1.9 OWNERSHIP OF PROPRIETARY MATERIAL

- A. Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:
 - 1. Graphics
 - 2. Record drawings
 - 3. Database
 - 4. Application programming code
 - 5. Documentation

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Provide Direct Digital Control components from the following list of acceptable Manufacturers. Acceptable Manufacturers for field devices and auxiliary control devices shall be as indicated in component specific paragraphs.
 - 1. Distech Controls, Inc.
 - 2. Automated Logic.
 - 3. Honeywell, Inc.
 - 4. Trane.

2.2 INSTALLER

- A. Acceptable Installers:
 - 1. Technical Solutions and Services Incorporated
 - 2. Or equal.
- B. Certification: Shall be certified by Tridium for Niagara 4 framework systems. Provide evidence of Niagara 4 certification as part of the submittal process.
- C. Qualifications: The Contractor shall have a successful history in the design, installation and maintenance of Niagara 4 Framework based building automation systems to provide web browser monitoring and control of BACnet field level devices. Contractor must have previous experience in BAS installations and in DDC installation projects with point counts comparable to this Contract and systems of the same character as this Contract.
- D. Installer shall have an established working relationship with Direct Digital Controls components Manufacturer and be an Authorized Integrator for components offered by Manufacturer with a minimum 5-years of documented experience with Manufacturer.
- E. Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present record of completed training including course outlines.
- F. Installer and BAS Contractor, when used in this Section refer to the same entity.

2.3 COMMUNICATION

- A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135.
- B. Install new wiring and network devices as required to provide a complete and workable control network. All wiring to be installed meeting the requirements of Division 26.
- C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.
- D. Internetwork operator interface and value passing shall be transparent to internetwork architecture.
 - 1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.
 - 2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute specified control sequences. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.
- E. Building Control Panels and Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated device via the internetwork. The system shall automatically adjust for daylight saving and standard time as applicable.

F. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

2.4 OPERATOR INTERFACE

- A. Supervisory Server Software:
 - 1. None required. System will interface with Owner existing Niagara 4 server software at a later date. System shall be configure to allow ease of future interface.
- B. Operator Interface, three modes:
 - 1. Each Ventilation Control Panel (VCP) shall be provided with a BACnet compliant, IP based resistive touchscreen color display for access to all system settings and alarms. Screen size shall be 10 inch minimum.
 - 2. Each VCP shall include a Network Controller (NC) which shall be capable of interfacing with Owner's portable computer through an Ethernet port on the controller. Furnish Owner nay product specific software required for interface with system and individual controllers.
 - 3. Future connection to plant wide Niagara 4 Server.
- C. Communication. Web server and controllers shall communicate using BACnet protocol. Web server and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135.
- D. System Software.
 - System Graphics. The operator interface software shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.
 - a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point- and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.
 - b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.
 - c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
 - d. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Adobe Flash).
 - 2. Custom Graphics. Custom graphic files shall be created with the use of a graphics generation package furnished with the system. The graphics generation package shall be a graphically based system that uses the mouse to create and modify graphics that are saved in the same formats as are used for system graphics.

- 3. Graphics Library. Furnish a complete library of standard HVAC equipment graphics such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. This library also shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. The library shall be furnished in a file format compatible with the graphics generation package program.
- E. System Applications. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each web browser interface. If furnished as a

stand-alone program, software shall be provided to allow installation on standard IBMcompatible PCs with no limit on the number of copies that can be installed under the system license.

- 1. Automatic System Database Configuration. Each web server shall store on its memory a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.
- 2. Manual Controller Memory Download. Operators shall be able to download memory from the system database to each controller.
- 3. System Configuration. Software shall be provided, installable on an Owner furnished computer that provides a method of configuring the system. This shall allow for future system changes or additions by users under proper password protection. Operators shall be able to configure the system.
- 4. On-Line Help. Provide a context-sensitive, on-line help system to assist the operator in operating and editing the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext.
- 5. Security. Each operator shall be required to log on to the system with user name and password in order to view, edit, add, or delete data.
 - a. Operator Access. The user name and password combination shall define accessible viewing, editing, adding, and deleting privileges for that operator. Users with system administrator rights shall be able to create new users and edit the privileges of all existing users. System Administrators shall also be able to vary and deny each operator's privileges based on the geographic location, such as the ability to edit operating parameters in Building A, to view but not edit parameters in Building B, and to not even see equipment in Building C.
 - b. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. This auto logoff time shall be user adjustable.
 - c. Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.
- 6. System Diagnostics. The system shall automatically monitor the operation of all building management panels and controllers. The failure of any device shall be annunciated to the operator.
- 7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified. Unless specific external hardwired alarm specified, alarms shall be BACnet alarm objects and shall use BACnet alarm services.
- 8. Alarm Messages. Alarm messages shall use the English language descriptor for the object in alarm in such a way that the operator will be able to recognize the source, location, and nature of the alarm without relying on acronyms.
- 9. Alarm Reactions. Operator shall be able to configure (by object) what, if any actions are to

be taken during an alarm.

- 10. Alarm and Event log. Operators shall be able to view all system alarms and changes of state from any location in the system. Events shall be listed chronologically. An operator with the proper security level may acknowledge and delete alarms, and archive closed alarms to the workstation or web server hard disk.
- 11. Trend Logs. The operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to memory. Trends shall be BACnet trend objects.
- 12. Object and Property Status and Control. Provide a method for the operator to view, and edit if applicable, the status of any object or property in the system. The status shall be available by menu, on graphics, or through custom programs.
- 13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.
- 14. Standard Reports. Furnish the following standard system reports:
 - a. Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.
 - b. Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.
 - c. Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:
 - 1) Alarm History.
 - 2) Trend Data. Operator shall be able to select trends to be logged.
 - Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.
- 15. Custom Reports. Operator shall be able to create custom reports that retrieve data, including archived trend data, from the system, that analyze data using common algebraic calculations, and that present results in tabular or graphical format. Reports shall be launched from the operator interface.
- F. Application Editors. Shall support editing of all system applications. The applications shall be downloaded and executed at one or more of the controller panels.
 - 1. Controller. Provide a full-screen editor for each type of application that shall allow the operator to view and change the configuration, name, control parameters, and set points for all controllers.
 - Scheduling. An editor for the scheduling application shall be provided at each workstation. Provide a method of selecting the desired schedule and schedule type. Exception schedules and holidays shall be shown clearly on the calendar. The start and stop times for each object shall be adjustable from this interface.
 - 3. Custom Application Programming. Provide the tools to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:
 - a. Language. Language shall be graphically based and shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to

create custom or compound function blocks.

- b. Programming Environment. Tool shall provide a full-screen, cursor-and-mousedriven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.
- c. Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.
- d. Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.
- e. Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
- f. Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.
- g. Variables. Operator shall be able to use variable values in program conditional statements and mathematical functions.
 - 1) Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.
 - System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.
- G. Portable Operator's Terminal. Provide all necessary software to configure an IBMcompatible laptop computer for use as a Portable Operator's Terminal. Operator shall be able to connect configured Terminal to the system network or directly to each controller for programming, setting up, and troubleshooting.

2.5 CONTROLLER SOFTWARE

- A. Furnish the following applications for building and energy management. All software applications shall reside and operate in the system controllers. Applications shall be editable through portable operator's terminal, or web browser interface. All software required to access, review, and modify controller programs shall be furnished to the Owner.
- B. Scheduling. Provide the capability to execute control functions according to a user created or edited schedule. Each schedule shall provide the following schedule options as a minimum:
 - 1. Weekly Schedule. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).
 - 2. Exception Schedules. Provide the ability for the operator to designate any day of the year

as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule has executed, the system shall discard and replace the exception schedule with the standard schedule for that day of the week.

- 3. Holiday Schedules. Provide the capability for the operator to define up to 24 special or holiday schedules. These schedules will be repeated each year. The operator shall be able to define the length of each holiday period.
- C. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.
- D. Binary Alarms. Each binary object shall have the capability to be configured to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.
- E. Analog Alarms. Each analog object shall have both high and low alarm limits. The operator shall be able to enable or disable these alarms.
- F. Alarm Reporting. The operator shall be able to determine the action to be taken in the event of an alarm. An alarm shall be able to start programs, print, be logged in the event log, generate custom messages, and display on graphics.
- G. Maintenance Management. The system shall be capable of generating maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits. Configure and enable maintenance alarms as specified in Control Sequences.
- H. Sequencing. Application software shall sequence equipment as specified in Control Sequences.
- I. PID Control. System shall provide direct- and reverse-acting PID (proportional-integralderivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs. The calculation interval, PID gains, and other tuning parameters shall be adjustable by a user with the correct security level.
- J. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.
- K. Energy Calculations:
 - 1. The system shall accumulate and convert instantaneous power (kW) or flow rates (gpm) to energy usage data.
 - 2. The system shall calculate a sliding-window average (rolling average). Operator shall be able to adjust window interval to 15 minutes, 30 minutes, or 60 minutes.
- L. Anti-Short Cycling. All binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.
- M. On and Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and a setpoint. The algorithm shall be direct-acting or reverse- acting.
- N. Runtime Totalization. Provide software to totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit. Configure and enable runtime totalization and alarms as specified in Control Sequences.

2.6 CONTROLLERS

- A. General. Provide an adequate number of Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified in System Performance paragraph. Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors. Controllers shall be readily available for purchase and integration by any installer, Owner, or Contractor without the need for a distributor agreement to purchase. Programming software shall be made available to Owner.
- B. BACnet:
 - 1. Network Controller (NC)
 - a. Network Controllers shall be Niagara 4 Framework style from the following list of acceptable Manufacturers:
 - 1) Distech EC-BOS-8
 - 2) Honeywell, WEB-8000;
 - 3) Johnson Controls, FX80;
 - 4) Tridium, JACE 8000;
 - 5) Vykon, JACE 8000;
 - 6) or equal.
 - b. These controllers are designed to manage communications between the programmable equipment controllers (PEC), application specific controllers (ASC) and advanced unitary controllers (AUC) which are connected to its communications trunks, manage communications between itself and other network controllers (NC) and with any operator workstations (OWS) that are part of the BAS, and perform control and operating strategies for the system based on information from any controller connected to the BAS.
 - c. The controllers shall be fully programmable to meet the unique requirements of the facility it shall control.
 - d. The controllers shall be capable of peer-to-peer communications with other NCs and with any OWS connected to the BAS, whether the OWS is directly connected, connected via cellular modem or connected via the Internet.

1) The communication protocols utilized for peer-to-peer communications between NCs will be Niagara 4 Fox, BACnet TCP/IP and SNMP. Use of a proprietary communication protocol for peer-to-peer communications between NC's is not allowed.

- e. The NC shall employ a device count capacity license model that supports expansion capabilities.
- f. The NC shall be enabled to support and shall be licensed with the following Open protocol drivers (client and server) by default:
 - 1) BACnet
 - 2) Lon
 - 3) MODBUS
 - 4) SNMP

- g. The NC shall be capable of executing application control programs to provide:
 - 1) Calendar functions.
 - 2) Scheduling.
 - 3) Trending.
 - 4) Alarm monitoring and routing.
 - 5) Time synchronization.
 - 6) Integration of LonWorks, BACnet, and MODBUS controller data.
 - 7) Network management functions for all NC, PEC and ASC based devices.
- h. The NC shall provide the following hardware features as a minimum:
 - 1) Two 10/100 Mbps Ethernet ports.
 - 2) Two Isolated RS-485 ports with biasing switches.
 - 3) 1 GB RAM
 - 4) 4 GB Flash Total Storage / 2 GB User Storage
 - 5) Wi-Fi (Client or WAP)
 - 6) USB Flash Drive
 - 7) High Speed Field Bus Expansion
 - 8) -20 to 60 degrees C Ambient Operating Temperature
 - 9) Integrated 24 VAC/DC Global Power Supply
 - 10) MicroSD Memory Card Employing Encrypted Safe Boot Technology
- i. The NC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.
- j. The NC shall provide alarm recognition, storage, routing, management and analysis to supplement distributed capabilities of equipment or application specific controllers.
- k. The NC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via cellular modem, or wide-area network.
- I. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but not limited to:
 - 1) Alarm.
 - 2) Return to normal.
 - 3) To default.
- m. Alarms shall be annunciated in any of the following manners as defined by the user:
 - 1) Screen message text.
 - 2) Email of complete alarm message to multiple recipients.
 - 3) Pagers via paging services that initiate a page on receipt of email message.
 - 4) Graphics with flashing alarm object(s).
- n. The following shall be recorded by the NC for each alarm (at a minimum):
 - 1) Time and date.
 - 2) Equipment (air handler #, access way, etc.).
 - 3) Acknowledge time, date, and user who issued acknowledgement.
- o. Programming software and all controller "Setup Wizards" shall be embedded into the NC.
- p. The NC shall support the following security functions:
 - 1) Module code signing to verify the author of programming tool and confirm that the code has not been altered or corrupted.

- 2) Role-Based Access Control (RBAC) for managing user roles and permissions.
- 3) Require users to use strong credentials.
- 4) Data in Motion and Sensitive Data at Rest be encrypted.
- 5) LDAP and Kerberos integration of access management.
- q. The NC shall support the following data modeling structures to utilize Search; Hierarchy; Template; and Permission functionality:
 - 1) Metadata: Descriptive tags to define the structure of properties.
 - 2) Tagging: Process to apply metadata to components
 - 3) Tag Dictionary
- r. The NC shall employ template functionality. Templates are a containerized set of configured data tags, graphics, histories, alarms... that are set to be deployed as a unit based upon manufacturer's controller and relationships. All lower level communicating controllers (PEC, AUC, AVAV, VFD.) shall have an associated template file for reuse on future project additions.
- 2. Building Controllers (BCs):
 - a. Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135 and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
 - b. A fully programmable control module capable of storing trends and schedules, serving as a router to devices on a subnet, and initiating read and write requests to other controllers.
 - c. Capable of serving as a master controller, storing schedules and trends for controllers on a subnet underneath the Building Controller.
 - d. Trend storage capacity shall be adequate to store trend data of all monitored points, taken at a 15-minute sample frequency for a minimum of 3-months. Trend data shall be downloadable from controller memory for external permanent data storage.
- 3. Advanced Application Controllers (AACs):
 - a. Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135 and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.
 - b. A fully programmable control module.
 - c. Capable of some of the advanced features found in Building Controllers (storing trends, initiating read and write requests, etc.) but it does not required to serve as a master controller.
- 4. Application Specific Controllers (ASCs):
 - a. Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135 and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
 - b. A pre-programmed control module intended for use in a specific application.
 - c. Configurable, in that the user can choose between pre-programmed options.
- 5. BACnet Communication:

- a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
- b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
- c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
- d. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
- C. Communication:
 - 1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.
 - 2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
 - 3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.
 - 4. Stand-Alone Operation. Each system specified in Control Sequences shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network such as outdoor air conditions, supply air or water temperature coming from source equipment, etc.
- D. Environment. Controller hardware shall be suitable for anticipated ambient conditions.
 - 1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).
 - 2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
- E. Keypad. Provide a local keypad and display for each BC and AAC. Operator shall be able to use keypad to view and edit data. Keypad and display shall require password to prevent unauthorized use.
- F. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.
- G. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to a field-removable modular terminal strip or to a termination card connected by a ribbon cable. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.
- H. Memory:
 - 1. Controller memory shall support operating system, database, and programming requirements.
 - 2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.
 - 3. Each BC shall have adequate memory to store trend data of all monitored points, taken at a 15-minute sample frequency for a minimum of 3-months. Trend data shall be downloadable from controller memory for external permanent data storage

4. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC 230923 - 18

application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.

- Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
- J. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.7 INPUT AND OUTPUT INTERFACE

- A. General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.
- B. Protection. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground shall cause no damage to the controller. All input and output points shall be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no controller damage.
- C. Binary Inputs. Binary inputs shall allow the monitoring of ON/OFF signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.
- D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall also accumulate up to 10 pulses per second.
- E. Analog Inputs. Analog inputs shall monitor low-voltage (0–10 Vdc), current (4–20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.
- F. Binary Outputs. Binary outputs shall provide for ON/OFF operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on Building Controllers shall have three-position

(on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.

- G. Analog Outputs. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0–10 Vdc or a 4–20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.
- H. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tristate outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct- mounted heating coils, and zone dampers.
- I. System Object Capacity. The system size shall be expandable to at least twice the number of input/ output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system

2.8 POWER SUPPLIES AND LINE FILTERING

- A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
 - 1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.
 - a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.
 - b. Line voltage units shall be UL recognized and CSA listed.
- B. Power Line Filtering:
 - 1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:
 - a. Dielectric strength of 1000 V minimum
 - b. Response time of 10 nanoseconds or less
 - c. Transverse mode noise attenuation of 65 dB or greater
 - d. Common mode noise attenuation of 150 dB or greater at 40–100 Hz.

2.9 DAMPERS

- A. General:
 - 1. No single damper shall be larger in size than 48-in in either dimension. Where a larger damper is required, multiple damper assemblies shall be provided.
 - 2. Where multiple damper assemblies are provided, a common actuator may be used to drive a maximum of four dampers. Provide stainless steel connecting linkage as required. Where an assembly is constructed of more than four dampers, multiple actuators shall be provided.
 - 3. Provide quantity, type, size, voltage as scheduled on Drawings.
- B. Control Dampers (MCD):
 - 1. Manufacturer:
 - a. Greenheck model VCD-33.
 - b. Or equal.
 - 2. Ultra low leakage damper.
 - 3. 16 gauge galvanized steel frame. Dampers installed in aluminum or stainless steel duct systems or unducted applications in areas specified to use aluminum or stainless steel ducts shall be provided with Hi-Pro polyester coating or be fabricated of 304 stainless steel frame and blades.
 - 4. Airfoil shaped double skin blades completely symmetrical about the axle pivot point.
 - 5. Blade axles in synthetic sleeve bearings.
 - 6. Silicone blade seals.
 - 7. Flexible stainless steel jamb seals.
 - 8. External (out of the airstream) blade to blade linkage.
 - 9. Suitable for pressures to 8-in. w.c. and velocities to 4,000-fpm with maximum AMCA leakage rate of 6 cfm/sq. ft at 4-in w.c.

- C. Insulated Control Dampers (ICD):
 - 1. Manufacturer:
 - a. Greenheck model ICD-45.
 - b. Or equal.
 - 2. 0.125-in aluminum channel frame insulated with polystyrene on four sides and thermally broken with dual polyurethane resin gaps.
 - 3. Aluminum airfoil blades internally insulated with polyurethane foam and thermally broken.
 - 4. Plated steel axle with dual bearings. Bearings shall have acetal inner sleeve and flanged outer bearing with no metal-to-metal or metal-to-plastic contact.
 - 5. External (out of the airstream) blade to blade linkage.
 - 6. Suitable for pressures to 8-in. w.c. and velocities to 4,000-fpm with maximum AMCA leakage rate of 8 cfm/sq. ft at 4-in w.c.
- D. Flow Measuring Control Dampers (FCD):
 - 1. Manufacturer:
 - a. Greenheck AMD-42
 - b. Ruskin AMS050
 - c. Or equal.
 - 2. Integrated airflow monitoring station with flow control damper.
 - 3. Damper:
 - a. Ultra low leakage damper.
 - b. 16 gauge galvanized steel frame.
 - c. Extruded aluminum airfoil shaped double skin blades completely symmetrical about the axle pivot point.
 - d. Parallel blade action.
 - e. Blade axles in synthetic sleeve bearings.
 - f. Stainless steel linkage.
 - g. Silicone blade seals.
 - h. Flexible stainless steel jamb seals.
 - i. External (out of the airstream) blade to blade linkage.
 - 4. Flow Measurement:
 - a. 16 gauge galvanized steel sleeve.
 - b. Aluminum or polycarbonate honeycombed pattern air straightener.
 - c. Extruded aluminum sensor blades with Total and Static pressure ports.
 - d. 5% accuracy across measurement range.
 - e. Controller:
 - 1) 24VAC
 - 2) Shall power modulating damper actuator.
 - 3) Capable of receiving a 0-10V analog airflow setpoint from BAS.
 - 4) Capable of exporting a 0-10V analog airflow feedback to BAS.
- E. Damper Actuators:
 - 1. Manufacturer:
 - a. Belimo

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b. Or equal.

- 2. Actuators shall be adequately sized for the damper size and air pressures anticipated in the system with a safety factor of two.
- 3. Actuators shall have ISO9001 quality certification and be UL listed under standard 60730-1 or UL listed under standard 873.
- 4. Actuators used on dampers shall be designed to directly couple and mount to a stem, shaft or ISO style-mounting pad. Actuator mounting clamps shall be a V-bolt with a toothed V- clamp creating a cold weld, positive grip effect. Single point, bolt, or single screw actuator type fastening techniques or direct-coupled actuators requiring field assembly of the universal clamp is not acceptable.
- 5. Actuators shall be fully modulating/proportional, pulse width, floating/tristate, or two position as indicated in the sequence of operation and be factory or field selectable. Actuators shall have visual position indicators and shall operate in sequence with other devices if required.
- 6. Provide actuators with end switches or position feedback as indicated in schedules or in the sequences of operation.
- 7. Actuators shall have an operating range of -22° to 122°F.
- 8. Proportional actuators shall accept a 0-10 VDC or 0-20 mA input signal and provide a 2-10 VDC or 4-20 mA (with a 500 W load resistor) operating range.
- 9. Actuators shall be capable of operating on 24 or 120 VAC, or 24VDC and Class 2 wiring as dictated by the application. Power consumption shall not exceed 10 VA for AC, including 120VAC actuators, and 8 watts per actuator for DC applications. Open/Close actuators shall be configured for 120V power supply, modulating actuators shall be configured for 24V power supply.
- 10. Actuators shall have electronic overload protection or digital rotation sensing circuitry to prevent actuator damage throughout the entire rotation. End switches to deactivate the actuator at the end rotation or magnetic clutches are not acceptable.
- 11. For power-failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Spring return actuators shall be capable of CW or CCW mounting orientation. Spring return models > 60 in-lbs. and non-spring return models > 90 in- lbs. shall be capable of mounting on shafts up to 1.05-in diameter. Spring return actuators with more than 60 in-lb. of torque shall have a metal, manual override crank. Actuators using "on-board" chemical storage systems, capacitors, or other "on-board" non-mechanical forms of fail-safe operation are unacceptable. Upon loss of control signal, a proportional actuator

shall fail open or closed as described below. Upon loss of power, a nonspring return actuator shall maintain the last position.

- 12. Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required. Dampers requiring greater torque or higher close off may be assembled with multiple low torque actuators. Dual mounted actuators using additional anti-rotation strap mechanical linkages, or special factory wiring to function are not acceptable. Actuators in a tandem pair must be "off the shelf," standard actuators ready for field wiring.
- 13. Damper actuators shall not produce more than 62 dB (A) when furnished with a mechanical fail-safe spring. Non-spring return actuators shall conform to a maximum noise rating of 45 dB(A) with power on or in the running or driving mode.
- 14. Proportional actuators shall be fully programmable. Control input, position feedback and running time shall be factory or field programmable. Diagnostic feedback shall provide indications of hunting or oscillation, mechanical overload, mechanical travel and mechanical load limit. The actuators shall also provide actuator service data, at minimum, number of hours powered and number of hours in motion.
- 15. Proportional actuators shall be capable of digital communication, as built.
- 16. All damper operators shall be oil submerged, geartrain type, inherently positive positioning.
- 17. The actuators shall be mounted externally of ducts or air handling equipment wherever possible for ease of service and isolated from internal temperatures.

- 18. Actuator enclosure:
 - a. Unless otherwise indicated, NEMA 2.
 - b. In areas designated as Class I, Division 1 or 2 hazardous environment, provide explosion proof enclosure.
 - c. All process areas (not Mechanical Rooms, in air handling units (AHU) or Administrative Spaces), NEMA 4X.
- 19. Fail Position:
 - a. Outside Air Louvers/Intakes: Closed.
 - b. Return Air Dampers: Open.
 - c. Duct Mounted Control Dampers: Closed.

2.10 TEMPERATURE SENSORS

- A. Temperature Sensors shall be of the type and have accuracy ratings as indicated and/or required for the application and shall permit accuracy rating of within 1% of the temperature range of their intended use. Sensors must be capable of being calibrated.
- B. Provide sensors such that the DDC shall be able to convert the resistive input signal available from the element into a digital signal for use by the DDC.
- C. All duct sensors shall be electronic resistance type.
- D. Sensors used for mixed air application shall be the averaging type of sufficient length to extend diagonally across the entire duct and have an accuracy of 1%.
- E. Duct sensors shall protrude into the air stream far enough to sense any temperature differences due to stratification, etc.
- F. Outside air sensors shall have a minimum range of -20 °F to 110 °F and an accuracy of within 1 °F in this temperature range. Sensors shall be provided with a water-tight fitting and adequate protection from the effects of solar radiation.
- G. Space temperature sensors located in the Office or Electrical Spaces (as defined on Drawing 1- ENV-01) shall have digital space temperature and setpoint display with external setpoint

adjustment and manual Occupied/Unoccupied override. Setpoint adjustment shall be software limited by the operator interface.

- H. Space temperature sensors located in process spaces shall be provided with a NEMA 4X enclosure with corrosion resistant elements. Sensors shall have no setpoint adjustment or display. Space temperature setpoint shall be made via the operator interface.
- Space temperature sensors located in areas identified and Class I, Division 1 or 2 shall be provided with an explosion proof enclosure with corrosion resistant elements. Sensors shall have no setpoint adjustment or display. Space temperature setpoint shall be made via the operator interface.
- J. All field mounted sensors shall be labeled in accordance with Section 40 05 10 with the name or identification number used in the control program.

2.11 LOW TEMPERATURE PROTECTION THERMOSTATS

A. Provide low-temperature protection thermostats of manual-reset type with sensing elements 8'-

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- 0" or 20'-0" in length.
- B. Provide thermostat designed to operate in response to coldest 1'-0" length of sensing element, regardless of temperature at other parts of element.
- C. Support element properly to cover entire unit width. Provide separate thermostats for each 25 sq. ft. of coil face area or fraction thereof.

2.12 LINE-VOLTAGE/LOW VOLTAGE ON-OFF THERMOSTATS

- A. Bi-metal actuated open contact, or bellows actuated enclosed snap-switch type.
- B. UL-listed at electrical rating comparable with application.
- C. Heat anticipation.

2.13 LINE VOLTAGE/LOW VOLTAGE THERMOSTATS WITH FAN SWITCH

A. Provide thermostats as described above with three position manual switch labeled Hand-Off- Auto. Switch shall be integral part of thermostat and be capable of mounting on 2-gang switch box.

2.14 CURRENT SENSORS

- A. Manufacturer:
 - 1. Automation Components Inc, Model A/SCTA.
 - 2. Or Equal.
- B. Split-core type 4-20 mA output current sensor.
- C. +12 o 30 VDC sensor supply voltage.
- D. 4-20 mA, 2-wire loop powered output.
- E. +/- 0.5% accuracy from 0-100% full scale output.
- F. 2,200 VAC isolation voltage and upto 600 VAC sensing voltage.
- G. Minimum 0.75 inch diameter aperture size.
- H. Contactor shall select scale to match equipment served.

2.15 PRESSURE SENSORS

- A. Pressure sensor shall be of commercial grade quality located at the point of measurement and installed in accordance with Manufacturer's recommendations.
- B. Shall be able to convert the 0-5 VDC input signal available from the sensor into a digital signal for use by the DDC.
- C. Ultra precision type with a tolerance at 70°F of no greater than +/- 0.8% of full scale and full scale accuracy of +/-2%.
- D. All field mounted sensors shall be labeled in accordance with Section 40 05 10 with the name or identification number used in the control program.

E. Water pressure sensors shall have range of 0-50 psig and be suitable for temperatures to 225°F. DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC 230923 - 24 F. Filter differential pressure sensors shall have a range of 0-1 inWC for units with single filters and 0-2 inWC for units with prefilters and carbon filters.

2.16 GAS DETECTION SYSTEMS

- A. Manufacturer:
 - 1. RKI Instruments.
 - 2. Or equal.
- B. Control Panel:
 - 1. RKI Instruments, Beacon series.
 - 2. Provide control panel with adequate quantity of channels to interface with total number of sensors required plus a minimum of one space channel.
 - 3. NEMA 4X non-metallic panel with hinged cover.
 - 4. 120V power supply.
 - 5. Capable of interfacing with 4-20mA 24VDC, two or three wire transmitters.
 - 6. Panel shall provide power source for all interconnected sensors.
 - 7. Panel shall include a minimum of two relays for each gas alarm, per channel, two relays for common gas alarm, and one relay for common malfunction. All relays shall be fully programmable and rated for minimum 10 amps at 120VAC.
 - 8. Local front of panel display of current value for each connected sensor and push button interface.
 - 9. Suitable for operating temperature range of -4°F to 122°F with 0-99% relative humidity (non- condensing).
- C. Sensors:
 - 1. RKI Instruments S2 series, or equal.
 - 2. Infrared sensing technology
 - 3. Configured for Methane (CH4) detection.
 - 4. Capable of measuring 0-100% lower explosive limit (LEL) with Lower Detectable Limit (LDL) within 2% of full scale.
 - 5. Maximum T90 response time of 30 seconds.
 - 6. 24VDC power with maximum 100 mA current draw. 3-wire system.
 - 7. 4-20mA analog output for measured concentration.
 - 8. Cast iron, explosion proof housing, suitable for a Class I, Division 1, Group D hazardous environment.
 - 9. Stainless steel sensing element.
 - 10. Suitable for indoor or outdoor locations with operating temperature range of -40°F to 122°F with 0-99% relative humidity (non-condensing).

2.17 ALARM LIGHTS AND HORNS

- A. Manufacturers:
 - 1. Sirena/EEC TWS Series
 - 2. Or equal.
- B. Construction:
 - 1. Stacking type alarm light and horn assembly utilizing a common electrical base for installation of up to five modules (lights and horns).
 - 2. 24VDC power supply.
 - 3. NEMA 4 (IP65) assembly rating with lights only, IP24 for assemblies with horns.

- 4. Suitable for indoor or outdoor locations with operating temperature range of -22°F to 140°F with 0-99% relative humidity (non-condensing).
- 5. Each light and horn module shall include individual contacts to allow individual activation of each module independent of other modules on the stack.
- 6. Lights:
 - a. Continuous LED style.
 - b. 5 watt maximum per module.
 - c. Provide Blue color selection for Gas Alarm.
 - d. Provide Amber color selection for Loss of Ventilation Alarm.
- 7. Horn:
 - a. Minimum 76-86 dB at 1 meter.
 - b. Maximum 6 mA power consumption.

2.18 VENTILATION CONTROL PANELS (VCP-100 and VCP-120)

- A. Provide control panels with suitable brackets for either wall or floor mounting where indicated and elsewhere as required. Locate panel as indicated and required.
- B. Provide standard NEMA 1 or 12 cabinets of size required to contain temperature controllers; DDC, IDC, and IBC controllers; relays; switches; and similar devices; except limit controllers and other devices excluded in sequence of operations.
- C. Each panel containing Building Controller (BC) shall be provided with an LCD touch screen interface installed on the face of the panel.
- D. Mount required alarm lights, indicating devices and manual controls on face of panel.

PART 3 - EXECUTION

3.1 GENERAL

- A. All necessary equipment, labor, and materials not specifically indicated or specified, but necessary to complete work, are to be provided as part of the Contract.
- B. Install all control equipment, accessories, wiring, and piping in a neat and workman like manner. All control devices must be installed in accessible locations.
- C. Provide all electrical relays and wiring, line and low voltage, for control systems, devices, and components. All relays and controllers shall be installed in Temperature Control Panels (TCP). All required control power shall be received from TCPs.
- D. Control panels serving equipment served by emergency power shall also be served by emergency power.
- E. Install system and materials in accordance with manufacturer's instructions and roughingin drawings, and details on drawings. Install electrical work and use electrical products complying with requirements of applicable Division 26 sections of these specifications. Mount controller at convenient locations and heights.
- F. Install "Hand-Off-Auto" selector switches on systems where automatic interlock controls are specified. When switch is in the "Hand" position, allow manual operation of the selected device without the operation of the interlocked motors but allowing unit safety devices to stay in the circuit. When air handling units are in the "Hand" mode, outside air damper shall be open. When fans interlocked with motor operated intake dampers are in the "Hand" mode,

associated damper shall open.

3.2 EXAMINATION

- A. The Contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.
- B. The Contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate or if any discrepancies occur between the plans and the Contractor's work and the plans and the work of others, Contractor shall report discrepancies to the Engineer and shall obtain written instructions for any changes necessary to accommodate Contractor's work with work of others. Any changes in work covered by this Section made necessary by the failure or neglect of the Contractor to report such discrepancies shall be made by and at the expense of, this Contractor.

3.3 PROTECTION

- A. Contractor shall protect all work and material from damage by his/her work or employees and shall be liable for all damage thus caused.
- B. Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. Contractor shall protect any material that is not immediately installed. Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.4 COORDINATION

- A. Site:
 - 1. Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, Contractor shall assist in working out space conditions to make a satisfactory adjustment. If Contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, Contractor shall make the necessary changes in his/her work to correct the condition without extra charge.
 - 2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.
- B. Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:
 - 1. All communication media and equipment shall be provided as specified in Communication paragraph of this Section.
 - 2. Each supplier of a controls product is responsible for the configuration, programming, start up, and testing of that product to meet the Control Sequences.
 - 3. Contractor shall coordinate and resolve any incompatibility issues that arise between control products provided under this Section and those provided under other sections or divisions of this specification.
 - 4. Contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.
 - 5. Contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

3.5 WORKMANSHIP

- A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install equipment in readily accessible locations as defined by National Electrical Code (NEC).
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.6 FIELD QUALITY CONTROL

- A. All work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes.
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship.
- C. Contractor shall have work inspection by local and/or state authorities having jurisdiction over the work.

3.7 WIRING

- A. All control and interlock wiring shall comply with national and local electrical codes, and Division 26 of this specification. Where the requirements of this Section differ from Division 26, the requirements of this Section shall take precedence.
- B. All wiring in mechanical, electrical, or service rooms or where subject to mechanical damage shall be installed in raceway at levels below 3 m (10ft).
- C. Do not install Class 2 wiring in raceways containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).
- D. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-towire connections shall be at a terminal block.
- E. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- F. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the contractor shall provide step-down transformers.
- G. Use color-coded conductors throughout with conductors of different colors.
- H. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.
- I. Conceal all raceways except within mechanical, process, electrical, or service rooms.

Install raceway to maintain a minimum clearance of 15 cm (6 inches) from high-temperature equipment (e.g. steam pipes or flues).

J. The contractor shall terminate all control and/or interlock wiring and shall maintain updated (as- built) wiring diagrams with terminations identified at the job site.

3.8 **COMMUNICATION WIRING**

- A. Contractor shall adhere to requirements of Division 26 and items listed in the Wiring paragraph of this Section.
- B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.
- C. Do not install communication wiring in raceways and enclosures containing Class 1 or other Class 2 wiring.
- D. Maximum pulling, tension, and bend radius for the cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.
- E. Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.
- F. All runs of communication wiring shall be unspliced length when that length is commercially available.
- G. All communication wiring shall be labeled to indicate origination and destination data.
- H. All communication wiring shall be labeled to indicate origination and destination data.
- I. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."
- J. BACnet MS/TP communications wiring shall be installed in accordance with ASHRAE/ANSI Standard 135. This includes but is not limited to:
 - 1. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 120 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot.)
 - 2. The maximum length of an MS/TP segment is 1200 meters (4000 ft) with AWG 18 cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485.
 - 3. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard. Additional nodes may be accommodated by the use of repeaters.
 - 4. An MS/TP EIA-485 network shall have no T connections.

3.9 SENSOR INSTALLATION

- A. Install sensors in accordance with the Manufacturer's recommendations.
- B. Mount sensors rigidly and adequately for environment within which the sensor operates.
- C. Room temperature sensors shall be installed on concealed junction boxes properly supported by wall framing.

D. Install all space temperature sensors and thermostats mounted at ADA heights.

- E. Any temperature sensor or thermostat mounted on an exterior wall shall be mounted on a thermally insulated sub-base.
- F. All wires attached to sensors shall be sealed in their raceways or in the wall to stop air transmitted from other areas from affecting sensor readings.
- G. Sensors used in mixing plenums and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.
- H. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 1-foot of sensing element for each 1-ft2 of coil area.
- I. Do not install temperature sensors within the vapor plume of a humidifier. If installing a sensor downstream of a humidifier, install it at least 10-feet downstream.
- J. All pipe-mounted temperature sensors shall be installed in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells.
- K. Install outdoor air temperature sensors on north wall, complete with sun shield.
- L. Differential Air Static Pressure:
 - 1. Supply Duct Static Pressure. Pipe the high-pressure tap to the duct using a pitot tube. Pipe the low-pressure port to a tee in the height-pressure tap tubing of the corresponding building

static pressure sensor (if applicable) or to the location of the duct high-pressure tap and leave open to the plenum.

- 2. Return Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Pipe the low- pressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor.
- 3. Building Static Pressure. Pipe the low-pressure port of the pressure sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover.
- 4. The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.
- 5. All pressure transducers shall be located in field device panels, not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment.
- 6. All air and water differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shut-off valves installed before the tee.
- M. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard- wired to de-energize equipment as described in the Control Sequences. Unless indicated otherwise, switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.
- N. Install humidity sensors for duct mounted humidifiers at least 10-feet downstream of the humidifier. Do not install filters between the humidifier and the sensor.

3.10 ACTUATOR INSTALLATION

A. General. Mount and link control damper actuators according to Manufacturer's instructions.

1. To compress seals when spring-return actuators are used on normally closedDIRECT DIGITAL CONTROL SYSTEMS FOR HVAC230923 - 30

dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.

- 2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
- 3. Provide all mounting hardware and linkages for actuator installation.
- B. Electric/Electronic:
 - 1. Dampers: Actuators shall be direct mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° travel available for tightening the damper seal. Actuators shall be mounted following Manufacturer's recommendations.
 - 2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator Manufacturer's recommendations.

3.11 CONTROL DAMPER INSTALLATION

- A. Damper submittals shall be coordinated for type, quantity, and size to ensure compatibility with sheet metal design.
- B. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure ¼ in. larger than damper dimensions and shall be square, straight, and level.
- C. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be within 0.3 cm (1/8 in.) of each other.
- D. Follow the Manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
- E. Install extended shaft or jackshaft according to Manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
- F. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to ensure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
- G. Provide a visible and accessible indication of damper position on the drive shaft end.
- H. Support ductwork in area of damper when required to prevent sagging due to damper weight.
- I. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

3.12 WARNING LABELS

- A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the control system.
 - 1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows:

CAUTION

This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

- B. Permanent warning labels shall be affixed to all control panels that are connected to multiple power sources utilizing separate disconnects.
 - 1. Labels shall use white lettering (12-point type or larger) on a red background.
 - 2. Warning labels shall read as follows.

CAUTION

This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.13 IDENTIFICATION OF HARDWARE AND WIRING

- A. All equipment labeling shall meet the requirements of Section 40 05 10. All wire, cable and raceway labeling shall meet the requirements of Section 26 05 23.
- B. All wiring and cabling, including that within factory-fabricated panels shall be labeled at each end within 5 cm (2 in.) of termination with control system address or termination number.
- C. All pneumatic tubing shall be labeled at each end within 2-inches of termination with a descriptive identifier.
- D. Permanently label or code each point of field terminal strips to show the instrument or item served.
- E. Identify all other control components with permanent labels. All plug-in components shall be labeled such that label removal of the component does not remove the label.
- F. Identify room sensors related to terminal boxes or valves with nameplates.
- G. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.
- H. Identifiers shall match record documents.

3.14 CONTROLLERS

- A. Provide a separate controller for each AHU or HVAC system as indicated in Control Sequences. A DDC controller may control more than one system provided that all points associated with the system are assigned to the same DDC controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.
- B. Building Controllers and Custom Application Controllers shall be selected to provide the required I/O point capacity required to monitor all required hardware points.

3.15 CONTROLS COMMUNICATION PROTOCOL

A. General. Electronic controls packaged with this equipment shall communicate with the building direct digital control (DDC) system. The DDC system shall communicate with these
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controls to read the information and change the control setpoints as shown in the Control Sequences and control schematics. The information to be communicated between the DDC system and these controls shall be in the standard object format as defined in ANSI/ASHRAE Standard 135 (BACnet). Controllers shall communicate with other BACnet objects on the internetwork using the Read (Execute) Property service as defined in Standard 135.

- B. Distributed Processing. The controller shall be capable of stand-alone operation and shall continue to provide control functions if the network connection is lost.
- C. I/O Capacity. The controller shall contain sufficient I/ O capacity to control the target system.
- D. The Controller shall have a physical connection for a laptop computer or a portable operator's tool.
- E. Environment. The hardware shall be suitable for the anticipated ambient conditions.
 - 1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at -40°C to 60°C (-40°F to 140°F).
 - 2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
- F. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.
- G. Memory. Controller shall maintain all BIOS and programming information in the event of a power loss for at least 30 days.
- H. Power. Controller shall be able to operate at 90% to 110% of nominal voltage rating.Transformer. Power supply for Controller must be rated at minimum of 125% of ASC power consumption and shall be fused or current limiting type.

3.16 **PROGRAMMING**

- A. Provide sufficient internal memory for the specified sequences of operation and trend logging.
- B. Point Naming. Name points as shown on the equipment points list provided with each sequence of operation. Where multiple points with the same name reside in the same controller, each point name may be customized with its associated Program Object number. For example, "Zone Temp 1" for Zone 1, "Zone Temp 2" for Zone 2.
- C. Software Programming:
 - Provide programming for the system and adhere to the specified Control Sequences. All other system programming necessary for the operation of the system, but not specified in this document, also shall be provided by Contractor. Embed into the control program sufficient comment statements to clearly describe each section of the program. Comment statements shall reflect the language used in the Control Sequences. Use the appropriate technique based on the following programming types:
 - a. Text-based:
 - 1) Must provide actions for all possible situations
 - 2) Must be modular and structured

- 3) Must be commented
- b. Graphic-based:
 - 1) Must provide actions for all possible situations
 - 2) Must be documented
- c. Parameter-based:
 - 1) Must provide actions for all possible situations
 - 2) Must be documented.
- D. Operator Interface:
 - 1. Standard Graphics. Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points such as setpoints.
 - Contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and its functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

3.17 CONTROL SEQUENCES

- A. General:
 - 1. All equipment served by the BAS system shall be provided with a means, through the computer interface, to over-ride the automatic controls of unit to manually start or stop the equipment.
 - 2. Each VCP shall include a HVAC Maintenance and HVAC Critical hardwired alarm signal to the Plant PLC:
 - a. HVAC Maintenance Alarms shall be generated as described below and:
 - 1) Any time space temperature deviates more than 10°F from setpoint.
 - b. HVAC Critical Alarms shall be generated as described below and:
 - 1) Any time space temperature drops below 35°F.
 - 2) Any time space temperature rises above 104°F.
 - 3) Any time equipment does not run when called.
 - 4) Any interlocked fire alarm shutdown.
 - 3. All measured values, positions and on/off statuses shall be visible on operator interface.
 - 4. Where multiple items serving the same space require thermostatic control, a single space temperature sensor shall be installed to serve all units, unless indicated otherwise.
 - 5. Individual equipment sequences that follow indicate that a controller shall be furnished for each piece of equipment. Contractor shall be permitted to use a single controller and/or input/output interface points for multiple systems to minimize quantity of controllers required.
- B. Provide NEMA 1 Temperature Control Panels (VCP-100 and VCP-120). Panel shall house

all controllers, shall be source for control power for HVAC control components both field (dampers, etc.) and panel installed, and shall be point of network interface via hard wired connection to Plant PLC. Coordinate 120V power requirements with Division 26.

- C. Relays carrying 120V power shall be installed adjacent to the temperature control panel in a separate enclosure. Intent is to separate control voltage and line voltage control components.
- D. Electric Control Sequences
 - 1. Stairwell Electric Unit Heaters:
 - a. Units Served:
 - 1) EUH-100
 - 2) EUH-101.
 - b. BAS Contractor shall provide and wire NEMA 1 wall mounted thermostat for each electric unit heater. Unit heater fan and electric heating coil shall operate in response to wall mounted thermostat. Upon fall in space temperature below setpoint, 60°F, adjustable, unit fan and electric heater shall energize. Upon satisfaction of space heating requirements, fan shall stop and heater shall deenergize.
- E. Digital Control Sequences:
 - 1. Filter Building Electrical Room Cooling and Heating
 - a. Units Served:
 - 1) RTU-100
 - b. BAS Contractor shall wire and install wall mounted thermostat furnished with each system. Unit shall operate in response to a Manufacturer furnished wall mounted thermostat.
 - c. Fan shall be programmed to run continuously.
 - d. Upon rise in temperature above setpoint 80°F, adjustable, ACU compressor shall energize and vary capacity as required to meet space cooling requirements.
 - e. Upon fall is space temperature below adjustable setpoint of 65°F, heating coil shall be energized as required to maintain space temperature.
 - f. Unit BACnet controller shall be connected to building automation system.
 - g. Initiation of any Economizer FDD Fault codes shall generate a Maintenance Alarm.
 - 2. Makeup Air, Building PFS:
 - a. Units Served:
 - 1) MAU-100; EF-101,-102,-103,-104; ICD-101,-102.
 - b. BAS Contractor shall provide DDC controller, ventilation control panel (VCP-100), discharge air temperature sensor, current sensor on each exhaust fan, space temperature sensor, current switch on all lighting circuits for the process areas (all rooms except electrical room, approximately 4 switches required), filter differential pressure transmitter, outside air temperature sensor, control dampers, exhaust fan interlocks, PLC interlocks and other components and wiring as required to meet the sequence of operation.
 - c. BAS Contractor shall coordinate 120V power supply to ICDs which is work of Division

- 26. BAS Contractor shall provide control relay.
- d. BAS Contractor shall provide Gas Detection System consisting of:
 - 1) Gas Detection Control Panel (GDP-100).
 - 2) Two combustible gas (CH4) detection sensors.
 - 3) All required interlocking and control wiring between GDP and sensors.
 - 4) Panel shall be configured to:
 - i. Output a single Gas Alarm signal to VCP when measured concentration is within 10% of LEL of CH4 from either sensor.
 - ii. Output a control Panel Failure Alarm to VCP when trouble or fail condition detected in panel.
- e. BAS Contractor shall provide Alarming System consisting of:
 - 1) Four sets of exterior alarm lights (Red and Blue).
 - 2) Two sets of interior alarm lights and horn (Red, Blue, and Horn).
 - 3) All required interlocking and control wiring between GDP, alarm lights, and VCP.
 - Upon indication of Gas Alarm, BAS shall energize all Blue alarm lights and horns. Alarm shall automatically clear upon loss of alarm condition.
 - 5) Upon indication of Loss of Ventilation Alarm (discussed later), BAS shall energize all Amber alarm lights.
 - 6) Upon indication of Loss of Ventilation Alarm (discussed later), BAS shall generate a Critical Alarm.
 - 7) Upon indication of Loss of Ventilation Alarm (discussed later), BAS shall generate a Loss of Ventilation Alarm signal to Plant PLC.
 - 8) Upon indication of Gas Alarm, BAS shall generate a Critical Alarm.
 - 9) Upon indication of Panel Failure Alarm, BAS shall generate a Critical Alarm.
- f. Temperature control panel face shall include the following components and labels.
 - 1) Hand-Off-Auto switch: "MAU-100 and EF-101, -102, -103, -104"
 - 2) Green Running Light for each fan: "Running"
 - 3) Amber Light: "Dirty Filter"
 - 4) Red Light: "Loss of Ventilation"
- g. In Hand Mode, MAU intake air damper shall open, supply fan shall energize and run continuously at high speed. MAU burner bypass damper shall open. Heating controls shall be locked out. EFs shall energize and run continuously at high speed. ICDs shall open. In the Off Mode, all fans shall remain off and insulated control dampers closed.
- h. In the Auto Mode:
 - 1) MAU supply fan shall energize and run continuously at low airflow rate (50% design). MAU burner bypass damper shall close.
 - 2) Insulated control dampers shall open. Upon proof of open, EFs shall energize and run continuously at low speed.
 - 3) EF-3 and EF-4 shall energize and run continuously at low airflow rate.
 - 4) MAU controller shall maintain discharge air temperature setpoint, initially set to 55°F. MAU controller shall modulate rate of fire of burner as required to satisfy discharge air temperature setpoint. BAS shall monitor space temperature, upon fall in space temperature below adjustable setpoint of 55°F, BAS shall reset discharge air temperature setpoint at MAU as required to satisfy space temperature setpoint. Upon rise in space temperature above setpoint, BAS shall reset discharge air temperature setpoint downward to initial setpoint.
 - 5) Under any of the following conditions:

- i. Building becomes occupied. Occupancy determined by a current switch on each lighting circuit. If at least 1 current switch shows lighting is energized, the space will be considered occupied.
- ii. Gas Alarm as determined from gas detection system.
- iii. Outside air temperature greater than 50°F.

The following shall occur to supply maximum outdoor airflow:

- i. MAU supply fan shall run continuously at high airflow rate.
- ii. MAU burner bypass damper shall open.
- iii. EFs shall increase to high airflow rate.
- b. Under all modes of operation:
 - 1) BAS shall monitor current draw from each EF motor. Current draw from MAU shall be interfaced with units VFD. Regardless of call to run, if current draw from fan is less than anticipated, Loss of Ventilation Alarm shall be initiated.
 - 2) Running lights on face of VCP shall be activated based upon fan current sensor status, not Hand-Off-Auto switch position.
 - 3) Upon detection that MAU leaving air temperature falls below 35°F (adjustable) fans shall stop. Provide a 3-minute time delay before stop condition is initiated.
 - 4) Filter differential pressure shall be monitored, upon rise in differential pressure above adjustable setpoint, coordinate initial setpoint with MAU manufacturer, a dirty filter light shall illuminate and a Maintenance Alarm shall be generated.
- 3. Split System Heating and Cooling Units
 - a. Units Served:
 - 1) ACU-120
 - 2) ACCU-120
 - b. Related Equipment:
 - 1) ICD-121, MCD-121
 - c. BAS Contractor shall provide DDC controller, space temperature sensor with digital display and setpoint registration, control wiring between ACU and ACCU, and other components and interlock wiring as required to meet sequence of operation.
 - d. BAS shall forward space temperature, space temperature setpoints (initially set for 80°F cooling and 65°F heating), and Fan Run command to integral ACU controller. Fan shall be programmed to run at all times.
 - e. Controller integral to ACU shall enable and control two stage cooling system, single stage heating system, and two-speed fan control as required to satisfy space temperature setpoint. High speed fan operation shall occur whenever second stage of cooling is required and when commanded by Economizer Control.
 - f. Controller integral to ACU shall interface with BAS to receive fan command, mechanical cooling lock-out, heating lock-out, space temperature setpoints, and high fan speed command.
 - g. BAS shall monitor the following minimum points from unit mounted controller:
 - 1) Heating status
 - 2) Stage 1 Cooling status
 - 3) Stage 2 Cooling status
 - 4) Discharge air temperature.

- 5) Fan status
- 6) Filter status
- h. Upon drift in space temperature 5°F above heating setpoint or below cooling setpoint, generate Maintenance Alarm.
- i. Upon drift in space temperature 10°F above heating setpoint or below cooling setpoint, generate Critical Alarm.
- 4. Split System Air Handling Unit Economizer Controls:
 - a. Units Served:
 - 1) ICD-121, MCD-121
 - b. Related Equipment:
 - 1) ACU-120, ACCU-120
 - c. BAS Contractor shall provide DDC controller, outside air temperature sensor, return air temperature sensor, mixed air temperature sensor, insulated control dampers with position feedback, motor operated control damper with position feedback, and other components and interlock wiring as required to meet sequence of operation and International Energy Code Economizer Fault Detection and Diagnostics requirements.
 - d. System shall utilize common space temperature sensor as ACU-120 and ACCU-120 system.
 - e. BAS shall monitor outside air temperature, space temperature, and space temperature setpoints:
 - 1) Upon call for space heating, ICD shall remain fully closed and MCD shall remain fully open.
 - 2) Upon call for cooling with outside air temperature above adjustable setpoint of 55°F, ICD shall remain fully closed and MCD shall remain fully open.
 - 3) Upon call for cooling with outside air temperature below adjustable setpoint of 55°F (Economizer Cycle), BAS shall reset mixed air temperature setpoint as required to maintain space cooling setpoint. BAS shall modulate ICD and MCD in equal and opposite rotations as required to maintain mixed air temperature setpoint with opening of ICD to provide additional cooling.
 - Upon call for mixed air temperature setpoint below 50°F, adjustable, BAS shall command ACU to high speed fan operation. Provide minimum 10 minute time delay between fan speed adjustments.
 - 5) Provide adjustable 15 minute time delay between switching between mechanical and economizer cooling.
 - 6) At any time when Economizer Cycle is active, BAS shall send mechanical cooling and heating lock-out to integral ACU controller to prevent mechanical cooling or heating.
 - Anytime mixed air temperature falls below 40°F (adjustable) and expiration of a 5 minute time delay, BAS shall stop ACU, fully close ICD, fully open MCD, and generate a freezestat and Critical alarm.
 - f. BAS shall provide status at Operator Interface of the following minimum items. BAS shall monitor applicable points on ACU controller as required to obtain applicable status:
 - 1) Free cooling available
 - 2) Economizer enabled

- 3) Mechanical cooling enabled
- 4) Heating enabled
- 5) Mixed air low limit cycle active
- 6) Current value of each system sensor
- g. BAS shall monitor and alarm at the following minimum faults. Presence of any of these faults shall generate a Maintenance Alarm:
 - 1) Air temperature sensor failure/fault
 - 2) Not economizing when the unit should be economizing
 - 3) Economizing when unit should be economizing
 - 4) Damper not modulating
 - 5) Excess outside air
- 5. Rooftop Heating and Cooling Unit:
 - a. Units Served:
 - 1) RTU-120, EF-120, MCD-123, MCD-123, MCD-124.
 - b. BAS Contractor shall provide DDC controller, unit discharge air temperature sensor, duct discharge pressure sensor, fan speed control interlock, return air humidity sensor, two space temperature sensors (grade and upper level), exhaust fan interlocks, motor control dampers, and other components and wiring as required to meet the sequence of operation. Refer to Section 23 74 19 for item furnished with the unit.
 - c. BAS system shall control adjustable Occupied/Unoccupied time clock. In the Occupied mode, RTU supply fan and EF-120 shall energize and run continuously and the outside air damper shall open to minimum position (420 CFM). In Unoccupied mode, supply fan shall energize on call for space heat from either space temperature sensor with outside air damper closed and return air damper open, EF-120 shall remain off.
 - d. Discharge air temperature and Heating Mode or Cooling Mode selection shall be set by the BAS based on summation of calls for heat and cooling from space temperature sensors and outside air temperature:
 - 1) Whenever outside air temperature is less than 55°F, adjustable, Heating Mode shall be active.
 - 2) Whenever outside air temperature is above 70°F, adjustable, Cooling Mode shall be active.
 - 3) When outside air temperature is between Heating and Cooling Mode activation temperatures, system shall be in cooling mode unless a space reaches minimum damper position and space temperature falls an adjustable 3°F below setpoint at which time, Heat Mode shall be activated. Coolest space damper shall fully open and warmest space damper shall close to minimum position. Unit shall remain in Heating Mode until a space is operating at minimum damper position and space temperature rises and adjustable 3°F above space temperature setpoint.
 - 4) When in Heating or Cooling Mode, RTU discharge air temperature setpoint shall be set as required to maintain space temperature in zone with most open damper at space temperature setpoint.
 - e. BAS shall monitor space temperature in two zones, grade (MCD-123) and upper level (MCD-122):
- When RTU in Heating Mode and space temperature is below setpoint, associated damper shall modulate towards open as required to satisfy space DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC
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temperature.

- 2) When RTU in Heating Mode and space temperature is above setpoint, associated damper shall modulate towards minimum open position as required to satisfy space temperature setpoint.
- 3) When RTU in Cooling Mode and space temperature is above setpoint, associated damper shall modulate towards open as required to satisfy space temperature.
- 4) When RTU in Cooling Mode and space temperature is below setpoint, associated damper shall modulate towards minimum open position as required to satisfy space temperature setpoint.
- 5) When RTU enhanced dehumidification is commanded, dampers shall operate as in Cooling Mode.
- f. RTU internal controls shall monitor outside air temperature. On call for cooling with outside air temperature above 55°F, adjustable, controller shall modulate Lead compressor, stage Lag compressors, and modulate condenser fans as required to meet discharge air temperature setpoint. On call for cooling when outside air temperature is less than 55°F, unit controller shall modulate outside air and return air dampers to maintain setpoint temperature, mechanical cooling shall be locked out.
- g. Upon call for heat, unit controller shall energize burner and modulate heating output to maintain discharge air setpoint.
- h. When supply fan called to run, BAS shall modulate supply fan speed to maintain duct static pressure setpoint of 1.0 inWC (adjustable). With fan speed and RTU manufacture recommended minimum, BAS shall modulate MCD-124 as required to maintain discharge static pressure. Upon detection of no duct pressure and fan called to run, Critical alarm shall be generated.
- i. BAS shall monitor return air relative humidity. Upon rise in humidity above adjustable setpoint of 65%, BAS shall send enable enhanced dehumidification command to RTU.
- j. Install return air smoke detector, furnished by Division 16. Coordinate interface with detector and fire alarm panel such that if smoke is detected in the return air or any of the spaces served, supply fan shall stop, outside air damper close, return damper open, EF-

120 shall stop, and Critical alarm shall be generated.

- k. Upon drop in discharge air temperature below 39°F, adjustable, supply and exhaust fans shall stop, outside air damper shall close, return air damper shall open, and alarm shall be sent.
- I. Upon dirty filter signal from RTU, Maintenance alarm shall be generated.
- 6. Main Pump Building II Lower Level Cooling and Heating
 - a. Units Served:
 - 1) RTU-121, RF-120
 - b. BAS Contractor shall wire and install wall mounted thermostat furnished with each system. Unit shall operate in response to a Manufacturer furnished wall mounted thermostat.
 - c. BAS Contractor shall wire any required interlock for operation of RF-120. BAS shall monitor RTU supply fan feedback and vary speed of RF-120 as required to match RTU supply airflow rate.
 - d. BAS Contractor shall wire and install return air humidity sensor furnished with equipment. Unit internal controls shall initiate enhanced dehumidification whenever return air humidity rises above an adjustable setpoint of 65%.
 - e. Fan shall be programmed to run continuously.

- f. Upon rise in temperature above setpoint 80°F, adjustable, ACU compressor shall energize and vary capacity as required to meet space cooling requirements.
- g. Upon fall is space temperature below adjustable setpoint of 65°F, heating coil shall be energized as required to maintain space temperature.
- h. Unit BACnet controller shall be connected to building automation system.
- i. BAS Contractor shall coordinate with work of Division 26 the installation of Division 26 furnished return air smoke detector and wiring of alarm contact to RTU fire alarm shutdown.
- 7. Switch Controlled Exhaust Fan:
 - a. Equipment

Served: 1) EF-

121

b. Coordinate with work of Division 26 to have fan powered through Division 26 furnished, wall mounted On-Off switch.

3.18 CONTROL SYSTEM CHECKOUT AND TESTING

- A. Startup Testing. All testing listed in this Section shall be performed by the Contractor and shall make up part of the necessary verification of an operating control system. Testing shall be completed before Owner's representative is notified of the system demonstration.
 - 1. Contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.
 - 2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
 - 3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to Manufacturers' recommendations.
 - 4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that normal positions are correct.
 - 5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. Contractor shall check all control valves and automatic dampers to ensure proper action and closure. Contractor shall make any necessary adjustments to valve stem and damper blade travel.
 - 6. Verify that system operation adheres to Control Sequences. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops.
 - 7. Alarms and Interlocks:
 - a. Check each alarm separately by including an appropriate signal at a value that will trip alarm.
 - b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
 - c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

3.19 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Demonstration:

1. Prior to acceptance, control system shall undergo a series of performance tests to verify operation and compliance with this specification. Tests shall occur after DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC 230923 - 41
Contractor has completed the installation, started up the system, and performed his/her own tests.

- 2. Tests described in this Section are to be performed in addition to the tests that the Contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in Control System Checkout and Testing paragraph of this Section. Engineer may be present to observe and review these tests. Engineer shall be notified at least 10 days in advance of the start of the testing procedures.
- 3. The demonstration process shall follow process which has been submitted and approved prior to system installation. Approved checklists and forms shall be completed for all systems as part of demonstration.
- 4. Contractor shall provide at least two persons equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. Purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the Contractor.
- 5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
- 6. Demonstrate compliance with System Performance paragraph of this Section.
- 7. Demonstrate compliance with Control Sequences through all modes of operation.
- 8. Demonstrate complete operation of operator interface.
- 9. Additionally, the following items shall be demonstrated:
 - a. DDC loop response. Contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the set point, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.
 - b. Interface to the building fire alarm system.
 - c. Operational logs for each system that indicate all set points, operating points, valve positions, mode, and equipment status shall be submitted to the architect/engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.
- 10. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. Contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.
- B. Acceptance:
 - 1. All tests described in this Section shall have been performed to satisfaction of both the Engineer and Owner prior to the acceptance of the control system as meeting requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the Engineer. Such tests shall then be performed as part of the warranty.
 - 2. System shall not be accepted until all forms and checklists completed as part of demonstration are submitted and approved.

3.20 CLEANING

- A. Contractor shall clean up all debris resulting from his/her activities daily. Contractor shall remove all cartons, containers, crates, etc., under his/her control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.
- B. At completion of work in any area, Contractor shall clean all work, equipment, etc., keeping it free from dust, dirt, and debris, etc.
- C. At completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.21 TRAINING

- A. Provide training for a designated staff of Owner's representatives. Training shall be provided via self-paced training, web-based or computer-based training, classroom training, or a combination of training methods.
- B. Training shall enable students to accomplish the following objectives:
 - 1. Day-to-day Operators:
 - a. Proficiently operate the system
 - b. Understand control system architecture and configuration
 - c. Understand DDC system components
 - d. Understand system operation, including DDC system control and optimizing routines (algorithms)
 - e. Operate the operator interface and peripherals
 - f. Log on and off the system
 - g. Access graphics, point reports, and logs
 - h. Adjust and change system set points, time schedules, and holiday schedules
 - i. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
 - j. Understand system drawings and Operation and Maintenance manual
 - k. Understand the job layout and location of control components
 - I. Access data from DDC controllers and ASCs
 - m. Operate portable operator's terminals
 - 2. Advanced Operators:
 - a. Make and change graphics on the workstation
 - b. Create, delete, and modify alarms, including annunciation and routing of these
 - c. Create, delete, and modify point trend logs and graph or print these both on an adhoc basis and at user-definable time intervals
 - d. Create, delete, and modify reports
 - e. Add, remove, and modify system's physical points
 - f. Create, modify, and delete programming
 - g. Add panels when required
 - h. Add operator interface stations
 - i. Create, delete, and modify system displays, both graphical and others
 - j. Perform DDC system field checkout procedures
 - k. Perform DDC controller unit operation and maintenance procedures
 - I. Perform workstation and peripheral operation and maintenance procedures
 - m. Perform DDC system diagnostic procedures
 - n. Configure hardware including PC boards, switches, communication, and I/O points
 - o. Maintain, calibrate, troubleshoot, diagnose, and repair hardware

- p. Adjust, calibrate, and replace system components
- 3. System Managers/Administrators:
 - a. Maintain software and prepare backups
 - b. Interface with job-specific, third-party operator software
 - c. Add new users and understand password security procedures
- C. Organize the training into sessions or modules for the three levels of operators listed above. (Day-to-Day Operators, Advanced Operators, System Managers and Administrators). Students will receive one or more of the training packages, depending on knowledge level required.
- D. Training shall be provided in three separate sessions, each session further divided into the modules described above. Sessions shall be as follows:
 - 1. Initial Training (minimum 4 hours): After system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior to training so that the Owners' personnel can start to familiarize themselves with the system before classroom instruction begins.
 - 2. First Follow-Up Training (minimum 4 hours): Approximately four weeks after initial training, and before Formal Acceptance. These sessions will deal with more advanced topics and answer questions.
- E. Provide course outline and materials which was submitted and approved a minimum of four weeks prior to scheduling of training. Provide one copy of training material per student.
- F. Instructor(s) shall be factory-trained and experienced in presenting this material.
- G. Classroom training shall be done using a network of working controllers representative of installed hardware.

3.22 START-UP AND CHECKOUT PROCEDURES

- A. Start up, check out, and test all hardware and software and verify communication between all components.
- B. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
 - 1. Verify that all analog and binary input/output points read properly.
 - 2. Verify alarms and interlocks.
 - 3. Verify operation of the integrated system.

END OF SECTION 23 0923







NO.	DATE	DESCRIPTION
1.	12/19/22	FOR REVIEW
2.	1/17/23	ISSUED FOR BID
3.	1/24/23	REVISED TO SHOW OFFSITE IMPROVEMENTS.
	С	
Proje	ct No.	21-13
Scale	<u>)</u>	
Shee	t Title	AS Indicated
		PLAN OVERVIEW
Ref. I	North	Sheet No.
		C102
PF	ROFESSION	AL DESIGN FIRM REGISTRATION #



	Be	ockford Illinois
NO.	DATE	DESCRIPTION
1.	12/19/22	
2. 3.	1/17/23	ADDED MATERIAL SPECIFICATION FOR 2" GAS PIPING.
	С	
Proje	ect No.	21-13
Scale	9	
Shee	et Title	As indicated
		UTILITY PLAN
Kef.	North	Sheet No.
PF	ROFESSION	C302 AL DESIGN FIRM REGISTRATION #

New Collection Systems Operation Facility

Capital Project No. 2217

for

Four Rivers

Sanitation Authority

Four Rivers Sanitation Authority



	ALIGNMENT LINE TABLE											
LINE #	LENGTH (FT)	DIRECTION BEARING	START STATION	END STATION								
L1	406.24	S88° 45' 44.89"W	STA. 100+00.00 N: 2026513.05 E: 2588350.11	STA. 104+06.24 N: 2026504.27 E: 2587943.96								
L2	440.35	N01° 15' 45.10"W	STA. 104+53.35 N: 2026533.60 E: 2587913.32	STA. 108+93.70 N: 2026973.85 E: 2587903.62								
L3	778.14	N00° 54' 49.74"W	STA. 200+00.00 N: 2026545.86 E: 2587345.39	STA. 207+78.14 N: 2027323.90 E: 2587332.98								
L4	1014.61	N88° 42' 38.40"E	STA. 600+00.00 N: 2026841.44 E: 2587034.75	STA. 610+14.61 N: 2026864.27 E: 2588049.11								

	ALIGNMENT CURVE TABLE											
CURVE #	DELTA	RADIUS (FT)	LENGTH (FT)	TANGENT (FT)	CHORD BEARING	CHORD DIST. (FT)						
C1	190°59'09.35"	30.00	47.11	29.99	N46°15'00.11"W	42.42						



New Collection







INTERIOR WALL TYPES



FLOOR PLAN Sheet No. Ref. North A101 PROFESSIONAL DESIGN FIRM REGISTRATION # 184-003342



(#	ACCESSO	L (LOCATION / QUANTITY				
ITEM	MANUFACTURER	MODEL NUMBER	DESCRIPTION	UNISEX (103)	UNISEX (104)	UTILITY (101)	
1	BRADLEY	812	GRAB BAR, STRAIGHT, 36" L, 1 1/2" DIA.	1	1	-	
2	BRADLEY	812	GRAB BAR, STRAIGHT, 42" L, 1 1/2" DIA.	1	1	-	
3	BRADLEY	812	GRAB BAR, VERTICAL, 18" L, 1 1/2" DIA.	1	1	-	
4	BRADLEY	5402	SURF. MOUNTED TOILET ROLL DISPENSER	1	1	-	
5	BRADLEY	2252-10	SURFACE MOUNTED PAPER TOWEL DISPENSER & WASTE RECEPTACLE	1	1	-	
6			ADA TOILET ROOM SIGNAGE	1	1	-	
7	BRADLEY	780-2436	MIRROR W/ CLIP FASTENERS 24" x 36"	1	1	-	
8	BRADLEY		SOAP DISPENSER	1	1	-	
9			UTILITY SINK (SEE PLUMBING DRAWINGS)	-	-	1	
10	TRUEBRO		LAV GUARD 2 - UNDERSINK PIPING COVER	1	1	-	
11	BRADLEY		MOP HOLDER / SHELF	-	-	1	
- ALL - WA	. MOUNTING HEIGHTS TO E TER SUPPLY & DRAIN PIPE	BE PER ADA - SEE COD	E 2 SHEET FOR DETAILS & SINKS SHALL BE INSULATED / PROTECTED PE	R IAC 606.5			

1 Enlarged Floor Plan 3/8" = 1'-0"

THE CONTRACTOR SHALL DETERMINE EXACT DIMENSIONS AND CONDITIONS AT THE SITE PRIOR TO SUBMITTING A BID. THE CONTRACTOR SHALL COORDINATE ALL DRAWINGS WITH ACTUAL FIELD CONDITIONS PRIOR TO PROCEEDING WITH THE WORK AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES. THIS DRAWING IS THE PROPERTY OF BLAKEMORE ARCHITECTS AND MAY NOT BE REPRODUCED WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ARCHITECT.

NO.	DATE	DESCRIPTION
1)	05-20-2021	Initial Owner Layout Review
2)	08-18-2021	Owner Layout Review
3)	01-21-2022	Owner Review One
4)	02-04-2022	Owner Review Two
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8)	12-16-2022	Issued for Permit
9)	01-17-2023	Issued for Bids
10)	02-06-2023	Addendum Two

-----_____

_____ _____ _____ COPYRIGHT Blakemore Architects 2022 BA Project No. 21-13 Scale 3/8" = 1'-0" Sheet Title ENLARGED FLOOR PLANS Ref. North Sheet No. A103

HARDWARE MANUFACTURERS

PRODUCT NAME	MANUFACTURER	MODEL/
HINGES	MCKINNEY	4.5x4.5 TA 2714
LOCKSET	SARGENT	10 LINE W/ L LEVEL, I
CLOSER	SARGENT	351 POWER SERIES PARALLEL ARM W/ P
WALL STOP	IVES	WS401/402-CCV
FLOOR STOP	IVES	AS REQUIRED
DOOR SILENCERS	IVES (3 PER DOOR)	NO. 02
THRESHOLD	REESE	S245A
DRIP CAP	HAGER	810S
LATCH GUARD	HAGER	332D
WEATHER-STRIPPING/SWEEP	- ANY -	-
PULL	HAGER	30 SERIES PLATE W/
PANIC BAR	SARGENT	88 SERIES RIM EXIT I (KEY LOCK)
ELECTRIC STRIKE	VON DUPRIN	24VDC 6211-FS-DS-C
LOCKSET FU		(EY (LF):
S = STOREROOM (04)* P = PASSAGE (15)	C = CLASSROOM (37) D = DUMMY	O = OFFICE (05) E = ENTRY

DOOR & FRAME REMARKS:

1.	20'x20' RAYNOR THERMASEAL TM200C HIGH LIFT "BRONZE" SECTIONA
	 2" INSULATED DOOR W/ 3" TRACK PHOTO EYE WITH 36" TALL LIGHT CURTAIN CONTROL HOIST "OPTIMA" CONTROLLER LOOP DETECTOR WITH LOOP WIRE INSTALLED BY DOOR INST TANDUM SHAFT - DOUBLE MAX CYCLE: 100,000 DOUBLE PANE INSULATED GLASS WINDOWS
DOC	OR & FRAME GENERAL NOT
A.	ALL HARDWARE FOR DOORS IN THE MEANS OF EGRESS SHALL CONF
В.	ALL EXTERIOR DOORS TO HAVE NON RISING FIXED HINGE PINS, DRIP OTHERWISE.
C.	ALL HOLLOW METAL DOORS & FRAMES TO BE PAINTED.
D.	OPENINGS WITH CLOSER AND NO WALL / FLOOR STOP TO USE STOP
E.	ALL GLAZING SHALL BE TEMPERED WHERE REQUIRED BY CODE.
F.	ALL EXTERIOR HOLLOW METAL DOORS AND FRAMES TO BE GALVANIZ
G.	VERIFY WITH MECHANICAL DRAWINGS DOORS THAT NEED TO HAVE A
H.	MINIMUM PERFORMANCE RATING FOR NEW EXTERIOR DOORS & WINE COMPLIANCE WITH SECTION C303.1.3 OF THE 2018 IECC).
I.	AT LOCKSETS, PROVIDE LARGE FORMAT INTERCHANGEABLE CORE (FAND 34 SERIES RIM CYLINDER. LENGTH UNDER CYLINDER HEAD: 41 (1
J.	AT PANIC BAR PROVIDE 700 SERIES ET TRIM W/ L LEVER

ROOM SCHEDULE REMARKS:

- 1. LINER PANELS AT INTERIOR PERIMETER OF "OPERATIONS" AREA UP TO 13'-10" A.F.F. SEAL BASE OF PANELS TO CONCRETE FLOOR.
- 2. PROVIDE RUBBER BLACK TRANSITION "T-1" BETWEEN VCT-1 & S.CONC. FLOORING AT UNISEX RESTROOMS.
- 3. ALL STEEL COLUMNS, WALL GIRTS & MISC. STEEL TO BE PAINTED "PT-3".

	0
PART NUMBER	FINISH
	-
ROSE DESIGN	US26D SATIN CHROMIUM
GLIDE / PS HEAVY DUTY OSITIVE STOP	MATCH US26D FINISH
	US26D SATIN CHROMIUM
	US26D SATIN CHROMIUM
	WHITE/GREY
	MILL AL.
	MILL AL.
	-
	-
P4E SECURITY PULL	STAINLESS STEEL
DEVICE W/ LEVER	US26D SATIN CHROMIUM
ON	US32D STAINLESS STEEL
PROVIDE 4-7/8" CURVED LIF (* LEVER TO RECEIVE TACT	P STRIKE PLATE AT ALL LOCKSETS TILE GRIP - ADA)
PR = PRIVACY	Y (65)
AL INSULATED STEEL DOOI	R W/ 24"x8" WINDOWS (R-VALUE: 18.0)
TALLER	

TES:

FORM TO NFPA NO. 101 AND IBC 2015.

P CAPS AND WEATHER STRIPPING, UNLESS NOTED

PARM CLOSER.

IIZED,

A 12"x12" VENT OR A 1" UNDERCUT IF ANY. NDOWS : U-FACTOR 0.65, SHGC 0.6, VT 0.3 (IN

(REMOVABLE CORE) 40 SERIES MORTISE CYLINDER (1-1/8") W/ #101 (13-0512) MISC. CAMS

DOC	DR SC	CHE	DULE											H	AR	DW	AR	RES	SC	HE	DUL	E							
															<u>r</u>				DP	OT	e e	۵.					КП	_	DEVICE RDWARE
			DOOR				FRA	ME	GLA	ZING		OTH	ER	HINGES	3 PAIR	ET		STOP	STOP BOLT-T(BOLT-B(R W/STO	HERSTRI DPROOF	SWEEPS	ATE 1	ATE 2 AP	ER	RIC STRI READER SIGN	N'S SIGN < SIGN GUARD	ONTROL DOR HAF
DOOR #	SG/PR/OH	WIDTH	HEIGHT	THICKNESS	DOOR MATERIAL	DOOR TYPE	FRAME MATERIAL	FRAME TYPE	DOOR GLAZING	FRAME GLAZING	FIRE RATING	LF	REMARKS	PIVOT		LATCH	PUSH	PULL &	FLOOR FLUSH	FLUSH	CLOSE	WEATH SOUNE	DOOR	KICKPL	KICKPL DRIP C	SILENC	CARD I MEN'S	WOME UNISE) LATCH	EXIT CO O.H. DO ROLLE
100A	SG	3' - 0"	7' - 0"	0' - 1 3/4"	FRP	D2	FRP	F1	1" INSUL.	-	-		EXTERIOR		2	0					0	0	00)	0		00	C	
100B	SG	3' - 0"	7' - 0"	0' - 1 3/4"	FRP	D2	FRP	F1	1" INSUL.	-	-		EXTERIOR)	808					0	0	00)	0	18	00	C	
100C	SG	3' - 0"	7' - 0"	0' - 1 3/4"	FRP	D2	FRP	F1	1" INSUL.	-	-		EXTERIOR)	80	10				0	0	00)	0	10	00	C	
100D	SG	3' - 0"	7' - 0"	0' - 1 3/4"	FRP	D2	FRP	F1	1" INSUL.	-	-		EXTERIOR)	80					0	0	00)	0	18	00	C	
100E	SG	3' - 0"	7' - 0"	0' - 1 3/4"	FRP	D2	FRP	F1	1" INSUL.	-	-		EXTERIOR)	80					0	0	00)	0	18	00	C	
101	SG	3' - 6"	7' - 0"	0' - 1 3/4"	FRP	D1A	FRP	F2A	-	-	-	S	INTERIOR		D	Ŏ		0			0	-				O	00		h
102	SG	3' - 0"	7' - 0"	0' - 1 3/4"	FRP	D1	FRP	F2	-	-	-		INTERIOR)	T	0	00			0					O	00		
103	SG	3' - 0"	7' - 0"	0' - 1 3/4"	FRP	D1	FRP	F2	-	-	-	PR	INTERIOR)	Ŏ		0								O	ifit	0	
104	SG	3' - 0"	7' - 0"	0' - 1 3/4"	FRP	D1	FRP	F2	-	-	-	PR	INTERIOR		D	0		0								0		0	
OH01	ОН	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1		-														0
OH02	ОН	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
OH03	ОН	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
OH04	ОН	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
OH05	ОН	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
OH06	ОН	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
OH07	ОН	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
OH08	ОН	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
OH09	ОН	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
OH10	ОН	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
OH11	OH	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
OH12	ОН	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
OH13	OH	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
OH14	ОН	0' - 0"	0' - 0"	0' - 0"	STL	-	STL	-	1" INSUL.	-	-		#1																0
														PIVOT HINGES	HINGE 3 PAIR	LATCH LOCKSET DASSACE SET	PUSH	PULL WALL STOP	FLOOR STOP FLUSH BOLT-TOP	FLUSH BOLT-BOT	CLOSER CLOSER W/STOP	WEATHERSTRIP SOUNDPROOF	DOOR SWEEPS	KICKPLATE 1	KICKPLATE 2 DRIP CAP	SILENCER	ELECTRIC STRIKE CARD READER MEN'S SIGN	WOMEN'S SIGN UNISEX SIGN LATCH GUARD	EXIT CONTROL DEVICE O.H. DOOR HARDWARE ROLLER CATCH

ROOI	M SCHEDU	LE								
ROOM INFO		FLOO	R		N		CEILING		OTHER	
ROOM #	ROOM NAME	FLOOR FINISH	FLOOR BASE	NORTH WALL	EAST WALL	SOUTH WALL	WEST WALL	CEILING FINISH	CEILING HEIGHT	REMARKS
100	OPERATIONS	S.CONC.	-	LINER PANELS	LINER PANELS	LINER PANELS	LINER PANELS	EXPOSED / PT-5	-	#1, #3
101	UTILITY	S.CONC.	RB-2	CMU / PT-3	CMU / PT-3	CMU / PT-3	CMU / PT-3	EXPOSED / PT-5	-	-
102	EQUIPMENT STO.	S.CONC.	RB-2	CMU / PT-3	CMU / PT-3	CMU / PT-3	CMU / PT-3	EXPOSED / PT-5	-	-
103	UNISEX	VCT-1	RB-2	CMU / PT-3	CMU / PT-3	CMU / PT-3	CMU / PT-3	LACP-1	8'-0"	#2
104	UNISEX	VCT-1	RB-2	CMU / PT-3	CMU / PT-3	CMU / PT-3	CMU / PT-3	LACP-1	8'-0"	#2
			1	1	l					

TAG	DESCRIPTION	MANUFACTURER	PRODUCT	COLOR / FINISH	REMARK
S. CONC.	SEALED CONCRETE FLOOR FINISH	BASF	LAPIDOLITH	-	
VCT-1	VINYL COMPOSITION TILE 1	ARMSTRONG	STANDARD EXCELON IMPERIAL TEXTURE / 12"x12"	SOFT WARM GRAY #51861 / MONOLITHIC INSTALL (FINAL COLOR T.B.D.)	
RB-1	RUBBER BASE (4" HIGH)	ROPPE	TP 76193 - 1/8" TPR RUBBER - COVE	BLACK-BROWN #P193 (FINAL COLOR T.B.D.)	
RB-2	RUBBER BASE (6" HIGH)	ROPPE	TP 76193 - 1/8" TPR RUBBER - COVE	BLACK-BROWN #P193 (FINAL COLOR T.B.D.)	
LACP-1	LAY-IN ACOUSTICAL PANEL CEILING 1	ARMSTRONG	CIRRUS #572 24" x 24" x 3/4" TILE W/ 15/16" (ANGLED TEGULAR EDGE) GRID SYSTEM	WHITE TILE / WHITE GRID	
PT-1	PAINT 1	SHERWIN WILLIAMS	SEE SPECIFICATIONS	(1) PRIME COAT / (2) FINISH COATS - EGG SHELL (WALLS)	
PT-2	PAINT 2	SHERWIN WILLIAMS	SEE SPECIFICATIONS	(1) PRIME COAT / (2) FINISH COATS - EGG SHELL (ACCENT WALLS)	
PT-3	PAINT 3	SHERWIN WILLIAMS	SEE SPECIFICATIONS	(1) PRIME COAT / (2) FINISH COATS - SEMIGLOSS (H.M. FRAMES / CMU / CONCRETE)	
PT-4	PAINT 4	SHERWIN WILLIAMS	SEE SPECIFICATIONS	(1) PRIME COAT / (2) FINISH COATS - EPOXY (TOILET ROOMS / JANITORIAL ROOMS)	
PT-5	PAINT 5	SHERWIN WILLIAMS	SEE SPECIFICATIONS	(1) PRIME COAT / (2) FINISH COATS - FLAT (ROOF STRUCTURE / DRYFALL) - WHITE	
PT-6	PAINT 6	SHERWIN WILLIAMS	SEE SPECIFICATIONS	(1) PRIME COAT / (2) FINISH COATS - FLAT WHITE	
CMU	CONCRETE MASONRY UNIT	-	-	-	
-	-	-	-	-	

2 Frame Types 1/4" = 1'-0"

12"x12" VENT AT — DOOR 101 ONLY

1 Door Types 1/4" = 1'-0"

3 Window Types 1/4" = 1'-0"

1)	05-20-2021	Initial Owner Layout Review
2)	08-18-2021	Owner Layout Review
3)	01-21-2022	Owner Review One
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5)	04-05-2022	Issued for Bids
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10)	02-06-2023	Addendum Two

C COPYRIGHT Blakemore Architects 2022 BA Project No. 21-13 Scale 1/4" = 1'-0" Sheet Title SCHEDULES Sheet No. Ref. North A104 PROFESSIONAL DESIGN FIRM REGISTRATION #

2 South Elevation 3/32" = 1'-0"

ELE	EVATION KEY NOTES
1)	KINGSPAN KS SERIES "AZTEC PANELS (VERTICALLY INSTALL
2)	KINGSPAN KS SERIES "AZTEC PANELS (VERTICALLY INSTALL
3)	KINGSPAN "MATRIX 1.0" CORR (HORIZONTALLY INSTALLED): (
4)	METAL COPING: PAINT TO MAT
5)	METAL COPING: PAINT TO MAT
6)	STONE WATER TABLE: COLOR
7)	EXTERIOR CMU: COLOR "T.B.D
8)	EXTERIOR BRICK VENEER: CO
9)	EXTERIOR HOLLOW METAL DO
10)	O.H. DOORS: COLOR "BRONZE
11)	CITADEL SINOCORE METAL PA "SILVER GREY"
12)	PIPE BOLLARD: COLOR "SAFE"
-	

GENERAL NOTES

ALL INSULATED METAL WALL PANELS & MATRIX METAL PANELS TO COME WITH ALL FLASHING, TRIMS & END CAPS -VERIFY COLORS WITH ARCHITECT.

SERIES "AZTECO" INSULATED METAL WALL TICALLY INSTALLED): COLOR "SANDSTONE" SERIES "AZTECO" INSULATED METAL WALL TICALLY INSTALLED): COLOR "DOVE GRAY" ATRIX 1.0" CORRUGATED METAL PANELS Y INSTALLED): COLOR "MEDIUM BRONZE" G: PAINT TO MATCH "SANDSTONE" G: PAINT TO MATCH "DOVE GRAY" R TABLE: COLOR "T.B.D." U: COLOR "T.B.D." ICK VENEER: COLOR "T.B.D."

<**#**>

LLOW METAL DOORS: PAINT TO MATCH "T.B.D."

COLOR "BRONZE" CORE METAL PANEL SYSTEM COLOR:

D: COLOR "SAFETY YELLOW"

4 West Elevation 3/32" = 1'-0"

2 East-West Building Section (Part 1) 1/8" = 1'-0"

4 Enlarged Elevation @ Platform 1/2" = 1'-0"

	27.112	
Initial Owner Layout Review	05-20-2021	1)
Owner Layout Review	08-18-2021	2)
Owner Review One	01-21-2022	3)
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Issued for Bids	04-05-2022	5)
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Issued for Bids	01-17-2023	9)
Addendum Two	02-06-2023	10)

(C) COPYRIGHT Blakemore Architects 2022 BA Project No. 21-13 Scale As indicated Sheet Title **BUILDING SECTIONS** Ref. North Sheet No.

A202

$1 \frac{\text{Enlarged Building Section 1}}{3/4" = 1'-0"}$

		α 	
3" CONC. FLOOR SLA 0 MIL VAPOR BARRI	AB OVER — ER		
2" RIGID INSULATION R-VALUE 10.0)	I AT PERIM	ETER –	
		4	

SEE STRUCTURAL FOR CMU REINFORCEMENT-

LAV GUARD 2 - UNDERSINK PIPING COVER-

SEE PLUMBING DRAWINGS FOR FIXTURE TYPE-

8" CMU WALL - INSULATED CORES W/ CORE -FILL 500 - TYP.

WALL GIRT (BEYOND)

BRADLEY 24"x36" MIRROR W/CLIP -FASTENERS (MODEL #780-2436)

BOND BEAMS W/ (2) #5 BARS CONT. -WALL GIRT (BEYOND) / B.O. BOND BEAM

SEE SCHEDULES FOR CEILING TYPE

IN-FILL GAP W/ (1) LAYER OF RIGID -INSULATION TO B.O. SIDE GIRT B.O. BOND BEAM 16' - 0"

IN-FILL GAP W/ BATT. INSULATION-----WALL GIRT (OVER CMU WALL ONLY) T.O. CMU WALL 18' - 0"

WALL GIRT 20' - 10"

WALL GIRT 25' - 10"

_____ SEE STRUCTURAL DRAWINGS -FOR JOIST SIZE AND DETAILS D. HSS

60 MIL FULLY ADHERED SINGLE PLY TPO MEMBRANE

INSTALLED BY G.C. UNDER THIS BID)-

ROOFING OVER (2) LAYERS OF RIGID INSULATION BRD. (R-30 TOTAL VALUE) - UP AND UNDER METAL WALL COPING 1-1/2" ROOF METAL DECK (UNDER PREVIOUS STEEL BID PACKAGE -

METAL WALL PANELS (VERTICALLY INSTALLED) (R-21.6 TOTAL VALUE) - COLOR "SANDSTONE"

-PRE-FINISHED METAL SILL TRIM TO MATCH COLOR

2 Wall Section Detail @ Window - Typ. 1 1/2" = 1'-0"

110.	DATE	DECOMINATION
1)	05-20-2021	Initial Owner Layout Review
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10)	02-06-2023	Addendum Two

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8" CMU WALL-1" RIGID INSULATION-

5 Enlarged Floor Plan @ Column 3/4" = 1'-0"

EXTERIOR PIPE BOLLARD (2 PER O.H. DOOR): - 6" DIA. SCH 40 STEEL PIPE BOLLARD (PROVIDED BY OTHERS, INSTALLED BY G.C.)

INTERIOR PIPE

BOLLARD

EXTERIOR PIPE

BOLLARD

NO.	DATE	DESCRIPTION
1)	05-20-2021	Initial Owner Layout Review
2)	08-18-2021	Owner Layout Review
3)	01-21-2022	Owner Review One
4)	02-04-2022	Owner Review Two
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10)	02-06-2023	Addendum Two

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A504

	11			STEEL	COLUM	IN SCHEE	DULE		 			
131'-4"		1										
T/HSS												
OARTOLEVEL 5												
125'-10"												
GIRT LEVEL 4												
120'-10"												
	53		53							~		
	V12X		V12X				ŝ			12X53		
GIRT LEVEL 3				_			12X5:			`````		
							N					
GIRT LEVEL 2												
107'-4"												
GIRT LEVEL 1												
104'-4"												
FIRST FLOOR				_								
100'-0"		I		I						I		
Column												
Locations	A-1, A-2, A-2.5,	A-3, A-3.5, A-4.3,										
	A-4.7, A-5, A-5, A.5-1, A.5-8, B-	1, B-2, B-7, B-8,		A 4		Б	2 0 1					
	C.5-1, C.5-8, D-1	I, D-2, D-2.5, D-3, 4 3 D-4 7 D-5		A-4		D.	-3, D-4,	Б-5, Б-0	(5-5, 6-4,	C-5, C-0	
	D-5.5, D-6, D	0-6.5, D-7, D-8										
B/Base PL EL	99'-5 1	/2"	gc	'-5 1/2"			98'-	-1 1/2"		99'-5	1/2"	
Base PL Size	18" x 1	2"	15	<u>-</u> B" x 12"			18"	' x 12"		18" ×	12"	
Base PL Thick	3/4"			3/4"				3/4"		3/4		
Anchor Rods	3/1 0	<u> </u>		3/4 Ø			, ,	14 Ø		2//	Ø	
Base DI Dotail	0/900	2		/2002			 	SU02		3/4	202	
	2/500	۲		13002			2/	3002		2/S(102	
Remarks												

FOOTING SCHEDULE							
MARK WIDTH		DIMENSIONS					
	WIDTH	LENGTH	DEPTH	REINFORCING	REMARKS		
F4	4'-0"	4'-0"	1'-0"	(4) #5 EW			
F5	5'-0"	5'-0"	1'-0"	(5) #5 EW			
F7	7'-0"	7'-0"	1'-2"	(9) #5 EW			
F8	8'-0"	8'-0"	1'-4"	(8) #6 EW			

PIER SCHEDULE						
MARK		DIMENSIONS		REINFORCING		DEMADKS
DIAMETER	WIDTH	DEPTH	VERTICAL	TIES	REWARKS	
P24		2'-0"	2'-0"	(8)-#6	#3 @1'-0" OC	

8 BAR LAYOUT	12 BAR LAYOUT
3 TIES/SET	4 TIES/SET

、 .	à à .	A	
\$ 7		а. 	4.'

4 TIES/SET

	16 BAR LAYOUT 4 TIES/SET	
HEDUL	E	

DECK/SLAB SCHEDULE								
	TOTAL	DECK/SLAB			тс	OPPING		
MARK	DEPTH	TYPE	DEPTH	GA	FINISH	DEPTH	TYPE	REMARKS
ROOF 2A	1 1/2"	METAL DECK - TYPE B	1 1/2"	22	GALVANIZED	-	-	
ROOF 2B	1 1/2"	METAL DECK - TYPE B	1 1/2"	20	GALVANIZED	-	-	
SOG 4	4"	NWC - SLAB ON GRADE	4"	-	-	-	-	6x6-W2.1/W2.1 WWF OR FORTA FERRO FIBER REINF (3LB/CY)
SOG 8	8"	NWC - SLAB ON GRADE W/ 10 MIL VAPOR BARRIER	8"	-	-	-	-	#4s AT 12" OC, EACH WAY (TOP & BOTTOM)

LINTEL SCHEDULE						
MARK	LINTEL	JAMB REINF	LINTEL TYPE	REMARKS		
L1	8" BOND BEAM W/ (2)-#5 CONT	(1) #5	A			

B/Base PL EL Base PL Size Base PL Thick Anchor Rods Base PL Detail Remarks

T/JOIST

131'-4"

T/HSS

125'-10"

67RTULEVEL 5

GIRT LEVEL 4 120'-10"

GIRT LEVEL 113'-10"

GIRT LEVEL 2

GIRT LEVEL 1 104'-4"

FIRST FLOOR

100'-0"

107'-4"

ULTIMATE ROOF SURFACE PRESSURE (PSF)						
AREA (SF)	10.0	100.0	500.0			
NEGATIVE ZONE 1	-52.6	-42.8	-35.9			
NEGATIVE ZONE 2	-82.5	-68.8	-59.2			
NEGATIVE ZONE 3	-112.4	-94.8	-82.5			
POSITIVE ZONE 1	16.0	16.0	16.0			
POSITIVE ZONES 2 & 3	-	-	-			
OVERHANG ZONE 1 & 2	-	-	-			
OVERHANG ZONE 3	-	-	-			
	ET SURFACE P	RESSURE (PSF)			
AREA (SF)	10.0	50.0	100.0			
CASE A: INTERIOR ZONE	106.4	94.0	87.7			
CASE A: CORNER ZONE	136.4	121.2	113.8			
CASE B: INTERIOR ZONE	-59.9	-55.1	-51.6			
CASE B: CORNER ZONE	-89.8	-79.4	-71.5			
ULTIMATE WALL SURFACE PRESSURE (PSF)						
•=·····						
AREA (SF)	20.0	100.0	200.0			
AREA (SF) NEGATIVE ZONE 4	20.0 -35.9	100.0 -32.6	200.0 -31.2			
AREA (SF) NEGATIVE ZONE 4 NEGATIVE ZONE 5	20.0 -35.9 -65.9	100.0 -32.6 -52.6	200.0 -31.2 -46.8			

COMPONENTS & CLADDING DIAGRAM

Four Rivers Sanitation Authority

Rockford, Illinois

THE CONTRACTOR SHALL DETERMINE EXACT DIMENSIONS AND CONDITIONS AT THE SITE PRIOR TO SUBMITTING A BID. THE CONTRACTOR SHALL COORDINATE ALL DRAWINGS WITH ACTUAL FIELD CONDITIONS PRIOR TO PROCEEDING WITH THE WORK AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES. THIS DRAWING IS THE PROPERTY OF BLAKEMORE ARCHITECTS AND MAY NOT BE REPRODUCED WITHOUT THE PRIOR WRITTEN PERMISSION OF THE ARCHITECT.

NO.	DATE	DESCRIPTION
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S002

EMBED LENGTH (IN.)	GROUT THICKNESS (IN.)
9	1 1/2
12	1 1/2
14	1 1/2
16	2 1/2
18	2 1/2
20	2 1/2
22	3 1/2
24	3 1/2

Professional Design Firm No. 184-003483 815-484-4708 Phone 815-484-4710 Fax e-mail legacy@legacydesigns.net web site www.legacydesigns.net

New Collection Systems Operation Facility

Capital Project No. 2217

for

Rockford, Illinois

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	Blakemore Architects 2022
Project No.	21-13
,	
Scale	
	1'' = 40' - 0''
Sheet Title	
	LIGHTING
	SIIE PLAN
Ref. North	Sheet No.
	ESIUI
PROFESSIONAL DES	SIGN FIRM REGISTRATION #
184	4-003342

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Scale

Project No.

1" = 40' - 0"Sheet Title ELECTRICAL – DUCTBANK SITE PLAN Sheet No. ES103

PROFESSIONAL DESIGN FIRM REGISTRATION # 184-003342

222189

New Collection Systems Operation Facility

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Scale

3/32" = 1'-0"Sheet Title LIGHTING OVERALL FLOOR PLAN Sheet No. Ref. North E101 PROFESSIONAL DESIGN FIRM REGISTRATION #

184-003342

222189

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roject No.	21-13
cale	
	3/32" = 1'-0"
heet Title	
	POWER & SYSTEMS Floor plan
lef. North	Sheet No
	E102
PROFESS	ONAL DESIGN FIRM REGISTRATION # 184-003342

NOT P E	BE REPRODU R M I S S I O	JCED WITHOUT THE PRIOR WRITTEN N OF THE ARCHITECT.
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9. 01-17-2023

/10. 02-06-2023

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Rockford, Illinois

Four Rivers Sanitation Authority

New Collection Systems Operation Facility

Capital Project No.

2217

for

Legacy Designs, Inc. 6116 Mulford Village Drive ROCKFORD, ILLINOIS 61107 Professional Design Firm No. 184–003483 815–484–4708 Phone 815–484–4710 Fax e-mail legacy@legacydesigns.net web site www.legacydesigns.net

ARCHITECTS 400 N. First Street Rockford, IL 61107 815-227-0023 Brian@m-b-arch.com blakemore-architects.com Telephone: Email: Web:

BLAKEMORE

ELECTRICAL SPECIFICATIONS:

1.01.	WORK INCLUDES	2.04.	BOXES		9. Breakers shall be back connected to bus bars with studs. All	В.
Α.	Raceways.	Α.	Outlet Boxes: Hot dipped galvanized, 1.25 oz./sq. ft. or cadmium		spaces for future breakers in all panels shall be equipped with proper buss connecting links to facilitate the	
в. С.	wires and capies. Boxes.		plated. 1. Interior Boxes: Pressed sheet steel, with knockouts for		elements calibrated in accordance with the drawings. The trip	
D.	Supporting devices.		2. Ceiling Boxes: 4 inch octagon boxes for 1 fixture; including		element shall insure constant calibration and be capable of withstanding excessive short current conditions without injury	
1.02.	REGULATORY REQUIREMENTS		fixture studs and maximum 2 connecting conduits. 3. Flush Mounted in Walls:		to the breaker.	
Α.	National Electrical Code, NEC (2014) 1. Comply with NEC/NFPA No. 70, for construction and installation		a. Boxes with matching plaster cover for single or two gang outlets.		10. Breakers shall have inverse time limit characteristics so that tripping will be prevented on momentary overloads, but will	
	of basic materials. 2. NEC 300—21: Wiring Methods; Spread of Fire or Products of		b. Two gang box or larger for conductors, conductor joints, conduit terminations and wiring devices.		clear before dangerous values are reached and shall have quick—make and quick—break toggle mechanism and a position	
	Combustion. 3. Building code for the city of Rockford.	В.	Pull Boxes and Junction Boxes: NEC metal construction; with screw- on or hinged cover.		between manual "on" and "off" positions when breaker is tripped.	
В.	Underwriter's Laboratories, UL: 1. All basic materials listed and labeled by UL.		 Flush Mounted Pull Boxes: Overlapping covers with flush-head cover retaining screws; prime coated. 		11. Each breaker shall be provided with a numerical designation	
1.03.	REFERENCED	2.05.	SUPPORTING DEVICES		strip to properly identify the circuit served. Buss bars for all panels shall be hard drawn electrolytic copper of 98%	
А.	American National Standards Institute. ANSI:	А.	Conduit Supports:		conductivity rated 1000 amperes per square inch and shall be of size in strict accordance with NEMA requirements.	
	1. C80.3: Specification for Electrical Metallic Tubing, Zinc Coated.		1. Single Runs: Galvanized conduit straps or ring bolt type hangers with specialty spring clips.		12. Multi-pole breakers shall have common trip with single handle.	
В.	National Electrical Manufacturer's Association, NEMA:	в	2. Vertical Runs: Channel support with conduit fittings.		Tying single pole breaker handles together is not acceptable.	
C	a. Type 1: Indoor use, atmospheric conditions normal.	υ.	1. Hollow Masonry: Toggle bolts or spider type expansion		13. Neutrals shall be grouped on a common bar and each terminal on the neutral bar shall be stamped with the number of the	
1.04			2. Solid Masonry: Lead expansion anchors or preset inserts Motel Surfaces: Machine percent holto, or welded stude		circuit with which it is associated.	
1.04.	Sober Drawin set		 Metal Surfaces: Machine screws, bots, or weided studs. Wood Surfaces: Wood screws. Sole deilling angles and anium. 		14. Panel cabinets shall not be less than 20" wide, $5-3/4$ " deep	7.07
А.	1. Submit drawings for:		studs.		ample width to accommodate branch circuit feeder conductors.	3.03.
	b. Electrical Panel.	С.	All 120V, single phase, 15 Amp and 20 Amp branch circuits serving		where cables are connected to panelboard main lugs and gutters	А.
	c. Receptacles.		combination type installed to provide protection to the branch circuit		used for through feed of feeder conductors shall be sized in accordance with the following schedule:	
1.05.	PROJECT RECORD DOCUMENTS				Up to #1/0 4" minimum	
Α.	Accurately record on mylar sepia copy of actual locations and wiring methods and "As-built" record documents.	2.06.	FIRE AND SMOKE PENETRATION SEALANT		15. Enclosure shall be of code gauge steel with ample wiring space	
В.	Submit for Architect's review.	Α.	NEC 300-21; UL rated flexible sealant.		on all sides. Trim and door shall be of #12 gauge steel fastened to the tub with adjustable clamps. Door shall be	В.
1.06.	DRAWINGS AND SPECIFICATIONS	2.07. A	CORROSION PREVENTION Protect all metallic materials against corrosion		provided with flush type hinges and chrome plated flush type combination catch and cylinder lock masterkeyed. Panel shall	
Α.	With the exception of systems and equipment furnished by Owner, it is intended that work covered by Specifications and Drawings	,	 All equipment enclosures given rust-inhibiting treatment and standard finish by manufacturer 		be provided with a circuit directory under glass in a metal frame. Panel tub shall be galvanized. Trim and door shall be	C.
	includes systems complete and operative, irrespective of whether or not every item is specifically shown on plans and/or specified.		2. Ferrous Metal Parts: Hot dip galvanized, ASTM A123 or ASTM		painted standard factory finish for final painting on job by General Contractor.	
	Any omission of direct reference herein to any essential item shall not excuse contractor from complying with above intent.		a. Includes anchors, bolts, braces, boxes, bodies, clamps,		16. Cabinets for panels shall comply with all NEMA standards and	3.04.
В.	In case of error or inconsistency, between Specifications and Drawings or within either document itself the item or arrangement		washers, and miscellaneous parts; other than stainless		shall be of the dead front type suitable for surface or recessed mountings as indicated on drawings.	Α.
	of better quality, greater quantity or highest cost shall take precedence over drawings as directed by Owner. Figured dimensions	В.	Isolation of Dissimilar Metals: Separate dissimilar metals with		17. All panelboard equipment shall include a around bus. Provide	
	supersede scaled dimensions. Contractor shall take no advantage of, and shall promptly call Owner's attention to any error omission or	0.00			isolated ground bus where called for under panel schedules.	
	inconsistency in Specifications and Drawings prior to submitting bid.	2.00.		2.09.	LUMINAIRES	3.05.
C.	Material shall be new. Seconds or damaged materials will be rejected by Owner, who reserves the right to disapprove and reject	А.	ACCEPTABLE MANUFACTURERS	Α.	Manufacturer: See lighting fixture schedule on floor plans.	Δ
	any materials, proposed or installed which, in their opinion, fail		2. Cutler. Hammer.	2.10.	EXIT SIGNS	,
	expense, remove any rejected materials and replace with approved materials		3. TIE-Siemens. 4. G.E	Α.	Manufacturers: See lighting fixture schedule on floor plans.	
2		В.	FABRICATION	2.11.	BALLASTS	
2.			1. Panels: Flush or Surface mounted complete with panel trim	Α.	Fluorescent Ballast — Rapid Start Electronic:	
∠.∪۱.	Conduit Materials Components:		having concealed hinges and trim mounting screws. Provide locking door with flush catch.		1. Magna Tek. 2. Description: ANSI CR2.14, bigh nower factor time (shous	
٨.	1. Conduit:		2. Tub: Galvanized.		.95) electronic ballast, Class P, sound rating A.	
	2. Couplings:		3. Keys: Provide two keys for each panel. Make keys		4. Transient Protection - ANSI C62.41, CAT. A.	
0.00	U. ENT COTUUT: SET SCREW.		interchangeable for panels of same voltage.		277 volt circuit at input frequency of 60 HZ light output	
2.02.	WIRES AND CABLES		 Branch circuit panelboards shall be of size and capacity as indicated on the drawings. 		to remain constant for voltage fluctuation of plus or minus 5%.	
A. _	Building Wiring: 98% conductivity copper, 600 volt insulation, THWN or THHN.		5. Branch non-interchangeable trip thermal magnetic circuits for		 requency - 25 Knz of higher with less than 2% lamp flicker. Lamp current crest factor - maximum 1.5. 	
B.	Branch Circuit Wiring: Conductors smaller than #12 AWG not permitted.		lighting and small motors shall consist of molded case, bolt—on circuit breakers.		 a. Iotal narmonic distortion - 10% or less. 9. Ballast efficiency - above 91% (power out/power in). 	
C.	Provide permanent plastic name tag indicating load fed.		6. Branch circuits for feeders and power loads over 100 amperes	_	10. Ballast shall not contain PCBs.	3.06.
2.03.	WIRING SYSTEM IDENTIFICATION		shall consist of thermal magnetic non- interchangeable trip molded case bolt-on type circuit breakers of rating type and	3.	EXECUTION	Α.
Α.	Wire Insulation Color:		capacity indicated.	3.01.	INSTALLATION	
	120/208 v., 3 phase, 4 wire		7. Breakers shall have thermal ratings as indicated on the drawings. Breakers shall be rated for local switching duty	Α.	Drawings are diagrammatic and are intended to convey scope of work and indicate general arrangement of conduit, boxes, equipment,	3.07.
	1. Phase A Black 2. Phase B Red		8 Fach conductor terminal shall be provided with a bolted clamp		fixtures and other work included in contract.	A.
	3. Phase C Blue 4. Neutral White		type solderless lug.	3.02.	RACEWAYS	В.
	5. Ground Green			Α.	Locations: 1. Above—Grade Interior Locations: Electrical metallic tubina.	
	277/480 V., 3 phase, 4 wire				 Install liquid-tight flexible conduit where subjected to one or more of the following conditions. 	C.

PANEL DESIGNA	TION	PANEL-3		PROJECT NO.			1	PZ	ANEL 1	DESIGNA	TION	PANEL-2	
120 / 208	VOLT			LOCATION/ROOM:				1	20 /	208	VOLT		
3 PHASE	150 AMP	MAIN LU	GS	SURFACE	MOUNT	ED	1		3	PHASE	150 AMP	MAIN LU	GS
4 WIRE			FAULT C	URRENT RATING	10K	AIC.	- 1		4	WIRE			FAULT C
	I	W 2	A TTS	·	1	1	-				I	W 2	A TTS
CCT AMP/	REMARKS	 LEFT	RIGHT	REMARKS	AMP/ POLE	CCT	ן נו	00	PH H	AMP/ POLE	REMARKS 	LEFT	RIGHT
1 A 15 /	EF-1 2HP	936	936	EF-2 2HP	15 /	1 2	- A	1	1 A)	20/1	RECEPTACLES	1080	1080
/ 3 B /	 " "	936	936	 " "	/ /		- B	 	 3 B	20/1		1080	1080
	 " "	936	936	 " "	/ / 3	 6	- I C I	 	 5 C	20/1	 RECEPTACLES	1080	1080
 7 Al 15 /		936	936		 15 /	 8	- I A I	1	 7 Al	40 /		3000	0
1 / 9 BL /	 " "	936	936		1 /	 10	- B	i	 9 BI	12		3000	0
					1/		-						
					/ 3 		- 1			20/1	1KH-1 		
13 A 15 /	EF-5 2HP 	936	936	EF-6 2HP 	15 <i> </i>	14	A -		13 A 	20/1	IRH-2 	800	800
15 B / /	" " 	936 	936 	" " 	/ /	16 	в -	1	15 B 	20/1	IRH-3 	800 	800
17 C / 3	" " 	936	936	" " 	/ 3 	18	с і - І	1	17 CI	20/1	IRH-4 	800	800
19 A 15 /	EF-8 2HP	936	936	EF-7 2HP	1 15 /	1 20	A -	1	19 A 	20/1	IRH-6 	800	800
21 B /	" "	936	936	" "		22	в 	1 2	21 B	20/1	IRH-13	800	800
23 CI / 3		936	936		1/3	24	сı	1 2	23 CI	20/1	IRH-14	800	800
25 A 15 /	EF-11 2HP	936	936	EF-10 2HP	115 /	1 26	A	2	25 A	20/1	IRH-15	800	800
27 B /	 " "	936	936		1 /	28	B		27 B	20/1	 IRH-16	800	1656
/ 29 C / 3	 " "	936	936	 " "	/ / 3	30	- I C I		 29 C	20/1	 IRH-19	800	1656
 31 A 15 /	 EF-9 2HP	936	936	 EF-12 2HP	 15 /	 32	- A	 3	 31 A	20/1	 IRH-20	800	1656
/ / 33 B /	 " "	936	936	 " "	/ /	 34	- I В I		 33 B	25/1	 CNTL PNL 3/4HP	1656	1656
		936	936	 " "	/ / 3	 36	- I C I		 35 CI	25/1	CNTL PNL 3/4HP	1656	1656
 37 AI 20/1	 EF-13	800	800	 EF-16		1	- A	1	 37 AI	25/1	CNTL PNL 3/4HP	1656	0
 39 BI 20/1	 	800	·			 40	- B		 39 BI			1656	0
			· · · · · ·					1			0/400		
							- 1		1				

Phase A Brown

Phase B Orange

Phase C Yellow

Ground Green

5. Neutral Gray

wire type used.

- a. Moist or humid atmosphere where condensate can be expected or accumulate. b. Corrosive atmosphere.
- c. Subjected to water spray. d. Subjected to dripping oil, grease, or water. Size raceways in accordance with NEC for TW wire regardless of

	9. Allow minimun
	10. Route all expo
	11. Fire rated wall Sealed in acc a. Flexible c
	transmiss 12. Building Expan fittings compl
	building expar a. Provide b expansior
	suspende
03.	RACEWAY SYSTEM IL
А.	1 Boxos on fac
	a Power –
	b. Systems telephone
в.	Identify all conduit
	1. Follow steps A
C.	Lettering to be as
04.	WIRE AND CABLES
Α.	Installation: 1. Make conducto 2. Lace or clip g
	center, pull b 3. Conductor size requirements
05.	BOXES
Α.	Installation: 1. Provide knocko
	blanks have b 2. Support all bo
	a. Flush mo
	3. Outlet Boxes: a. Flush moi rooms, e b. Masonry
	3. Outlet Boxes: a. Flush mor rooms, e b. Masonry 1 1) Adjus to s
	3. Outlet Boxes: a. Flush mor rooms, e b. Masonry V 1) Adjus to s 2) Coor oper
	3. Outlet Boxes: a. Flush mor rooms, e b. Masonry V 1) Adjus to s 2) Coor oper 3) Loca be c
	3. Outlet Boxes: a. Flush mor rooms, e b. Masonry V 1) Adjus to s 2) Coor oper 3) Loca be c c. Do not us Architect d. Adjust ou
	 Outlet Boxes: a. Flush more rooms, e b. Masonry M 1) Adjustion constant <liconstant< li=""></liconstant<>
06.	 3. Outlet Boxes: a. Flush more rooms, e b. Masonry M 1) Adjust to s 2) Coor oper 3) Loca be c c. Do not us Architect d. Adjust ou location 4. Pull Boxes and boxes above rooms, or stores
06. A.	 3. Outlet Boxes: a. Flush more rooms, e b. Masonry M 1) Adjust to s 2) Coor oper 3) Loca be c c. Do not us Architect d. Adjust ou location 4. Pull Boxes and boxes above rooms, or stores SUPPORTING DEVICES Installation: 1. Maintain headre equipment location
06. A. 07.	 3. Outlet Boxes: a. Flush more rooms, e b. Masonry M 1) Adjust to s 2) Coore oper 3) Loca be of the construction c. Do not us Architect d. Adjust ou location 4. Pull Boxes above rooms, or store SUPPORTING DEVICES Installation: 1. Maintain headre equipment location
06. A. 07. A.	 3. Outlet Boxes: a. Flush more rooms, e b. Masonry M 1) Adjust to s 2) Coore oper 3) Loca be c c. Do not us Architect d. Adjust ou location 4. Pull Boxes and boxes above rooms, or stores above r
06. А. 07. А. В.	 3. Outlet Boxes: a. Flush more rooms, e b. Masonry M 1) Adjust to s 2) Coore oper 3) Loca be c c. Do not us Architect d. Adjust ou location 4. Pull Boxes and boxes above rooms, or stoper solutions of stoper solutions of stoper solutions. SUPPORTING DEVICES Installation: Maintain headre equipment location INSTALLATION PANEL Provide mounting be for unused spaces. Prepare and affix ty panelboard indication
06. А. 07. В.	 3. Outlet Boxes: a. Flush more rooms, e b. Masonry M 1) Adjust to s 2) Coore oper 3) Loca be c c. Do not us Architect d. Adjust ou location 4. Pull Boxes and boxes above rooms, or stores above rooms, or st

and wall pattern.

		PANEL-1 PROJECT NO.			PANEL I	PANEL DESIGNATION			MECH PROJECT NO.				
	120 / 208 VOLT		LOCATION/ROOM:		1	277 /	480	VOLT			LOCATION/ROOM:		
D	3 PHASE 400 AMP	MAIN LUGS	SURFACE	MOUNTE		3	PHASE	400 AMP MAIN	BREAKER		SURFACE	MOUNTE	5D
AIC.	^r 4 WIRE	FAULT C	URRENT RATING	10K	AIC.	· 4	WIRE			FAULT C	URRENT RATING	65K	AIC.
CCT PH		W A TTS	 REMARKS	 AMP/ POLE	 CCT PH	 CCT PH H	AMP/ POLE	 REMARKS 	W A	A TTS RIGHT	REMARKS	 AMP/ POLE	 CCT PH
2 A		1000 1000	EWH-1 HEATER	20 /	2 A	 1A	20 /	OVERHEAD DOORS	2826	2826	OVERHEAD DOORS	20 /	2 A
4 B	/ 3B /2 2KW	1000 1000	 2 KW	/ / 2	 4 B	 3B	/	"2 HP EACH	2826	2826	" "2 HP EACH		 4 B
6 C I	 5 C 20 / EWH-1 HEATER	1000 1000	 EWH-1 HEATER		6 C I	 5 C	/ 3	 " "	2826	2826	" "2 HP EACH	1/3	 6 C
 8 A	/ 7 A /2 2 KW	1000 1000	 2 KW	/ / 2	 8 A	 7A	20 /	OVERHEAD DOORS	2826	2826	OVERHEAD DOORS		 8 A
	 9 B 20 / EWH-1 HEATER	1000 1000	 EWH-1 HEATER	 20 /	 10 B	 9B	/	 " "2 HP EACH	2826	2826	" "2 HP EACH		 10 B
 12 C	/ 11 C / 2 2 KW	1000 1000	 2 KW	/ / 2	12 C	 11 C	/ 3	 " "	2826	2826	" "2 HP EACH	/ / 3	 12 C
 14 A		 0 1080	 RECEPTACLES	 20/1	 14 A	 13 A	20/1	 LIGHTING	2000	2000	LIGHTING		 14 A
 16 B	 15 B 20/1 SPACE	0 1080	 RECEPTACLES	 20/1	 16 B	 15 B	20/1		2000	2000	LIGHTING		 16 B
 18 C	 17 C 20/1 SPACE	 0 1080	 RECEPTACLES	 20/1	18 C	 17 C	20/1	EM LIGHTING*	1200	2000	LIGHTING	20/1	 18 C
	 19 A 20/1 SPACE	0 1080			 20 A	 19 A	20/1	EXTERIOR LTG**	2000	2000	LIGHTING	20/1	 20 A
					 22 B	 21 B	20/1	EXTERIOR LTG**	2000	2000	LIGHTING		
			FLECTRIC GATE		24 C I		20/1	EXTERIOR LTG**	2000			20/1	 -24 C
					 		20/1				CDACE		
20 A					26 A 		20/1				5FACE		20 A
	27 B 2071 SPACE		SPACE 	1	28 B 	27 B 	20/1				SPACE		28 B
30 C	29 C 20/1 SPACE 	0 0	SPACE 	20/1 	30 C	29 C 	20/1	SPACE 	0	0	SPACE	20/1	1 30 C
32 A 	31 A 20/1 SPACE 	0 0	SPACE 	20/1 	32 A 	31 A 	20/1	SPACE	0 	0	SPACE	20/1 	32 A
34 B	33 B 20/1 SPACE 	0 0	SPACE 	20/1 	34 B 	33 B 	20/1	SPACE	0 	0	SPACE	20/1 	34 B
36 C	35 C 20/1 SPACE 	0 0	SPACE 	20/1 	36 C I	35 C 	20/1	SPACE	0 	0	SPACE	20/1 	36 C
38 A	37 A 150/ PANEL-2	14072 12832	PANEL-3	150/ /	38 A	37 A	20/1	SPACE	0	35064	150 KVA XFMR	180/ /	38 A
40 B	39 B / " "	15786 12032	" "	i /	40 B	39 B	20/1	SPACE	0	35698	PANEL-1,2,3		40 B
42 C	41 C / 3 " "	14384 12032	" "	1/3	42 C	41 C	20/1	SPACE	0	32496		/ 3	42 C
38 A 40 B 42 C 		3/ A 150/ PANEL-2 / 39 B / " " 39 B / " " 41 C / 3 " " 41 C / 3 " " PHASE A = 34640 PHASE B = 34698 PHASE C = 32072	37 A 150/ PANEL-2 140/2 12032 / 39 B / " " 15786 12032 / 41 C / 3 " " 14384 12032 PHASE A = 34640 PHASE B = 34698 PHASE C = 32072	37 A 150/ PANEL-2 14072 12832 PANEL-3 39 B / " " 15786 12032 " " / 41 C / 3 " " 14384 12032 " " +11 C / 3 " " 14384 12032 " " +11 C / 3 " " 14384 12032 " " +12854 A = 34640 TOTAL CONNECTEI PHASE A = 34698 LOAD (WATTS) = PHASE C = 32072 101410	$ \begin{vmatrix} 37 & A & 1507 & PANEL-2 & 14072 & 12832 & PANEL-3 & 1507 \\ & & & & & & & & $	37 A 150/ PANEL-2 14072 12832 PANEL-3 1507 36 A 39 B " 15786 12032 " / 40 B 39 B / " 15786 12032 " / 40 B 41 C 3 12032 " " / 3 42 C 103 42 C PHASE A = 34640 TOTAL CONNECTED PHASE B = 34698 LOAD (WATTS) = PHA	37 A 150/ PANEL-2 140/2 12832 PANEL-3 150/ 38 A 57 A / / 141 C 141 C 141 C 141 C 141 C 141 C 1	37 A 150/ PANEL-2 140/2 12832 PANEL-3 150/ 38 A 57 A 20/1 /	37 Å 150/ PANEL-2 14072 12832 PANEL-3 150/ 38 Å 3/ Å 20/1 SPACE / / / / 39 B / " " 15786 12032 " " / 40 B 39 B 20/1 SPACE / / / / / / / / /	37 Å 150/ PANEL-2 14072 12832 PANEL-3 150/ 38 Å 37 Å 20/1 SPACE 0 / 39 B / " " 15786 12032 " " / 40 B 39 B 20/1 SPACE 0 / 41 C / 3 " " 14384 12032 " " / 3 42 C 41 C 20/1 SPACE 0 41 C / 3 " " 14384 12032 " " / 3 42 C 41 C 20/1 SPACE 0 PHASE A = 34640 TOTAL CONNECTED PHASE A = 54368 PHASE B = 34698 LOAD (WATTS) = PHASE C = 49000	37 Å 150/ PANEL-2 14072 12832 PANEL-3 150/ 38 Å 37 Å 20/1 SPACE 0 35064 / / / 39 B / " " 15786 12032 " " / 40 B 39 B 20/1 SPACE 0 35698 / /	37 Å 150/ PANEL-2 140/2 12832 PANEL-3 150/ 38 Å 37 Å 20/1 SPACE 0 35064 150 KVA APAK	37 Å 150/ FANEL-2 14072 12832 FANEL-3 150/ 38 Å 37 Å 20/1 SPACE 0 35064 150 KVA AFMK 160/ / /

B. Installation of Conduit: 1. Install conduit and tubing products indicated, in accordance with manufacturer's written instructions and requirements of NEC and NECA, Standard of Installation.

2. Conceal conduit in all areas excluding mechanical, electrical and other unfinished rooms, connections to motors, and connections to surface cabinets. Attach conduit with clamps. Coordinate installation of conduit in partition work.

- Install conduit free from dents and bruises. Plug conduit ends to prevent entry of dirt or moisture. Clean out conduit before installation of conductor(s). Alter conduit routing to avoid structural obstructions, minimize cross-overs; and where possible, install raceways and steam piping. m 6 inch clearance at flues, steam pipes, and heat
 - osed conduits parallel or perpendicular to Ils, partitions, floors, ceiling penetrations:
 - cordance with NEC 300-21. conduit sufficient length to avoid vibration sion.
 - nsion Joints: Install UL listed expansion lete with grounding jumpers where conduits cross insion joints. bends or offsets in conduit adjacent to building on joints where conduit is installed above
 - ed ceiling. DENTIFICATION
 - conduits and boxes as follows:
 - ce of coverplate.
 - Show panel, voltage and circuit number, painted letters. (Black letters, yellow background). - Indicate system, such as sound, clock,
 - ne, etc., (black letters, yellow background) and boxes above accessible ceilings.
 - A.1. above.
 - large as possible for each conduit size.

tor length for parallel feeders identical. groups of feeder conductors at distribution

- oxes and wireways. size indicated on drawings indicates ampacity s using copper conductors.
- out closures to cap unused knockout holes where been removed. oxes independently of conduit.
- ount outlet boxes in areas other than mechanical electrical rooms, and above removable ceilings. Walls:
- ust position of outlets in finished masonry walls suit masonry course lines. rdinate cutting of masonry walls to achieve neat nings for boxes.
- cut from masonry units. se sectional boxes unless approved by /Engineer. utlet mounting height to grade with specified for equipment served.
- nd Junction Boxes: Locate pull boxes and junction removable ceilings or in electrical rooms, utility orage areas.
- room, neat mechanical appearance, and support ads specified.
- BOARDS
- rackets, busbar drillings, and filler pieces sypewritten directory to inside cover of
- r/breaker number and use.

/4 #1/0 THWN

1 #8 GROUND

<u>PANEL-2</u> 120/208V

3PH. 4W.

150A.

FIRST FLOOR LEVEL

NO SCALE

<u> PANEL–</u>

0/208

3PH. 4W.

400A.

3 #3/0 THWN \ 1 #6 GROUND

2 SETS OF 4 #3/0 THWN

1 #6 GROUND

XFMR

150 KVA

ELECTRICAL RISER DIAGRAM

~~~<u>||||</u>

PURELY DIAGRAMMATIC

GROUND PER-

ARTICLE 250

OF N.E.C.

2"C. EACH SET

1.5" C.

PANEL-3

120/208

3PH. 4W.

150A.

ead front, coordinated with adjoining electrical, heating and plumbing equipment, architectural details

- B. Following removed present equipment and materials which are in good condition (or are placed in good condition), suitable, meet requirements of these specifications, and are approved in writing by engineer, or called for, may be reused (PXN-PN).
- 1. Lighting fixtures. Speakers.
- Removed conduit and wire must not be reused. Any of above equipment which is not reused and following removed present equipment shall become property of contractor, and shall be removed from premises by him (PX). Equipment so designated on drawings.
- Following present equipment shall be carefully removed, intact, match, marked, in-so-far as is practical, shall remain property of Owner, and shall be delivered to Owner outside of building where directed by the engineer (PX-DO). 1. Equipment so designated on drawings.
- F. Contractor shall: Provide new floors under removed present equipment and where
- called for. Repair floors under and walls adjacent to removed equipment,
- to match adjacent construction. Fill in present chases which are no longer required and neatly
- patch to match adjacent construction. 4. Cut openings required for:
- a. His work. b. Admission of new equipment.
- Removal of present equipment. d. New connection to present construction.
- Patch and repair unused present holes and openings, and those left by the removal of present equipment and admission of new equipment. 6. Patch and repair present equipment, and building construction
- which has been cut, removed, disturbed or marred as required to restore it to original condition before being disturbed. G. Unused openings in enclosures in conduits, boxes, cabinets, and
- panels shall be filled. H. Present painted construction which is marred shall be repaired same
- as new construction. I. Certain abbreviations or symbols, when applied to present (or existing) line, device or equipment, shall have the following
- meanings. K. New conduit serving new and/or present electrical devices in finished rooms or spaces shall be concealed in finished rooms, where possible, or shall be run in adjoining unfinished rooms, shafts, chambers, cloak rooms, etc., where exposed conduit is permitted in finished present rooms by Architect in writing, it shall be wiremold, with matching boxes, run as inconspicuously as possible, in straight lines, parallel to walls and ceilings, with neat bends. Unneeded boxes, switches and wiring shall be completely removed and openings patched. In present rooms or locations where new lighting equipment is shown, present fixtures, boxes, wiring, switches, etc., shall be removed as per note "PX", unless another symbol is shown on drawings. Where specifically approved by Architect in writing, boxes may be permitted to remain and be provided with new flush covers, extending over entire wall opening. L. Lighting fixtures which are reused shall have lens and reflectors
- cleaned. All fixtures shall be provided with new lamps. M. Work shall be coordinated so that heating, plumbing, electrical and telephone services to the present building will not be interrupted, except as approved by the Architect.
- 3.09. CLEANING A. Clean systems internally before placing in operation. Clean externally and restore damaged surfaces. B. Lubricate equipment per manufacturer's instructions. Where -
- Lubricate equipment per manufacturers instructions. Iubrivating points are not easily accessible, provide extensions. ite boxes in masonry walls so that only corner need f 4. FIRE ALARM AND DETECTION SYSTEM
  - A. Electrical Contractor provide a zone, none-coded, continuous sounding, U.L. listed, electrically supervised system, fully installed and tested. Requirements of regulatory agencies:
    - 1. National Fire Protection Association (NFPA): NFPA-70 National Electrical Code (NEC) NFPA-101 Life Safety Code
    - Local codes and ordinances Underwriters Laboratories, Inc. (UL)
  - C. Reference Standards: 1. National Fire Protection Association (NFPA)
    - NFPA-72A Local Protection Signaling Systems NFPA-72B Auxiliary Signaling Systems Remote Station System
    - NFPA-72D Proprietary Signaling System NFPA-72E automatic Fire Detectors
    - National Electrical Manufacturer's Association (NEMA) All equipment specified shall be U.L. listed and cross listed for use with the
    - main fire alarm control panel and shall bear the same manufacturer's name on the main control panel as well as all the remote devices. Systems having equipment with various manufacturer's names will not be acceptable. The Fire Alarm System specified is manufactured by the Simplex Time Recorder Co. Catalog and model numbers are intended to establish the type and quality of equipment and system design as well as exact operating features required.
    - The manufacturer's specification sheets of each item so listed shall be considered to be part of the specification and binding therein. Acceptable as equal: 5. Pyrotronics а.
      - Gamewell Edwards Fire-Lite

6.

- System Operation Actuation of any alarm initiating device shall cause all alarm devices to sound continuously. Alarm initiating device shall be grouped in zones. A zone in alarm conditions shall be indicated by a red LED on the proper
  - zone module. Actuation of any alarm initiating device shall automatically cause the following operations when furnished as a part of this system. (1) Sound or audio-visual devices continuously (NOTE: A one (1) minute inhibit shall not allow the audible signals to be
  - prematurely silenced until one (1) minute after the alarm has sounded. (2) Indicate on the control panel the zone initiating the alarm and/or trouble condition.
  - (3) Indicate the zone of the reporting device on the remote annunciator. Be arranged to transmit a signal to the local fire department (via
  - leased telephone lines).
- <u>MECH</u> 480/277 (J3PH. 4W. 400 A. <u>400 AMP</u> DISC.SW.

2" C.

- FUSED NEMA3R GRADE 4 #600 MCM
  - \_\_\_\_ 1 #1/0 GROUND DUCTBANK (TO SUBSTATION 3-6 > 2 SETS OF  $\sim$ 4 #3/0 THWN 70 1 #4 GROUND

![](_page_95_Figure_85.jpeg)

![](_page_95_Picture_86.jpeg)

![](_page_95_Picture_87.jpeg)

| C COPYRIGHT BIC    | kemore Architects 2022 |
|--------------------|------------------------|
| Project No         | 21-13                  |
|                    | 2110                   |
|                    |                        |
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| Scale              |                        |
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| Shoot Title        |                        |
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| LEUIRIUAL S        | ISER DIACRAM           |
| X IV               | IJLN DIAGNAM           |
| Ref. North         | Sheet No.              |
|                    |                        |
|                    | F103                   |
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| PROFESSIONAL DESIG | N FIRM REGISTRATION #  |
| 184-0              | 003342                 |
|                    |                        |
|                    |                        |

PERMISSION OF THE ARCHITECT. NO. DATE DESCRIPTION 05-20-2021 Initial Owner Layout Review 2. 08-18-2021 Owner Layout Review

Owner Review One

Owner Review Two

Issued for Zoning Review

Issued for Bids

Issued for Bids

Issued for Bids

Addendum Two

Issued for Permit

3. 01-21-2022

4. 02-04-2022

8. 01-17-2023

9. 01-17-2023

/10. 02-06-2023

\_\_\_\_\_

04-05-2022

07-14-2022

08-22-2022

| DRAWINGS WITH ACTUAL FIELD CONDITIONS PRIOR TO  |
|-------------------------------------------------|
| PROCEEDING WITH THE WORK AND NOTIFY THE         |
| ARCHITEGT OF ANY DISCREPANCIES. THIS DRAWING IS |
| THE PROPERTY OF BLAKEMORE ARCHITECTS AND MAY    |
| NOT BE REPRODUCED WITHOUT THE PRIOR WRITTEN     |
| PERMISSION OF THE ARCHITECT                     |

Rockford, Illinois

| Four Rivers<br>Sanitation Authority |
|-------------------------------------|
|                                     |

1

New Collection Systems Operation Facility

Capital Project No.

2217

for

Legacy Designs, Inc. 6116 Mulford Village Drive ROCKFORD, ILLINOIS 61107 Professional Design Firm No. 184-003483 815-484-4708 Phone 815-484-4710 Fax e-mail legacy@legacydesigns.net web site www.legacydesigns.net

![](_page_96_Figure_0.jpeg)

![](_page_96_Picture_2.jpeg)

|                                                                                                                                                                                                            | 34                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BLAK<br>ARCH<br>400 N. First Str<br>Telephone:<br>Email:<br>Web: bl                                                                                                                                        | EMORE<br>HITECTS<br>eet Rockford, IL 61107<br>815-227-0023<br>Brian@m-b-arch.com<br>lakemore-architects.com                                                                                                                                                      |
| Legacy I<br>6116 Mulford Vi<br>ROCKFORD, ILLINOIS<br>Professional Design<br>815–484–4708 Pho<br>e-mail legacy<br>web site www.le                                                                           | Designs, Inc.<br>illage Drive<br>61107<br>Firm No. 184–003483<br>one 815–484–4710 Fax<br>y@legacydesigns.net<br>gacydesigns.net                                                                                                                                  |
| New (<br>Systems<br>Fa                                                                                                                                                                                     | Collection<br>s Operation<br>acility                                                                                                                                                                                                                             |
| Capital<br>2                                                                                                                                                                                               | Project No.<br>217                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                            | for                                                                                                                                                                                                                                                              |
| <b>Fo</b><br>Sani                                                                                                                                                                                          | tation Authority                                                                                                                                                                                                                                                 |
| Rockf                                                                                                                                                                                                      | ord, Illinois                                                                                                                                                                                                                                                    |
| THE CONTRACTOR SHALL<br>AND CONDITIONS AT TH<br>BID. THE CONTRACT<br>DRAWINGS WITH ACTUA<br>PROCEEDING WITH T<br>ARCHITECT OF ANY DIS<br>THE PROPERTY OF BLA<br>NOT BE REPRODUCED<br>P E R M I S S I O N C | L DETERMINE EXACT DIMENSIONS<br>IE SITE PRIOR TO SUBMITTING A<br>OR SHALL COORDINATE ALL<br>AL FIELD CONDITIONS PRIOR TO<br>THE WORK AND NOTIFY THE<br>CREPANCIES. THIS DRAWING IS<br>KEMORE ARCHITECTS AND MAY<br>WITHOUT THE PRIOR WRITTEN<br>OF THE ARCHITECT |
| NO. DATE                                                                                                                                                                                                   | DESCRIPTIO                                                                                                                                                                                                                                                       |
| 2. 08-18-2021                                                                                                                                                                                              | Owner Layout Revie                                                                                                                                                                                                                                               |
| 4. 02-04-2022                                                                                                                                                                                              | Owner Review Tw                                                                                                                                                                                                                                                  |
| 6.         07-14-2022                                                                                                                                                                                      | Issued for Zoning Revie                                                                                                                                                                                                                                          |
| 7.         08-22-2022           8.         01-17-2023                                                                                                                                                      | Issued for Bic<br>Issued for Perm                                                                                                                                                                                                                                |
| 9. 01-17-2023<br>10. 02-06-2023                                                                                                                                                                            | Issued for Bic<br>Addendum Tw                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                  |
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| С сорукієнт<br>Project No.                                                                                                                                                                                 | Blakemore Architects 2022<br>21-13                                                                                                                                                                                                                               |
| Scale                                                                                                                                                                                                      | 3/32" = 1'-0'                                                                                                                                                                                                                                                    |
| Sheet Title<br>FI<br>OVERA                                                                                                                                                                                 | RE PROTECTION<br>LL FLOOR PLAN                                                                                                                                                                                                                                   |
| Ref. North                                                                                                                                                                                                 | Sheet No<br>FP101                                                                                                                                                                                                                                                |
| PROFESSIONAL DES                                                                                                                                                                                           | SIGN FIRM REGISTRATION #<br>4-003342                                                                                                                                                                                                                             |
| 10                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                  |
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