DIVISION OF FINANCE – PURCHASING DEPARTMENT
100 N. Broadway St, Suite 610 Wichita, KS 67202 • Phone (316) 660-7255 • Fax (316) 660-1839
PURCHASING@SEDGWICK.GOV • SEDGWICKCOUNTY.ORG

ADDENDUM #01
RFB #24-0073
SOUTH CENTRAL KANSAS REGIONAL PSYCHIATRIC HOSPITAL

November 1, 2024

The following is to ensure that vendors have complete information prior to submitting a bid. Here are some clarifications regarding the bid for RFB #24-0073 South Central Kansas Regional Psychiatric Hospital.

Questions and/or statements of clarification are in **bold** font, and answers to specific questions are *italicized.*

1) **Is GC responsible for plan review fees?**
   a) *No, the owner will cover plan review fees.*

2) **Is GC responsible for building permit fees?**
   a) *Yes, the GC will be responsible for permit fees.*

3) **Is GC responsible for permanent electrical service fees?**
   a) *No*

4) **Is GC responsible for permanent gas service fees?**
   a) *No*

5) **Who is responsible for material testing (GC or Owner)?**
   a) *The owner will engage.*

6) **Who is responsible for special inspections (GC or Owner)?**
   a) *The owner will be responsible for special inspections.*

7) **Advertisement For Bids section 1.3A states: "Owner will receive electronically submitted bids…via web-based bidding management software". Invitation For Bids page 1 states "responses will be received in the Sedgwick County Purchasing Department… 100 N Broadway Avenue, Suite 610". Request For Bid Conditions item 4 states to email to purchasing@sedgwick.gov. Please clarify bid submittal process.**
   a) *Bids can either be hand delivered to the address listed, or emailed to the above email address. emails shall be limited to less than 35MB in size. Either delivery method chosen must still meet the deadline requirements of 1:45PM on November 19, 2024.*

8) **There is too much information to process to turn this bid around in 3 weeks. Can the bid date please be extended by 2 additional weeks?**

a) *The bid due date remains unchanged. However, consideration will be given to making this accommodation.*

9) **Reference Bid Form: Page 1 item 8 states "Base Bid" but the 2nd column has Volume 3**
   a) *Please see revised bid form, attached.*

10) **Add Alternate in the same column as Volume 1,2. Please clarify where we are to list the Alternate price?**
   a) *Please see revised bid form, attached.*

11) **Reference Bid Form: Please clarify if we are to enter the total price for each division on the bolded lines, and each subsequent line item beneath is to be a breakout price which are included in the bolded division heading?**
   a) *Please see revised bid form, attached.*

12) **Reference Bid Form: What is the intent behind listing certain scope items beneath the Divison headings? Example) why are we breaking out pricing on hollow metal doors and frames, but wood doors, detention doors, overhead doors, etc. are not listed on the bid form?**
   a) *Please see revised bid form, attached.*

13) **Reference Bid Form: Where are we to enter pricing for DIV 31,32,33?**
   a) *Please see revised bid form, attached.*

14) **There are multiple spec sections of 061000, 072100, and 078413. Please clarify.**
   a) *One is for the Core/Shell (Volume #1) and One is for the TI (Volume #2)*

15) **Can proposals be emailed?**
   a) *Yes, they can be emailed.*

16) **The Bid Form as a bid breakdown in lieu of a bid total. Is this correct?**
   a) *Please see revised bid form, attached.*

17) **If a breakdown is required, can it be provided after the bid?**
   a) *Please see revised bid form, attached.*

18) **The bid breakdown has listings of CSI Division with areas to list contractor names. There will be multiple contractors in each division and there will not be room to list all contractors. Please advise.**
   a) *Please see revised bid form, attached.*

19) **Also, it would be helpful to allow a breakdown after the bid given the amount of information required.**
   a) *Bid breakdown has been removed from the bid form.*

20) **The bid breakdown is missing site related divisions. Please add.**
   a) *Please see revised bid form, attached.*

21) **The bid breakdown references a GMP. The example contracts were stipulated sum. Please advise.**

a) *Please see revised bid form, attached.*

22) Please clarify Allowance 1 – There is not a not 5R
a) Revise 5R to 5.O.

23) Is Alternate 1 to include all items listed in Furniture Basis of Design Package A & B, Equipment Spec Book Medical Equipment, and Kitchen Equipment Schedule? Please clarify.
a) The alternate should cover everything that is documented in Volume #3 including the above items.
*b) From the meeting minutes, Basil Sherman stated: "*In simple terms, "if the building were tipped upside down, all of the stuff that would fall out would be considered to be a part of volume 3"

24) Items B022, B022.1, B022.2, V001, and V002-V005 in the Medical Equipment Spec, list Contractor to provide and Vendor to install. Please clarify.
a) These items are shown as vendor installed because it is typical to see them installed by vendor for warranty reasons. The intent on this project is that ultimately the contractor be responsible for these the purchase and install of these items as part of the turn key package.

***25)* Kitchen Equipment Schedule does not list specific equipment requirements. Please provide.**
a) Reference the Kitchen Equipment Specification in the spec book.

26) Document 002115 part 1.6.A.3.a states, "Note that greater qualification weight will be given to firms that exceed these minimum requirements." Is there a scoring matrix that shows how the pre-qualification data (experience, staff, capacity etc.) will be weighted against cost/duration? We want to understand how the decision process is getting made. Is the process that everyone who meets the minimum qualifications gets put in a pool of approved contractors and from there the absolute lowest cost/duration will be awarded? Or is there a value decision that will be made where cost is weighted at some factor along with qualifications?
a) Information regarding this question will be forthcoming in the next Addendum

27) Generally the bidding documents, including sample contracts, align with our expectations for a lump sum project. Division 00 – sub section 03 Bid Form conflicts with the rest of the documents asking for a GMP. Please clarify which is desired.
a) *Please see revised bid form, attached.*

28) Division 00 – sub section 03 Bid Form calls for a lot of detailed quote breakout. It will be a burden for general contractors to fill out and submit with bids given the last minute nature of this process. Can this bid form be simplified and additional breakout provided at a later date?
a) *Please see revised bid form.*

29) The mental health facility is out for bid. Did you realize that the controls spec is "wide open" to any company in business to bid this? I would think that opens you up to risk of future support.
a) This has been updated, please see attached revised Spec section 230900 DIRECT DIGITAL CONTROLS SYSTEM FOR HVAC.

30) After reading through the invitation and general information, I would assume the pre-bid meeting is intended for prime GCs not furniture folks. Can you please confirm?

a) It is intended primarily for GC bidding the work and anyone else that they chose to invite as well.

31) Are we supposed to submit our bid on this form on the same date and time the construction bid is due? Tuesday, November 19, 2024 by 1:45 p.m.? Also, does the bid bond requirement apply to the furniture portion of this project?

a) The furniture portion of the work, as well as the remainder of Volume #3 Alternate, will need to be bundled with the Prime bidder's bid.

***32)* Specification section 019113, 1.2 mentions an allowance for Commissioning. Sections 083113.53 and 083113 mention allowances for access doors. Allowances section 012100 only mentions Allowance No. 1 "include 2-tons of extra steel". Please clarify.**

a) 019113-1.2 has been removed from the specification, Please see attached updated spec.
b) 083113-1.3 has been removed from the specification, Please see attached updated spec.
c) 083113.53-1.3 has been removed from the specification, Please see attached updated spec
d) The allowance for 2 tons of additional steel shall be accounted for.

33) What is the total gas load for the building (MBH)?

a) 10,495 MBH of gas is anticipated at this building.

***34)* When will stamped mechanical and plumbing drawings be available?**

a) A drawing set containing the signed and sealed drawings will be issued on December 19, 2024

35) Please confirm there will be no wage determination rate requirements.

a) Wage determination rates requirements do not apply, however contractors and subcontractors will need to document wage and labor standards, including compliance with the Fair Labor Standards Act, Kansas Wage Payment Act (K.S.A. 44-313 et. seq.), Kansas Minimum Wage and Overtime Law (K.S.A. 44-1201 et. seq.), and Kansas Child Labor Law (K.S.A. 38-602 and 38-603).

36) Reference ARPA Agreement, Attachment B, section 15 K. Is there a certain Act (such as Build America Buy America) or a percentage threshold we will be required to meet for compliance on Domestic goods?

a) The sources of funding for this project are not subject to the requirements of Build America Buy America, therefore domestic preference requirements do not apply.

37) For the IT room clean agent suppression system, will FK-5-1-12 extinguishing agent be an approved equal to HFC-227?

a) No, FK-5-1-12 is not an approved extinguishing agent.

38) Please add section 014339 (Mockups) to the Spec Index.

a) This has been added to the specification index. Please see attached, revised, specification index.

39) Please add section 074243 (Composite Wall Panels) to the Spec Index.

a) This has been added to the specification index. Please see attached, revised, specification index.

40) Please add section 077200 (Roof Accessories) to the Spec Index.

a) This has been added to the specification index. Please see attached, revised, specification index.

41) Please add section 084213 (AL Framed Entrances) to the Spec Index.

a) This has been added to the specification index. Please see attached, revised, specification index.

42) Please add section 088700 (Window Film) to the Spec Index.

a) This has been added to the specification index. Please see attached, revised, specification index.

43) Please add section 096500 (Resilient Rubber Flooring) to the Spec Index.

a) This has been added to the specification index. Please see attached, revised, specification index.

44) Please add section 102123 (Cubicle Curtains and Track) to the Spec Index.

a) This has been added to the specification index. Please see attached, revised, specification index.

45) Please add section 116623 (Gym Wall Padding) to the Spec Index.

a) This has been added to the specification index. Please see attached, revised, specification index.

46) Spec Index lists section 074293 (Soffit Panels). This section is not provided. Please clarify/provide.

a) This has been removed from the specification index. Please see attached, revised, specification index.

47) Spec Index lists section 111200 (Parking Control Equipment). This section is not provided. Please clarify/provide.

a) This has been removed from the specification index. Please see attached, revised, specification index.

48) Spec Index lists section 1119812 (Detenton Doors and Frames). This section is not provided. Please clarify/provide.

a) This has been removed from the specification index. Please see attached, revised, specification index.

49) Please adjust Spec Index 144000 (Food Service Equipment). The provided spec is 114000.

a) Please see attached, revised, specification index.

50) Please re-issue 042613-1. The spec is shifted over and cut off from the page.

a) Please see attached, reprinted, specification.

51) Please re-issue 084413-1. The spec is shifted over and cut off from the page.

a) Please see attached, reprinted, specification.

52) Please re-issue 142123.06-1. The spec is shifted over and cut off from the page.

a) Please see attached, reprinted, specification.

53) Please re-issue 321813-1. The spec is shifted over and cut off from the page.

a) Please see attached, reprinted, specification.

54) Please re-issue 321316-1. The spec is shifted over and cut off from the page.

a) Please see attached, reprinted, specification.

55) Are the duress buttons shown on the security plans to be connected to the access control system or the DETENTION MONITORING AND CONTROL SYSTEM"

a) Duress buttons shall be connected to Real Time Management System (which interfaces with the Detention Monitoring and Control System)

56) Section 002115, C Submission of Qualification Documents, Item 2 states: Bid Submittal, Electronic: Owner will receive electronically submitted bids until the Bid time and date via County Bid web-based site. This contradicts with Section 0002 – Instructions to Bidder, Section Identification and Submission of Bid, Item 2 states: All the Bid Documents shall be enclosed in a sealed envelope with the notation "Bid Enclosed" on the face. Please advise.

a) This has been updated in the Instructions to Bidders to allow Email submission. Please see attached revised specification.

***57)* It seems the Division 28, Security Electronics division is being sole specified for ECC (Electronic Contracting Company.) I was wanting to also be approved to bid this project since we supply the Security Electronics system at the Jail.**

a) This needs to be handled via the Substitution procedures outlined in 02 - Instruction to Bidders.

58) Inquiring if Trane could be an approved manufacturer for air cooled chillers in section 236426.13

a) This has been updated, please see attached revised Spec Section 236426.13 FL AIR-COOLED, ROTARY-SCREW WATER CHILLERS.

59) Missing specification section 224600 LIGATURE RESISTANT PLUMBING FIXTURES.

a) This has been updated, please see attached new Spec 224600 LIGATURE RESISTANT PLUMBING FIXTURES.

60) Spec 001113 Part 1 1.9D notes that qualifications are to be submitted with the bid. Spec 002115 Part 1, 1.1D notes that "Only those Prospective Bidders who have complied with the Requirements for Qualification and have been determined to be qualified will be eligible to submit construction bids on Project." Both qualifications and the bid for construction are due on 11/16/2024 at 1:45pm CST. Please confirm that bids may be submitted without a pre-determination of qualification.

a) Confirmed, but qualification documentation must accompany the bid delivered on the original due date of 11/19/2024 by 1:45 PM, Central Standard Time.

61) As noted in the pre-bid conference this morning, there is conflicting information as to how the bid may be submitted. Please confirm that an email bid submitted to purchasing@sedgwick.gov is an acceptable way to submit the bid and that a hard copy in sealed envelope is NOT also required.

a) Confirmed - purchasing@sedgwick.gov is the email address to submit bids to. A sealed hard copy is NOT required. Bid due date and time have not changed from 11/19 at 1:45 PM, regardless of delivery.

Revised Documents, attached:

- **Specifications**
- Pre-Bid meeting minutes and sign-in
- 02- Instructions to Bidders (modified, see questions above)
- 03- Bid Form (modified, see questions above)
- 000110- Spec Index (modified, see questions above)
- 012100 Allowances (modified, see questions above)
- 019113 General Commissioning (modified, see questions above)
- 042613 Masonry Veneer (reprinted)
- 083113 Access Doors and Frames (reprinted)
- 083113.53 Security Access Doors and Frames (reprinted)
- 084113 Glazed Aluminum Curtain Walls (reprinted)
- 142123.16- MRL Electric Traction Passenger Elevators (reprinted)
- 224600 Ligature Resistant Plumbing Fixtures (new)
- 230900 Direct Digital Control System For HVAC (modified, see questions above)
- 236426.13 Air-Cooled, Rotary-Screw Water Chillers (modified, see questions above)
- 321316 Decorative Concrete Paving (reprinted)
- 321813 Synthetic Turf Surfacing (reprinted)

- **Sheets**
- 2TC1-100 - LEVEL 1 - COMMUNICATIONS PLAN – OVERALL:
  - Added PA zone K.
  - Revised overall Paging Zone Layout.
- 2TC1-141 - LEVEL 1 - COMMUNICATIONS PLAN - AREA D:
  - Added PS-04 within Courtyard C.
  - Added (2) PS-03 within Courtyard D.
- 2TC1-151 - LEVEL 1 - COMMUNICATIONS PLAN - AREA E:
  - Added PS-04 within Courtyard B .
  - Added (2) PS-03 within Courtyard A.
- 2TC1-161 - LEVEL 1 - COMMUNICATIONS PLAN - AREA F:
  - Added PS-03 at loading dock outside.
  - Added (2)PS-02 Within Receiving/Dock 148.
  - Added (2) PS-02 Within Receiving/Dock Vestibule 148A.
- 2TC5-101 - COMMUNICATIONS RISERS AND DETAILS:
  - Added additional zone output from VO-01 to AMP-01.
  - Shifted circuiting of each zone from AMP-01.
  - Added PS-03 and PS-04 where needed and revised wattage count.
- 2TC6-100 - COMMUNICATIONS SCHEDULES:
  - Added PS-03 and PS-04 to AUDIO-VISUAL EQUIPMENT SCHEDULE.
- 2TN1-161 - LEVEL 1 - DATA NETWORK PLAN - AREA F:
  - Added data drop in Loading Dock.

Firms interested in submitting a ***bid*** must respond with complete information and **deliver on or before 1:45 pm *CST, November 19, 2024*.** Late ***bids*** will not be accepted and will not receive consideration for final award.

"PLEASE ACKNOWLEDGE RECEIPT OF THIS ADDENDUM ON THE BID RESPONSE PAGE."

Joseph Thomas
Purchasing Director

JT/jp

Meeting Notes

PULSE DESIGN GROUP

Project Name: South Central Kansas Regional Psychiatric Hospital

Project Number: 23179
11/1/2024

DISTRIBUTION

See attached sign in sheets

PROJECT

Project Name: South Central Kansas Regional Psychiatric Hospital

Client: Sedgwick County

Project Location: Wichita, KS

DATE

11/1/2024

BY

Luke Abkes

PROJECT NUMBER: 23179

Pre Bid Meeting Minutes – October 31, 2024 @ 11:00 am CST

With reference to the above captioned project, a meeting was held at 11:00 am on Thursday, October 31st , 2024 following individuals indicated on the sign in sheets (attached) in attendance:

The following items were discussed:

1. **Discussion Items**
    a. Meeting Introduction
        i. Final bids due 11/19
        ii. Pre-bid meeting is being recorded
        iii. Sign in sheet has been passed around and was located at each entry
    b. Project Overview (Basil Sherman – Pulse Design Group)
        i. Overall security levels 1 and 2
            1. Color coded to note levels 1 through 5
        ii. Renderings
            1. Exterior materials
        iii. Site Access
    c. Bid Format
        i. See attached for updated bid form
        ii. Bids will be lump sum
        iii. Calendar days have been removed
    d. Fees
        i. Bids are preferred to be electronic, but the county will also accept hard copies
            1. Bids are due no later than 1:45 pm on November 19, 2024
            2. Electronic bid files must be under the maximum of 35 mb per file
                a. Multiple files are allowed
        ii. There are duplicate spec section numbers in the project manual
            1. Spec sections noted as C.S. are for the core and shell portions of the project
                a. Volume 1
            2. Spec sections notes as T.I. are for the Tenant Infill portion of the project
                a. Volume 2
        iii. Clarification on volume 3

1. In simple terms, “if the building were tipped upside down, all of the stuff that would fall out would be considered to be a part of volume 3”

iv. Vendor installed items will be under the G.C contract
v. Weighted qualifications will be a tie breaker
    1. County is planning to release a matrix
vi. Allowances
    1. Allowances for commissioning has been removed
    2. Allowance for misc steel remains in the contract
vii. Spec index has been updated
viii. There will be no wage determinate rates required
    1. Contractors and subcontractors will need to document wage and labor standards
ix. Sources of funding for this project are not subject to the requirements of Build America Buy America, therefore domestic requirements do not apply

The above constitutes the writer’s understanding of the items discussed and the conclusions reached. This understanding will be deemed correct unless any additions and/or corrections are made within seven days of this memorandum.

LA

PRE-BID/PROPOSAL MEETING
RFB #24-0073

PROJECT: **South Central Kansas Regional Psychiatric Hospital**

LOCATION: **100 N. Broadway, Wichita, Kansas, 67202**

DATE: **October 31, 2024** **TIME:** 11:00 AM

PLEASE **PRINT CLEARLY** SHOULD WE NEED TO CONTACT YOU AT A LATER DATE

CONTACT PERSON	*COMPANY NAME*	*E-MAIL ADDRESS*	*PHONE NUMBER*	*FAX NUMBER*
Mitch Binns	McCown Gordon Construction	mbinns@mccowngordon.com	785-210-7829	
JOHN BREDENTHAL	PROFESSIONAL ENGINEERING CONSULT.	JOHN.BREDENTHALPEC1.com	316-262-2691	
Ryan Rowley	Hutton	rrowley@huttonbuilds	316-303-2893	
SPENCER LEVIN	HUTTON	slevine huttonbuilds.com	316.303.6506	
GARRETT HAAK	Icon Structures	GH@Icon-Structures.com	316-207-5391	
Russ Weckel	Linder & Assoc.	rweckel@linderandassociates	316-204-7267	
Andrew Schon	Five Star Mechanical	ASchon@FiveStarKS.com	316-943-7827	
Jeff Davis	Five Star Mechanical	JDavis@FiveStarKS.com	316-943-7827	
Todd Helmert	Five Star Mech.	thelmert@fivestarks.com	316-789-5162	
Jay Gifford	Five Star Mech.	jgifford@fivestarks.com	316 617 1081	

Purchasing Tech (name) _____

Date posted to website _____

Addenda sent to all attendees (email) at Pre-bid meeting and the original bidder list ___ Yes ___ No

Email address(es) added to the SAP Bidder List _____Yes _____No

PRE-BID/PROPOSAL MEETING
RFB #24-0073

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LOCATION: 100 N. Broadway, Wichita, Kansas, 67202

DATE: October 31, 2024 **TIME:** 11:00 AM

PLEASE **PRINT CLEARLY** SHOULD WE NEED TO CONTACT YOU AT A LATER DATE

CONTACT PERSON	*COMPANY NAME*	*E-MAIL ADDRESS*	*PHONE NUMBER*	*FAX NUMBER*
GREG ANDERSON	DONDLINGER	ganderson@dondlinger.build	316.945.0555	316.945.9009
GREG PROBST	DONDLINGER	gprobst@dondlinger.build	316-945-0550	
ANDY HOFFMAN	WALDINGER	ANDY.HOFFMAN@WALDINGER.COM	316-295-8200	
Taylor Creighton	Central Consolidated	estimate@centralconsolidated.net	316-249-1024	
AARON Hay	Harman Huffman	ahay@harmanhuffman.com	316 744-2081	
ALEX BREITENBACH	JE DUNN	ALEXBRE JEDUNN.COM	816-266-2665	
Kurt Hershey	TESSERE			
Josh Sullard	APAC	Joshua.Sullard@apac.com	(316) 652-5832	
Chad McCutcheon	JE Dunn	chad.mccutcheon@jedunn.com	707-583-4437	
Dan Cummings	JE Dunn	dan.cummings@jedunn.com		

Purchasing Tech (name) _____

Date posted to website _____

Addenda sent to all attendees (email) at Pre-bid meeting and the original bidder list ___ Yes ___ No

Email address(es) added to the SAP Bidder List _____Yes _____No

PRE-BID/PROPOSAL MEETING
RFB #24-0073

PROJECT: **South Central Kansas Regional Psychiatric Hospital**

LOCATION: **100 N. Broadway, Wichita, Kansas, 67202**

DATE: **October 31, 2024** **TIME:** 11:00 AM

PLEASE **PRINT CLEARLY** SHOULD WE NEED TO CONTACT YOU AT A LATER DATE

CONTACT PERSON	*COMPANY NAME*	*E-MAIL ADDRESS*	*PHONE NUMBER*	*FAX NUMBER*
Fred Britain	Tessere	Fred.Britain@tessere.com	316-621-0774	
Jesus Rubio	TESSERE	jesus.rubio@tessere.com		
Luke Abkes	Pulse Design Group	labkes@pulsedesigngroup.com	913 522 2965	
Keatin Herder	Key Construction	kdherder@keyconstruction.com	316-644-7378	
Troy Heckart	Key Construction	tkheckart@keyconstruction.com	316-263-9515	
Jake Stredicke	INA Alert	jake@INAAlert.com	785 424 0850	
IRYNA YEROMENKO	KDADS	IRYNA.YEROMENKO2@ks.gov	7852502168	

Purchasing Tech (name) _____

Date posted to website _____

Addenda sent to all attendees (email) at Pre-bid meeting and the original bidder list ___ Yes ___ No

Email address(es) added to the SAP Bidder List _____Yes _____No

PRE-BID/PROPOSAL MEETING
RFB #24-0073

PROJECT: **South Central Kansas Regional Psychiatric Hospital**

LOCATION: **100 N. Broadway, Wichita, Kansas, 67202**

DATE: **October 31, 2024** **TIME:** 11:00 AM

PLEASE **PRINT CLEARLY** SHOULD WE NEED TO CONTACT YOU AT A LATER DATE

CONTACT PERSON	*COMPANY NAME*	*E-MAIL ADDRESS*	*PHONE NUMBER*	*FAX NUMBER*
David Smith	CMW	Bids@cenmech.com	316-267-7676	
Jayson Muñoz	NAPCO	jmuñoz@napcoprecast.com	918-841-5119	
Steven Castillo	NAPCO	SCastillo@napcoprecast.com	918-810-9484	
Adam Crocker	C&C Group	ACrocker@C-CGroup.com	316-744-5256	
Derek Dahm	The Law Company	estimating@law-co.com	316-268-0200	

Purchasing Tech (name) _____

Date posted to website _____

Addenda sent to all attendees (email) at Pre-bid meeting and the original bidder list ___ Yes ___ No

Email address(es) added to the SAP Bidder List _____Yes _____No

PRE-BID/PROPOSAL MEETING
RFB #24-0073

PROJECT: **South Central Kansas Regional Psychiatric Hospital**

LOCATION: **100 N. Broadway, Wichita, Kansas, 67202**

DATE: **October 31, 2024** **TIME:** 11:00 AM

PLEASE **PRINT CLEARLY** SHOULD WE NEED TO CONTACT YOU AT A LATER DATE

CONTACT PERSON	*COMPANY NAME*	*E-MAIL ADDRESS*	*PHONE NUMBER*	*FAX NUMBER*
Brian Aldrich	Floor Coverings Intnl	brianaldrich@fcifl.com	316-221-1488	
Jeffrey Franck	CTI	Jeffrey.Franck@cti.com	316 247 9690	
Joe Thomas	Sedg County	joseph.thomas@sedgwick.gov	316-660-7265	

Purchasing Tech (name) _____

Date posted to website _____

Addenda sent to all attendees (email) at Pre-bid meeting and the original bidder list ___ Yes ___ No

Email address(es) added to the SAP Bidder List _____Yes _____No

INSTRUCTIONS TO BIDDERS

PROJECT: **South Central Kansas Regional Psychiatric Hospital**

South of West 31st Street South, east South West Street, west of South Meridian Avenue, and north of West MacArthur Road in Wichita, Kansas.

COUNTY BID NUMBER: 24-0073

ARCHITECT: **Luke Abkes**
Pulse Design Group
4622 Pennsylvania Avenue
Suite 1050
Kansas City, MO 64112..

913.438.9095
labkes@pulsedesigngroup.com

Bids shall be made in accordance with these Instructions to Bidders:

A. Responses to this invitation will be accepted only from General Contractors who are licensed to do business in Sedgwick County.

B. Applications will also be accepted from General Contractors who have applied to receive a reciprocal license.

C. A copy of General Contractor's Certificate of Insurance will be required to be submitted with the Bid at the time the bids are due. Insurance policy will be due from the successful contractor as part of the required documents prior to issuance of the notice to proceed.

D. Bidding Documents shall include the Invitation for Bids, Bid Form, construction drawings, proposed Contract Documents, including any Addenda issued prior to receipt of Bids, supplemental information and any additional information requested.

E. Bids must be on a bid GMP that shall include a five-percent jointly managed contingency help below the total of the GC Bid Amount and shall be the Contract Amount.

F. Bidder Qualifications: For the duration of the project, all Prime Bidders shall be located within Sedgwick County, Kansas or establish an office in Sedgwick County, Kansas, and may be required by the Owner to furnish information to support the Bidder's capability to fulfill the Contract if awarded the Contract. Such information does not need to be submitted with the Bid, but may be requested at the Owner's option. Such information may include, but not be limited to, the following:

1. Proof of registration with the Kansas Director of Taxation by non-resident Bidders (K.S.A. 79-1009).
2. Proof of registration with the Kansas Secretary of State by foreign corporations.
3. List of projects of similar size and type the Bidder has constructed or in which the Bidder has been engaged in a responsible capacity.
4. Evidence the Bidder maintains a permanent place of business.
5. A current financial statement.

Examination:

1. BEFORE SUBMITTING A BID, each Bidder shall examine carefully all documents pertaining to the work and visit the site to fully inform himself of the condition of the site and the conditions and limitations under which the work is to be performed.

2. SUBMISSION OF A BID will be considered presumptive evidence that the Bidder has fully informed himself of the conditions of the site, requirements of the Contract Documents, and of pertinent national, state and local codes and ordinances, and that the Bid made allowances for all conditions, requirements and contingencies.

3. In reviewing these Documents, it is evident that certain information, if disclosed to the public, may jeopardize the security of Sedgwick County, and appropriate measures will be taken to maintain confidentiality.

4. **In order to ensure each bidder has the most current information for bidding there is an established date and time for last questions to be asked. Bidders requiring clarification or interpretation of the Bidding Documents shall make such requests, in writing only, to the Purchasing Agent no later than 5:00 p.m. on Wednesday, November 06, 2024**

5. Samples shall be submitted by the above referenced deadline to permit evaluation and notification of Bidders.

6. Any interpretation, correction or change of the Bidding Documents will be made by written Addenda. Interpretations, corrections, or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections, and changes.

Addenda:

1. DISCREPANCIES OR OMISSIONS in the documents will be clarified in the form of an electronic Addendum and will be posted on the County web site. Bidders finding discrepancies, omissions, or who are in doubt as to the meaning of any portion of the Contract Documents, should immediately request an interpretation from the Purchasing Agent. In response, an Addendum will be issued and the contractor shall rely solely on information contained in the written Addenda about said discrepancy or omission. **Neither the Architect nor the Owner will be responsible for any other form of instructions or interpretations given to the contractor, either verbal or written.**

2. ADDENDA received by Bidders shall be acknowledged by same on their Bid Form.

Substitutions:

1. Each Bidder represents that their Bid is based upon materials and equipment described in the Bidding Documents.

2. No substitution will be considered unless written request has been submitted to the Purchasing Agent and the Architect, in duplicate, for approval by 5:00 p.m. on Tuesday, November 19, 2024. Each such request shall include a complete description of the

proposed substitute, drawings, cuts, performance or test data, or information necessary for a complete evaluation. If the Architect approves any proposed substitution, such approval will be set forth in an Addendum.

Preparation of Bids:

1. BIDS shall be made on unaltered Bid Forms furnished by the County, or detached from this Project Manual.

2. FILL IN all blanks on the Bid Form with ink or type. Blanks left on Bid Form may be cause for disqualification of Bidder.

3. SIGN BID FORM in longhand, with name typed below signature. Where Bidder is a Corporation, Bids must be signed with the legal name of the Corporation, followed by the legal signature of an officer authorized to bind the Corporation to a contract.

4. RECAPITULATION of work to be done shall not be included with any Bid.

5. Where so indicated by the makeup of the Bid Form, amounts shall be expressed in both words and figures, and in case of discrepancy between the two, the written amount shall govern.

Identification and Submission of Bid:

1. Contractor shall provide one (1) Original of the Bid Response Form, Bid Security and other supplemental information required to be submitted with the Bid.

2. All of the Bid Documents shall be enclosed in a sealed envelope with the notation “Bid Enclosed” on the face. The firm name and address, Bid number, Bid opening date, and Bid opening time shall be provided in the lower left-hand corner of the Envelope.

   OR

   Bids may be emailed with all required documentation to the Purchasing Department of Sedgwick County.

Modification and Withdrawal of Bid:

1. A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period that a Bidder’s Bid Security is held following the time and date designated for the receipt of Bids. The Bidder so agrees in submitting his Bid.

2. WITHDRAWAL BEFORE BID OPENING: A Bid may be withdrawn at any time before Bid Opening, but may not be resubmitted. If a bidder withdraws a bid, as authorized in K.S.A. 75-6905, the awarding authority may require that such bidder shall not be allowed to perform any work on the project through subcontract agreements or by any other means including re-bids.

3. AFTER BID OPENING: No Bid may be withdrawn or modified, except where the award of contract has been delayed for more than 60 days.

In the event of an Award, the lowest, responsive, responsible and best bid price meeting the specifications will be required to enter into contract required for the Project. Said Bidder shall also provide a Performance Bond for the full amount of the contract. The Performance Bond, in the amount of 100% of the Contract amount, must be submitted within 30 calendar days after award of contract. Failure to return these Documents within the required time period may cause a cancellation of the Award.

Consideration of Bids/Selection Process:

1. Bids received will be opened and read aloud publicly.

2. Owner shall have the right to determine the acceptable Bidder on the basis of the sum of the Base Bid, the Alternates accepted, and the qualifications of the bidder..

3. The Owner will award a contract to the lowest, responsive, responsible and best qualified Bidder provided:

    a. The Bid conforms to and has been submitted according to the requirements of the Bidding Documents and includes the Certificate of Insurance including Contractor's General Automotive Liability, Workers Compensation Insurance and Owner's Liability Insurance.

    b. The Bid is judged to be reasonable.

    c. The Bid does not exceed the funds available.

    d. The Bid complies with the Instruction to Bidders and Mandatory Requirements.

    e. The completion time is satisfactory to the Owner.

    f. Evidence of the experience, qualifications and financial responsibility of the Bidder and his Subcontractors and the time of completion are all satisfactory to the Owner.

    g. The County reserves the right to reject Bidders in accordance with the Bidding Documents.

    h. Best Bid. The evaluation of the overall bid, considering the quality, price, various elements of the required goods or services and the responsiveness and responsibility of the bidder.

4. Bids will be screened by a Review Committee consisting of the Project Manager, Architect and the Purchasing Agent.

5. No negotiations, decisions, or actions shall be initiated by any firm as a result of any verbal discussion with the Owner or employee of the Owner before the opening of responses to the document.

6. The Owner shall have the right to waive any informality and/or irregularity in any Bid received.

7. The Owner shall have the right to reject any and all Bids.

Time for Completion and Liquidated Damages:

All Bidders are required to state on the Bid Form the time needed for all work under the general contract to be completed, which would yield their best Bid. Unless otherwise required, this time frame shall be stated in calendar days and shall represent the Contractor's commitment to complete the project on schedule.

The contractual period will begin with the issuance of Notice to Proceed and continue through completion of the project.

The Bidder understands that the Certificate of Occupancy and Substantial Completion must be completed by **October 31, 2026**.

The Agreement will include a stipulation that liquidated damages will be assessed in the amount of $3,000 per calendar day or $21,000 per calendar week, prorated, after Completion Date that the work is not substantially complete.

Upon satisfactory completion of the Contract, a formal CERTIFICATE OF SUBSTANTIAL COMPLETION will be forwarded to the Contractor by the Project Architect. The date of substantial completion of the Project will be the starting date of the warranty period.

All work shall be in accordance with all Federal and State Laws, Local Ordinances and Building Codes, and the 2010 Standards for Accessible Design.

Taxes: Materials and equipment incorporated in the work are exempt from payment of sales tax under the laws of the State of Kansas.

Project Time Line:

The following dates are provided in addition to those previously stated to help interested contractors in planning participation in the project herein. The dates listed, however, are in no way guaranteed and are subject to change without notice.

Project out for bid – **October 24, 2024.**
Pre-bid Meeting – **October 31, 2024** at **11:00** a.m.
Last questions received – **November 6, 2024** at **5:00 p.m.**
Last Addendum Issued – **November 13, 2024** at **5:00 p.m.**
Bids Due in Purchasing – **Tuesday, November 19,2024** at **1:45 p.m.**
Bid Opening – **Tuesday, November 19,2024** at **2:00 p.m.**
Board of Bids and Contracts – **Thursday, December 5, 2024.** Date is subject to change.
Board of County Commissioners – **Wednesday, December 11, 2024.** Date is subject to change.

Notice to Proceed:

No work shall commence until the Owner issues a Notice To Proceed, and a Notice To Proceed will not be issued until all of the following are mailed or delivered to:

Tania Cole
Assistant County Manager
Sedgwick County
100 N. Broadway
Suite 630
Wichita, Kansas 67202

by the selected vendor:

1. The Contract signed by the representative with authority and ability to do so.
2. Performance and Statutory Bonds with the attached powers of attorney. Attach the receipt of the Clerk of the District Court to the Statutory Bond.
3. List of subcontractors and supplier's proof of a valid Contractor's license from the jurisdiction in which the work is being performed for both contractor and applicable sub-contractors is required.
4. Corporate Resolution of authority to sign and deliver the Contract Documents, executed by the Corporation's Secretary or Assistant Secretary and dated before all other dated submittals.
5. Domestic (Kansas) corporations shall furnish evidence of good standing in the form of a Certificate signed by the Kansas Secretary of State. Foreign (non-Kansas) corporations shall furnish evidence of authority to transact business in Kansas, in the form of a Certificate signed by the Kansas Secretary of State.
6. Construction Schedule with major milestones identified.
7. Insurance Certification for Payment.

Such documents must be delivered within ten (10) days of the Owner's written notification to the successful Bidder. If they are not delivered within such time then the Bidder will be deemed to have abandoned its contract with the Owner, and the Owner will award a contract to the next lowest and best Bid.

1. The successful Bidder shall not make claim either for time or money against the Owner for labor or materials performed or delivered prior to issuance of the Notice to Proceed.
2. The County's responsibility to issue a Notice To Proceed is expressly conditioned on the Contractor's timely execution and delivery of such documents.
3. The County intends to issue a Notice To Proceed within 30 days of receipt of Bids.
4. Bidders shall also note that the Work cannot begin until after a State of Kansas Sales Tax Exemption Certificate has been provided by Sedgwick County and affixed to the Purchase Order and the Notice to Proceed.
5. Contractor must submit Insurance Policy.

END OF INSTRUCTIONS TO BIDDERS

BID FORM

BID PROVIDED BY:

_____
(Company Name)

I have received the Bid Documents, Specifications, and Construction Documents, collectively known as the Contract Documents for Construction of the

South Central Kansas Regional Psychiatric Hospital

COUNTY BID NUMBER: 24-0073

as prepared by the Architect Basil Sherman II:

In submitting this Bid, I agree:

1. To hold my Bid open for 60 days after the date of this Bid.

2. To enter into and execute a Contract, if awarded on the basis of this Bid, and to proceed in accordance with the requirements of the General Conditions and Contract Form.

3. To provide all labor, materials, equipment, tools of trades and labor, accessories, appliances, warranties and guarantees, and to pay all royalties, fees, permits, licenses and applicable taxes necessary to complete the work in accordance with the proposed Contract Documents.

4. To remove and haul away from the construction site any and all debris arising from this contract and to assume sole liability for all removal, handling, and dumping of debris.

5. To comply with any and all local, state, federal or other governmental laws, rules and regulations with respect to the transportation, disposal, and dumping of debris and other excavated materials and Contractor shall secure any and all necessary permits and approvals incident to said transportation, dumping and disposal.

6. To further agree to indemnify and hold the Owner and Designer harmless from any and all claims and/or damage of any kind whatsoever as a result of the Contractor's performance of this Contract.

7. That attached to this Bid is one copy of the Certificate of Insurance including Contractor's General Automotive Liability, Workers Compensation Insurance and Owner's Liability Insurance.

8. **BID:**
   BASE BID
   To complete the Base Bid Work, in the time stipulated, in accordance with the Bidding Documents as follows:

PROJECT TOTAL

PORTION OF WORK	COSTS
VOLUME 1 & 2 BASE BID	
FIXED JOINTLY MANAGED CONTINGENCY	**$5,000,000**
TOTAL BASE BID CONTRACT VALUE	
ADD ALTERNATE 1 VOLUME 3 TOTAL	
TOTAL CONTRACT VALUE INCLUDING ADD ALTERNATE 1	

9. **ADDENDA:**
The Bidder acknowledges receipt of the following numbered Addenda:

None (___) #1(___) #2(___) #3 (___) #4(___) #5

10. **AGREEMENTS:**
The Undersigned agrees to the following terms and conditions:

a. An incomplete Bid, or other information not requested which is written on this Bid Form, may be cause for rejection.
b. Read the Invitation for Bids and the Instructions to Bidders carefully.
c. The Owner reserves the right to reject any or all Bids and to waive all technicalities should such action be deemed to be in the best interest of the Owner.
d. This Bid may not be withdrawn for a period of 60 calendar days following the receipt and opening.
e. Failure to acknowledge receipt of any Addendum issued may be cause for Bid rejection.
f. In the event that changes to the work are required, the undersigned agrees that ten percent (**10% for Self-Perform, 5% for Sub, 3% for Sub of Sub**) total between General and Subcontractors of his net costs shall be added thereto for Overhead, Profit and General Requirements (including but not limited to, Insurance and Bonds).

11. **MAJOR SUBCONTRACTORS:**
The Undersigned acknowledges the following named major subcontractors are to be used for their respective division of work. Contractors shall identify by type, any disadvantaged, minority and women-owned businesses used as a subcontractor for this project.

Subcontractor:_____
Address – City, State, Zip: _____

Additional, if necessary:

12. **DECLARATIONS:**

The Undersigned hereby declares he has carefully examined the Drawings and Specifications, has visited the actual location of the work, has satisfied himself as to all conditions and understands that, in signing this Bid Form, he waives all right to plead any misunderstandings regarding same and agrees to be bound by the provisions of said Drawings and Specifications and all statements made therein.

The Undersigned proposes to enter into Contract and to furnish and pay for the specified Bonds and other required Documents within 10 working days after notification of award of Contract.

13. **FIRM IDENTIFYING INFORMATION:**

FIRM NAME _____

CONTACT _____

SIGNATURE _____TITLE _____

PRINT NAME _____

ADDRESS _____ CITY/STATE _____ ZIP _____

PHONE _____ FAX _____ HOURS _____

COMPANY WEBSITE ADDRESS _____ E-MAIL _____

NUMBER OF LOCATIONS _____ NUMBER OF PERSONS EMPLOYED_____

TYPE OF ORGANIZATION:

Public Corporation ___ Private Corporation___ Sole Proprietorship ___ Partnership __ Small Business __

General Nature of Business _____

Manufacturer _____ Distributor _____ Retail _____ Dealer____ Service _____

___Not Minority/Caucasian (00) publicly traded companies and nonprofits are in this category

Minority Owned Business:

___African American (05), ___Asian Pacific (10), ___Subcontinent Asian (15), ___Hispanic (20),

___Native American (25), ___Other (30) - Please specify_____,

___Not Minority/Caucasian – Woman Owned (50), ___African American – Woman Owned (55),

___Asian Pacific – Woman Owned (60), ___Subcontinent Asian – Woman Owned (65), ___Hispanic – Woman Owned (70), ___Native American – Woman Owned (75), ___Other – Woman Owned (80)

Insurance registered in the State of Kansas with a minimum best rating of A-VIII: ____Yes ___ No

14. **SIGNATURE AND SEAL:**

DATED THIS _____ DAY OF _____, 2024.

_____
LEGAL NAME OF PERSON, FIRM OR CORPORATION

_____
MAILING ADDRESS OF ABOVE

_____
SIGNATURE

_____
TELEPHONE NUMBER FAX NUMBER

(Affix Corporate Seal here)

E-MAIL

Construction Documents
South Central Kansas Régional Psychiatric Hospital
Sedgwick County
Wichita Kansas

Architect's Project No. 23179

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

000001	Cover
000101	Project Title Page
000107	Statement of Responsibility
000110	Specification Index
000115	Drawing Index
002115	Instructions for Qualification
003132	Geotechnical Data
01 –	Invitation to Bid
02 -	Instruction to Bidders
03 -	Bid Form
04 -	Bid Terms Conditions (rev 6-22-22 LJ)
05 -	Performance Labor and Material Bonds
06 -	KS Statutory Payment Bond
07 -	Performance Bond
08 -	Certified Copy of a Resolution
09 -	Exhibit A - (rev 01-03-19) small projects - construction
10 -	Subcontracting Work Sheet
11 -	FORM OF CONTRACT
12.	A101
	Exhibit A
	A201

DIVISION 01

010000	General Requirements
011000	Summary
012100	Allowances
012200	Unit Prices
012300	Alternates
012500	Substitution Procedures
012600	Contract Modification Procedures
012900	Payment Procedures
013233	Photographic Documentation
013300	Submittal Procedures

ADDENDUM-01
2024.11.01

ADDENDUM-01
2024.11.01

Division 26 - Electrical

Division 27 - Telecommunications

331413	Public Water Utility Distribution Piping
333111	Public Sanitary Sewerage Gravity Piping
334200	Stormwater Conveyance

END OF SECTION 000110

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost allowances.
3. Quantity allowances.
4. Contingency allowances.
5. Testing and inspecting allowances.

C. Related Requirements:

1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
2. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
3. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.2 DEFINITIONS

A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include [**taxes,**]freight[**,**] and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 UNIT-COST ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include [**taxes,**]freight[**,**] and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and

accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 QUANTITY ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include [**taxes,**]freight[**,**] and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.9 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's[**overhead, profit, and**] related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation[**, taxes**], insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.10 TESTING AND INSPECTING ALLOWANCES

A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.

B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.

C. Costs of testing and inspection services not specifically required by the Contract Documents are Contractor responsibilities and are not included in the allowance.

D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.11 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, required maintenance materials, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs due to a change in the scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Quantity Allowance: Include 2-tons of extra steel per general note ~~5R~~ **5.O.** on sheet 1S1-001.

1. Coordinate quantity allowance adjustment with unit-price requirements in Section 012200 "Unit Prices."

END OF SECTION 012100

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General requirements for coordinating and scheduling commissioning activities.
2. Commissioning meetings.
3. Commissioning reports.
4. Use of commissioning process test equipment, instrumentation, and tools.
5. Construction checklists, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
6. Commissioning tests and commissioning test demonstration.
7. Adjusting, verifying, and documenting identified systems and assemblies.

B. Related Requirements:

1. Section 011000 "Summary" for Commissioning Authority responsibilities.
2. Section 013300 "Submittal Procedures" for submittal procedure requirements for commissioning process.
3. Section 017700 "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.
4. Section 017823 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal requirements.
5. Section 019119.43 "Exterior Enclosure Commissioning" for technical commissioning requirements for exterior closure.
6. Section 210800 "Commissioning of Fire Suppression" for technical commissioning requirements for fire suppression.
7. Section 220800 "Commissioning of Plumbing" for technical commissioning requirements for plumbing.
8. Section 230800 "Commissioning of HVAC" for technical commissioning requirements for HVAC.
9. Section 260800 "Commissioning of Electrical Systems" for technical commissioning requirements for electrical systems.
10. Section 270800 "Commissioning of Communications" for technical commissioning requirements for communications systems.
11. Section 280800 "Commissioning of Electronic Safety and Security" for technical commissioning requirements for electronic safety and security systems.

~~1.2 ALLOWANCES~~

~~A. Labor and management costs for the performance of commissioning process.~~

~~B. The following are excluded from the commissioning allowance:~~

1. ~~Equipment and systems installation, startup, and field quality-control testing indicated in the Contract Documents.~~
2. ~~Test equipment, instrumentation, and tools (including, but not limited to, proprietary test equipment, instrumentation, and tools) required to perform tests.~~
3. ~~Work to correct commissioning issues.~~
4. ~~Work to repeat tests when equipment and systems fail acceptance criteria.~~

1.3 DEFINITIONS

A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

B. Basis-of-Design Document: A document prepared by Architect that records concepts, calculations, decisions, and product selections used to comply with Owner's Project Requirements and to suit applicable regulatory requirements, standards, and guidelines.

C. Commissioning Authority: An entity engaged by Owner, and identified in Section 011000 "Summary," to evaluate Commissioning-Process Work.

D. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation of commissioning requirements.

E. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities.

F. Construction-Phase Commissioning-Process Completion: The stage of completion and acceptance of commissioning process when resolution of deficient conditions and issues discovered during commissioning process and retesting until acceptable results are obtained has been accomplished. Owner will establish in writing the date construction-phase commissioning-process completion is achieved. See Section 017700 "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.

1. Commissioning process is complete when the Work specified of this Section and related Sections has been completed and accepted, including, but not limited to, the following:

    a. Completion of tests and acceptance of test results.
    b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
    c. Comply with requirements in Section 017900 "Demonstration and Training."
    d. Completion and acceptance of submittals and reports.

G. Owner's Project Requirements: A document that details the functional requirements of a project and the expectations of how it will be used and operated, including Project

goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. This document is prepared either by the Owner or for the Owner by the Architect or Commissioning Authority.

H. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.

I. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.

J. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

K. Sampling Procedures and Tables for Inspection by Attributes: As defined in ASQ Z1.4.

1.4 COMPENSATION

A. If Architect, Commissioning Authority, other Owner's witness, or Owner's staff perform additional services or incur additional expenses due to actions of Contractor listed below, compensate Owner for such additional services and expenses.

1. Failure to provide timely notice of commissioning activities schedule changes.
2. Failure to meet acceptance criteria for test demonstrations.

B. Contractor shall compensate Owner, Architect, or Consultant for such additional services and expenses at the rate of $200 per labor hour, plus $2,000 per round trip for personnel travelling more than [**100**] miles, plus per diem allowances for meals and lodging according to current U.S. General Services Administration (GSA) Per Diem Rates.

1.5 COMMISSIONING TEAM

A. Members Appointed by Contractor(s):

1. Commissioning Coordinator: A person or entity employed by Contractor to manage, schedule, and coordinate commissioning process.
2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the commissioning process.
3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the commissioning process.
4. Appointed team members shall have the authority to act on behalf of the entity they represent.

B. Members Appointed by Owner:

1. Commissioning Authority, plus consultants that Commissioning Authority may deem appropriate for a particular portion of the commissioning process.

2. Owner representative(s), facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that Owner may deem appropriate for a particular portion of the commissioning process.
3. Architect, plus employees and consultants that Architect may deem appropriate for a particular portion of the commissioning process.

1.6 INFORMATIONAL SUBMITTALS

A. Comply with requirements in Section 013300 "Submittal Procedures" for submittal procedure general requirements for commissioning process.

B. Commissioning Plan Information:

1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors performing the various commissioning requirements.
2. Schedule of commissioning activities, integrated with the Construction Schedule. Comply with requirements in Section 013200 "Construction Progress Documentation" for the Construction Schedule general requirements for commissioning process.
3. Contractor personnel and subcontractors participating in each test.
4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.

C. Commissioning schedule.

D. Two-week look-ahead schedules.

E. Commissioning Coordinator Letter of Authority:

1. Within 10 days after approval of Commissioning Coordinator qualifications, submit a letter of authority for Commissioning Coordinator, signed by a principal of Contractor's firm. Letter shall authorize Commissioning Coordinator to do the following:

a. Make inspections required for commissioning process.
b. Coordinate, schedule, and manage commissioning process of Contractor, subcontractors, and suppliers.
c. Obtain documentation required for commissioning process from Contractor, subcontractors, and suppliers.
d. Report issues, delayed resolution of issues, schedule conflicts, and lack of cooperation or expertise on the part of members of the commissioning team.

F. Commissioning Coordinator Qualification Data: For entity coordinating Contractor's commissioning activities to demonstrate their capabilities and experience.

1. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of [**five**] previous projects similar in nature, size, and extent to this Project; being familiar with special requirements

indicated; and having complied with requirements of authorities having jurisdiction.

G. List test instrumentation, equipment, and monitoring devices. Include the following information:

1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.
2. Brief description of intended use.
3. Calibration record showing the following:

a. Calibration agency, including name and contact information.
b. Last date of calibration.
c. Range of values for which calibration is valid.
d. Certification of accuracy.
e. Certification for calibration equipment traceable to NIST.
f. Due date of the next calibration.

H. Test Reports:

1. Pre-Startup Report: Prior to startup of equipment or a system, submit signed, completed construction checklists.
2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.
3. Commissioning Issue Reports: Daily, at the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.
4. Weekly Progress Report: Weekly, at the end of each week in which tests are conducted, submit a progress report.
5. Data Trend Logs: Submit data trend logs at the end of the trend log period.
6. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit printout of log of alarms that occurred since the last log was printed.

I. Construction Checklists:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

1.7 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction-Phase Commissioning Completion, include the following:

a. Pre-startup reports.
b. Approved test procedures.
c. Test data forms, completed and signed.
d. Progress reports.

e. Commissioning issue report log.
f. Commissioning issue reports showing resolution of issues.
g. Correspondence or other documents related to resolution of issues.
h. Other reports required by commissioning process.
i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction-Phase Commissioning Completion.
j. Report shall include commissioning work of Contractor.

B. Request for Certificate of Construction-Phase Commissioning Process Completion.

C. Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Commissioning Coordinator Qualifications:

1. Documented experience commissioning systems of similar complexity to those contained in these documents on at least [**three**] projects of similar scope and complexity.
2. Certification of commissioning-process expertise. The following certifications are acceptable. Owner reserves the right to accept or reject certifications as evidence of qualification.

a. Certified Commissioning Authority, by AABC Commissioning Group (ACG).
b. Commissioning-Process Management Professional, by American Society of Heating, Refrigerating and Air-Conditioning Engineers.
c. Certified Commissioning Professional, by Building Commissioning Association.
d. Accredited Commissioning-Process Authority Professional, by University of Wisconsin.
e. Accredited Commissioning-Process Manager, by University of Wisconsin.
f. Accredited Green Commissioning-Process Provider, by University of Wisconsin.

B. Calibration Agency Qualifications: Certified by The American Association for Laboratory Accreditation that the calibration agency complies with minimum requirements of ISO/IEC 17025.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Test equipment and instrumentation required to perform the commissioning process shall remain the property of Contractor unless otherwise indicated.

B. Test equipment and instrumentation required to perform commissioning process shall

comply with the following criteria:

1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.
2. Calibrated and certified.
    a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags shall be permanently affixed.
    b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.
3. Maintain test equipment and instrumentation.
4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.

1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

2.3 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Record report on compact disk.
2. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include a table of contents and an index to each test.
2. Include major tabs for each Specification Section.
3. Include minor tabs for each test.
4. Within each minor tab, include the following:

a. Test specification.
b. Pre-startup reports.
c. Approved test procedures.
d. Test data forms, completed and signed.
e. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

PART 3 - EXECUTION

3.1 PREPARATION

A. Review preliminary construction checklists and preliminary test procedures and data forms.

3.2 CONSTRUCTION CHECKLISTS

A. Construction checklists cannot modify or conflict with the Contract Documents.

B. Create construction checklists based on actual systems and equipment to be included in Project.

C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment if applicable.

1. Service connection requirements, including configuration, size, location, and other pertinent characteristics.
2. Included optional features.
3. Delivery Receipt Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness, and lack of damage.
4. Installation Checks:

a. Location according to Drawings and approved Shop Drawings.
b. Configuration.
c. Compliance with manufacturers' written installation instructions.
d. Attachment to structure.
e. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.
f. Utility connections are of the correct characteristics, as applicable.

g. Correct labeling and identification.
h. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.

D. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, at minimum.

E. Performance Tests:

1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests.
2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.
3. Equipment and Assembly Performance Tests: Test and evaluate performance of equipment and assemblies under a full range of operating conditions and loads.
4. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.
5. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.

F. Deferred Construction Checklists: Obtain Owner approval of proposed deferral of construction checklists, including proposed schedule of completion of each deferred construction checklist, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. When approved, deferred construction checklists may be completed after date of Construction-Phase Commissioning Completion. Include the following in a request for Certificate of Construction-Phase Commissioning Process Completion:

1. Identify deferred construction checklists by number and title.
2. Provide a target schedule for completion of deferred construction checklists.
3. Written approval of proposed deferred construction checklists, including approved schedule of completion of each deferred construction checklist.

G. Delayed Construction Checklists: Obtain Owner approval of proposed delayed construction checklists, including proposed schedule of completion of each delayed construction checklist, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. When approved, delayed construction checklists may be completed after date of Construction-Phase Commissioning Completion. Include the following in a request for Certificate of Construction-Phase Commissioning Process Completion:

1. Identify delayed construction checklist by construction checklist number and title.
2. Provide a target schedule for completion of delayed construction checklists.
3. Written approval of proposed delayed construction checklists, including approved schedule of completion of each delayed construction checklist.

3.3 GENERAL EXECUTION REQUIREMENTS

A. Schedule and coordinate commissioning process with the Construction Schedule.

B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.

C. Perform test demonstrations for Owner's witness. Unless otherwise indicated, demonstrate tests for 100 percent of work to which the test applies. In some instances, demonstration of a random sample of other than 100 percent of the results of a test is specified.

1. Where sampling is specified, the sampling plan and procedure for the test demonstration shall be determined using ASQ Z1.4.

a. General Inspection: [**Level III**].
b. Special Inspection: [**Level S-4**].
c. Acceptance Quality Limit (AQL) of [**1.5**].

2. The "lot size" in ASQ Z1.4 is the sum of the number of items to which the test demonstration applies, as described in the scope subparagraph of each test.
3. On determination of the sample size, the samples shall be selected randomly by Owner's witness at the time of the test demonstration.
4. Include in the Commissioning Plan a detailed list of the test demonstrations with lot and sample quantities for each test.

D. Report test data and commissioning issue resolutions.

E. Schedule personnel to participate in and perform Commissioning-Process Work.

F. Installing contractors' commissioning responsibilities include, but are not limited to, the following:

1. Operating the equipment and systems they install during tests.
2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

3.4 COMMISSIONING COORDINATOR RESPONSIBILITIES

A. Management and Coordination: Manage, schedule, and coordinate commissioning process, including, but not limited to, the following:

1. Coordinate with subcontractors on their commissioning responsibilities and activities.
2. Obtain, assemble, and submit commissioning documentation.

3. [**Conduct**] periodic on-site commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."
4. Develop and maintain the commissioning schedule. Integrate commissioning schedule into the Construction Schedule. Update Construction Schedule at specified intervals.
5. Review and comment on preliminary test procedures and data forms.
6. Report inconsistencies and issues in system operations.
7. Verify that tests have been completed and results comply with acceptance

criteria, and that equipment and systems are ready before scheduling test demonstrations.
8. Direct and coordinate test demonstrations.
9. Coordinate witnessing of test demonstrations by Owner's witness.
10. Coordinate and manage training. Be present during training sessions to direct video recording, present training, and direct the training presentations of others. Comply with requirements in Section 017900 "Demonstration and Training."
11. Prepare and submit specified commissioning reports.
12. Track commissioning issues until resolution and retesting is successfully completed.
13. Retain original records of Commissioning-Process Work, organized as required for the commissioning report. Provide Owner's representative access to these records on request.
14. Assemble and submit commissioning report.

3.5 COMMISSIONING TESTING

A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Contractor's quality-control process.

B. Owner's witness will be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Owner's project manager will coordinate attendance by Owner's witness with Contractor's published Commissioning Schedule. Owner's witness will provide no labor or materials in the commissioning work. The only function of Owner's witness will be to observe and comment on the progress and results of commissioning process.

C. Construction Checklists:

1. Complete construction checklists as Work is completed.
2. Distribute construction checklists to installing contractors before they start work.
3. Installers:

    a. Verify installation using approved construction checklists as Work proceeds.
    b. Complete and sign construction checklists [**weekly**] for work performed during the preceding [**week**].

4. Provide Commissioning Authority access to construction checklists.

D. Installation Compliance Issues: Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists. Record installation compliance issues on the construction checklist at the time they are identified. Record corrective action and how future Work should be modified before signing off the construction checklist.

E. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if

left uncorrected, adversely impact the ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.

F. Test Procedures and Test Data Forms:

1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.
2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.
3. Completed test data forms are the official records of the test results.
4. Commissioning Authority will provide to Contractor preliminary test procedures and test data forms for performance tests and commissioning tests after approval of Product Data, Shop Drawings, and preliminary operation and maintenance manual.
5. Review preliminary test procedures and test data forms, and provide comments within 14 days of receipt from Commissioning Authority. Review shall address the following:

    a. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.
    b. Applicability of the procedure to the specific software, equipment, and systems approved for installation.

6. After Contractor has reviewed and commented on the preliminary test procedures and test data forms, Commissioning Authority will revise and reissue the approved revised test procedures and test data forms marked "Approved for Testing."
7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.

G. Performance of Tests:

1. The sampling rate for tests is 100 percent. The sampling rate for test demonstrations is 100 percent unless otherwise indicated.
2. Perform and complete each step of the approved test procedures in the order listed.
3. Record data observed during performance of tests on approved data forms at the time of test performance and when the results are observed.
4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures and data forms according to the "Commissioning Compliance Issues" Paragraph in this Article.
5. On completion of a test, sign the completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.

H. Performance of Test Demonstration:

1. Perform test demonstrations on a sample of tests after test data submittals are approved. The sampling rate for test demonstrations shall be [**100**] percent unless otherwise indicated in the individual test specification.
2. Notify Owner's witness at least [**three days**] in advance of each test demonstration.
3. Perform and complete each step of the approved test procedures in the order listed.
4. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.
5. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration. On completion of a test demonstration, sign the completed data form and obtain signature of Owner's witness at the time of the test to authenticate the reported results.
6. Test demonstration data forms not signed by Contractor and Owner's witness at the time of the completion of the procedure will be rejected. Test demonstrations for which data forms are rejected shall be repeated and results shall be resubmitted.

    a. Exception for Failure of Owner's Witness to Attend: Failure of Owner's witness to be present for agreed-on schedule of test demonstration shall not delay Contractor. If Owner's witness fails to attend a scheduled test, Contractor shall proceed with the scheduled test. On completion, Contractor shall sign the data form for Contractor and for Owner's witness, and shall note the absence of Owner's witness at the scheduled time and place.

7. False load test requirements are specified in related sections.

    a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without Architect's written approval.

I. Deferred Tests:

1. Deferred Test List: Identify, in the request for Certificate of Construction-Phase Commissioning Process Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved, deferred tests may be completed after the date of Construction-Phase Commissioning Completion. Identify proposed deferred tests in the request for Certificate of Construction-Phase Commissioning Process Completion as follows:

    a. Identify deferred tests by number and title.
    b. Provide a target schedule for completion of deferred tests.

2. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify Architect and Commissioning Authority at least

[**three working days**] (minimum) in advance of tests.

3. Where deferred tests are specified, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

J. Delayed Tests:

1. Delayed Test List: Identify, in the request for Certificate of Construction-Phase Commissioning Process Completion, proposed delayed tests. Obtain Owner approval of proposed delayed tests, including proposed schedule of completion of each delayed test, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. Include the following in the request for Certificate of Construction-Phase Commissioning Process Completion:

    a. Identify delayed tests by test number and title.
    b. Written approval of proposed delayed tests, including approved schedule of completion of delayed tests.

2. Schedule and coordinate delayed tests. Schedule delayed tests when conditions that caused the delay have been rectified. Notify Architect and Commissioning Authority at least [**three working days**] (minimum) in advance of tests.
3. Where delayed tests are approved, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule delayed tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

K. Commissioning Compliance Issues:

1. Test results that are not within the range of acceptable results are commissioning compliance issues.
2. Track and report commissioning compliance issues until resolution and retesting are successfully completed.
3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Owner for billed costs for the participation in the repeated demonstration.
4. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:

    a. Complete a commissioning compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.
    b. Submit commissioning compliance issue report form within [**24 hours**] of the test.
    c. Determine the cause of the failure.
    d. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.

5. Commissioning Compliance Issue Report: Provide a commissioning compliance issue report for each issue. Do not report multiple issues on the same

commissioning compliance issue report.

a. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning compliance issue report. (For example, if all return-air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning issue report. If a single commissioning issue report is used for multiple commissioning compliance issues, each device shall be identified in the report, and the total number of devices at issue shall be identified.
b. Complete and submit Part 1 of the commissioning compliance issue report immediately when the condition is observed.
c. Record the commissioning compliance issue report number and describe the deficient condition on the data form.
d. Resolve commissioning compliance issues promptly. Complete and submit Part 2 of the commissioning compliance issue report when issues are resolved.

6. Diagnose and correct failed test demonstrations as follows:

a. Perform diagnostic tests and activities required to determine the fundamental cause of issues observed.
b. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.
c. Record the results of each step of the diagnostic procedure.
d. Record the conclusion of the diagnostic procedure on the fundamental cause of the issue.
e. Determine and record corrective measures.
f. Include diagnosis of fundamental cause of issues in commissioning compliance issue report.

7. Retest:

a. Schedule and repeat the complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of Owner's witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Contractor's responsibility, compensate Owner for direct costs incurred as the result of repeated test demonstrations to achieve acceptable results.
b. For each repeated test demonstration, submit a new test data form, marked "Retest."

8. Do not correct commissioning compliance issues during test demonstrations.

a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than [**five**]<**Insert number**> minutes. If corrections are made under this exception, note the deficient conditions on the test data form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution

has been completed.

3.6 COMMISSIONING MEETINGS

A. [**Schedule and conduct**] commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."

3.7 SEQUENCING

A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:

1. Construction Checklists:

a. Material checks.
b. Installation checks.
c. Startup, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which the startup depends.
d. Performance Tests:

1) Static tests, as appropriate.
2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.
3) Equipment and assembly performance tests.
4) System performance tests.
5) Intersystem performance tests.

2. Commissioning tests.

B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.

C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Architect if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.

D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

3.8 SCHEDULING

A. Commence commissioning process as early in the construction period as possible.

B. Commissioning Schedule: Integrate commissioning activities into Construction Schedule. See Section 013200 "Construction Progress Documentation."

1. Include detailed commissioning activities in monthly updated Construction Schedule and short-interval schedule submittals.
2. Schedule the start date and duration for the following commissioning activities:

    a. Submittals.
    b. Preliminary operation and maintenance manual submittals.
    c. Installation checks.
    d. Startup, where required.
    e. Performance tests.
    f. Performance test demonstrations.
    g. Commissioning tests.
    h. Commissioning test demonstrations.

3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.
4. Determine milestones and prerequisites for commissioning process. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short-interval schedule submittals.

C. Two-Week Look-Ahead Commissioning Schedule:

1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning process.
2. Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.
3. Use two-week look-ahead schedules to notify and coordinate participation of Owner's witnesses.

D. Owner's Witness Coordination:

1. Coordinate Owner's witness participation via Architect.
2. Notify Architect of commissioning schedule changes at least [**two**] work days in advance for activities requiring the participation of Owner's witness.

3.9 COMMISSIONING REPORTS

A. Test Reports:

1. Pre-startup reports include observations of the conditions of installation, organized into the following sections:

    a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.
    b. Preinstallation Physical Condition Checks: Observe physical condition of

equipment prior to installation. Note conditions including, but not limited to, physical damage, corrosion, water damage, or other contamination or dirt.

c. Preinstallation Component Verification Checks: Verify components supplied with the equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.
d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and the corrective actions for each. Verify that issues noted have been corrected.
e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to Owner completion of equipment model verification, preinstallation physical condition checks, preinstallation component verification checks, and completion of corrective actions for installation compliance issues.

2. Test data reports include the following:

a. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.
b. Data and observations, including, but not limited to, data trend logs, recorded during the tests.
c. Signatures of individuals performing and witnessing tests.
d. Data trend logs accumulated overnight from the previous day of testing.

3. Commissioning Compliance Issue Reports: Report as commissioning compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Use sequentially numbered facsimiles of commissioning compliance issue report form included in this Section, or other form approved by Owner. Distribute commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:

a. Commissioning compliance issue report number. Assign unique, sequential numbers to individual commissioning compliance issue reports when they are created, to be used for tracking.
b. Action distribution list.
c. Report date.
d. Test number and description.
e. Equipment identification and location.
f. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.
g. Diagnostic procedure or plan to determine the cause (include in initial submittal)
h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).
i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.

j. When issues have been resolved, update and resubmit the commissioning issue report forms by completing Part 2. Identify resolution taken and the dates and initials of the persons making the entries.
k. Schedule for retesting.

4. Weekly progress reports include information for tests conducted since the preceding report and the following:

a. Completed data forms.
b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.
c. Activities scheduled but not conducted per schedule.
d. Commissioning compliance issue report log.
e. Schedule changes for remaining Commissioning-Process Work, if any.

5. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.

a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.
b. Attach to the data form printed trend log data collected during the test or test demonstration.
c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.

6. System Alarm Logs: Record and print out a log of alarms that occurred since the last log was printed. Evaluate alarms to determine if the previous day's work resulted in any conditions that are not considered "normal operation."

a. Conditions that are not considered "normal operation" shall be reported on a commissioning issue report attached to the alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

3.10 CERTIFICATE OF CONSTRUCTION-PHASE COMMISSIONING PROCESS COMPLETION

A. When Contractor considers that construction-phase commissioning process, or a portion thereof which Owner agrees to accept separately, is complete, Contractor shall

prepare and submit to Owner and Commissioning Authority through Architect a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to compete commissioning process.

B. On receipt of Contractor's list, Commissioning Authority will make an inspection to determine whether the construction-phase commissioning process or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether included on Contractor's list, which is not sufficiently complete as defined in "Construction-Phase Commissioning Process Completion" Paragraph in the "Definitions" Article, Contractor shall, before issuance of the Certificate of Construction-Phase Commissioning Process Completion, complete or correct such items on notification by Commissioning Authority. In such case, Contractor shall then submit a request for another inspection by Commissioning Authority to determine construction-phase commissioning process completion.

C. Contractor shall promptly correct deficient conditions and issues discovered during commissioning process. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Architect's and Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.

D. When construction-phase commissioning process or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction-Phase Commissioning Process Completion that shall establish the date of completion of construction-phase commissioning process. Certificate of Construction-Phase Commissioning Process Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION 019113

SECTION 042613 – MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brick.
2. Ties and anchors.
3. Embedded flashing.
4. Accessories.
5. Mortar mixes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type and color of brick and colored mortar.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product.

1.4 MOCKUPS

A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.

1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches long by 36 inches high by full thickness.

1.5 FIELD CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects will be exposed in the completed Work.

2.2 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units.

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C216 or hollow brick complying with ASTM C652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area), Grade SW, Type FBS.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Acme Brick Company.
b. Belden Brick Company (The).
c. Boral Bricks, Inc; Boral Limited.
d. Endicott Clay Products Co.
e. General Shale, Inc.
f. Glen-Gery Corporation.

2. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested in accordance with ASTM C67/C67M.
3. Efflorescence: Provide brick that has been tested in accordance with ASTM C67/C67M and is rated "not effloresced."
4. Surface Coating: Brick with colors or textures produced by application of coatings withstand 50 cycles of freezing and thawing in accordance with ASTM C67/C67M with no observable difference in the applied finish when viewed from 10 ft. or have a history of successful use in Project's area.
5. Size (Actual Dimensions): 3-5/8 inches wide by 1-5/8 inches high by 11-5/8 inches long.
6. Color and Texture: As selected by Architect.

7. Basis of Design: Furnish brick equal to Durango Smooth Roman size brick by The Belden Brick Company.

2.3 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Preblended Dry Mortar Mix: Packaged blend made from portland cement and hydrated lime, sand, water repellents, and admixtures and complying with ASTM C1714/C1714M.

1. Preblended Dry Portland Cement Mortar Mix:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Amerimix.
2) QUIKRETE.
3) SAKRETE of North America LLC.
4) Spec Mix, LLC.

E. Aggregate for Mortar: ASTM C144.

1. White-Mortar Aggregates: Natural white sand or crushed white stone.
2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Euclid Chemical Company (The); an RPM company.
b. GCP Applied Technologies Inc.

G. Water: Potable.

2.4 TIES AND ANCHORS

A. General: Ties and anchors extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M, with ASTM A153/A153M, Class B-2 coating.
2. Masonry-Veneer Anchors; Single-Barrel Screw: Self-drilling, single-barrel screw designed to receive wire tie. Screw has a smooth barrel the same thickness as insulation with factory-installed gasketed washer to seal at face of insulation and sheathing and a coating to reduce thermal conductivity.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Heckmann Building Products, Inc.
2) Hohmann & Barnard, Inc.
3) Rodenhouse Inc.
4) Wire-Bond.

3. Masonry-Veneer Anchors; Single-Barrel Screw with Double-Pintle Wingnut: Self-drilling, single-barrel screw with thermally-resistant wingnut head designed to receive double-pintle wire tie. Screw has a smooth barrel the same thickness as insulation with factory-installed gasketed washer to seal at face of insulation and sheathing and a coating to reduce thermal conductivity.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Heckmann Building Products, Inc.
2) Hohmann & Barnard, Inc.

2.5 EMBEDDED FLASHING

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016-inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4-inch and down into joint 1/4-inch to form a stop for retaining sealant backer rod.

B. Flexible Flashing: Use the following unless otherwise indicated:

1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Hohmann & Barnard, Inc.
2) Hyload, Inc.
3) Mortar Net Solutions.
4) Wire-Bond.

b. Monolithic Sheet: Elastomeric thermoplastic flashing, 40 mil thick.
c. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 25 mil thick, with a 15-mil-thick coating of adhesive.

1) Color: White.

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

D. Termination Bars for Flexible Flashing, Flanged: Stainless-steel sheet 0.019-inch by 1-1/2 inches with a 3/8-inch flange at top and bottom.

2.6 ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.

B. Weep/Vent Products: Use 1 of the following unless otherwise indicated:

1. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8- by 1-1/2 by 3-1/2 inches long.
2. Cellular Plastic Weep/Vent: 1-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8-inch less than depth of outer wythe, in color selected from manufacturer's standard.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Advanced Building Products Inc.
2) Heckmann Building Products, Inc.
3) Hohmann & Barnard, Inc.
4) Mortar Net Solutions.
5) Wire-Bond.

C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Mortar Deflector: Strips, 1 inch and 10 inches high, with dovetail-shaped notches that prevent clogging with mortar droppings.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Advanced Building Products Inc.
2) Hohmann & Barnard, Inc.
3) Keene Building Products.
4) Mortar Net Solutions.
5) Wire-Bond.
6) York Manufacturing, Inc.

2.7 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Use Type N unless another type is indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested in accordance with ASTM C67/C67M. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2-inch or minus 1/4-inch.
2. For location of elements in Plan, do not vary from that indicated by more than plus or minus 1/2-inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4-inch in a story height or 1/2-inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4-inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8-inch in 10 feet, 1/4-inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4-inch in 10 feet, 3/8-inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8-inch in 10 feet, 1/4-inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4-inch in 10 feet, 3/8-inch in 20 feet, or 1/2-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8-inch, with a maximum thickness limited to 1/2-inch.
2. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8-inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8-inch.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.5 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use 2 fasteners unless anchor design only uses 1 fastener.
2. Embed tie sections in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.
5. Space anchors as indicated, but not more than 16 inches o.c. vertically and 25 inches o.c. horizontally, with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

B. Provide not less than 2 inches of airspace between back of masonry veneer and face of insulation.

3.6 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with

mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

2. Extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under water-resistive barrier, lapping at least 4 inches.
3. At lintels and shelf angles, extend flashing 6 inches minimum, to edge of next full unit at each end. At heads and sills, extend flashing 6 inches minimum, to edge of next full unit and turn ends up not less than 2 inches to form end dams.
4. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2-inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.

C. Install weep holes in veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products to form weep holes.
2. Space weep holes 24 inches o.c. unless otherwise indicated.

D. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Accessories" Article.

E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements will be at Contractor's expense.

B. Inspections: Special inspections in accordance with Level 2 in TMS 402.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

C. Testing Prior to Construction: 1 set of tests.

D. Clay Masonry Unit Test: For each type of unit provided, in accordance with ASTM C67/C67M for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.

3.8 CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.9 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042613

SECTION 083113.53 - SECURITY ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes security access doors and frames for walls and ceilings.

B. Related Requirements:

1. Section 083113 "Access Doors and Frames" for access doors and frames for nonsecurity applications.

~~1.3 ALLOWANCES~~

~~A. Security access doors and frames are part of a security access door and frame allowance.~~

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details materials, individual components and profiles, and finishes.

B. Samples: For each type of security access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches (150 by 150 mm) in size.

C. Product Schedule: For security access doors and frames.

PART 2 - PRODUCTS

2.1 SECURITY ACCESS DOORS AND FRAMES

A. Medium-Security Flush Access Doors with Exposed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Acudor Products, Inc.
    b. Babcock-Davis.
    c. JL Industries, Inc.; a division of the Activar Construction Products Group.
    d. Larsens Manufacturing Company.

2. Locations: Ceiling.
3. Door Size: Refer to Plan
4. Uncoated Steel Sheet for Door: Nominal 0.105 inch (2.66 mm), 12 gage; factory primed.
5. Metallic-Coated Steel Sheet for Door: Nominal 0.108 inch (2.74 mm), 12 gage; factory primed.
6. Stainless-Steel Sheet for Door: Nominal 0.109 inch (2.78 mm), 12 gage; No. 4 finish.
7. Frame Material: Same material, thickness, and finish as door.
8. Hinges: Manufacturer's standard security hinge.
9. Latch and Lock: Cam latch, hex-head wrench operated.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, [Type 304] [Type 316]. Remove tool and die marks and stretch lines, or blend into finish.

E. Frame Anchors: Same type as door face.

F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

D. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.
3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Factory-Primed Finish: Apply manufacturer's standard lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

E. Stainless-Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.

a. Run grain of directional finishes with long dimension of each piece.
b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

3. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113.53

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes access doors and frames for walls and ceilings.

B. Related Requirements:

1. Section 077200 "Roof Accessories" for roof hatches.
2. Section 083113.53 "Security Access Doors and Frames" for access doors and frames for security applications.
3. Section 083483 "Floor Doors" for doors installed in floors.
4. Section 233300 "Air Duct Accessories" for heating and air-conditioning duct access doors.

~~1.3 ALLOWANCES~~

~~A. Access doors and frames are part of an access door and frame allowance.~~

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches (150 by 150 mm) in size.

C. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection and temperature-rise limit ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Concealed Flanges:

1. Manufacturer:

a. Bauco Access Panel Solutions, Inc. (Bauco Plus II)

2. Description: Door face flush with infill and finish to match adjacent finish; with concealed flange for gypsum board installation and concealed hinge.
3. Locations: Wall and ceiling.
4. Door Size: Per drawing.
5. Gypsum Board panel per manufacturer for Door.
6. Latch and Lock: Cam latch, screwdriver operated or Cam latch, key operated as noted.

B. Aluminum Flush Access Doors, on the walls where access doors are required/called-out in tile walls.

1. Manufacturers:

a. Babcock - Davis
b. Or approved equal

2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
3. Locations: Wall.
4. Door Size: As indicated on drawings.
5. Aluminum Sheet for Door: Nominal 0.045 inch (1.15 mm), with clear anodized mill finish.
6. Frame Material: [Same material, thickness, and finish as door] <Insert material, thickness, and finish>.
7. Latch and Lock: Cam latch, screwdriver operated or Cam latch, key operated.

C. Exterior Flush Access Doors, as indicated on the drawings:

1. Manufacturers:

a. Babcock - Davis
b. Or approved equal

2. Description: Weatherproof assembly, with face of door fit flush with frame and with exposed frame. Include extruded door gaskets and minimum 2-inch-thick (50-mm-thick) fiberglass insulation.
3. Locations: [Wall] <Insert location or substrate>.
4. Door Size: As indicated on drawings.
5. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch (1.63 mm), 16 gauge, factory finished to match adjacent wall finish.
6. Frame Material: Same material, thickness, and finish as door.
7. Latch and Lock: Cam latch operated by handle, with keyed lock in handle.

2.3 FIRE-RATED ACCESS DOORS AND FRAMES

A. Fire-Rated, Flush Access Doors with Concealed Flanges <Insert drawing designation>:

1. Manufacturers:

   a. Babcock - Davis
   b. Or approved equal

2. Description: Door face flush with frame, [with a core of mineral-fiber insulation enclosed in sheet metal] [uninsulated]; with concealed flange for [gypsum board] [plaster] installation, self-closing door, and concealed hinge.
3. Locations: [Wall] [Ceiling] [Wall and ceiling] <Insert location or substrate>.
4. Door Size: As indicated on drawings.
5. Fire-Resistance Rating: Not less than that indicated.
6. Temperature-Rise Rating: 450 deg. F (250 deg. C) at the end of 30 minutes.
7. Uncoated Steel Sheet for Door: Nominal 0.036 inch (0.91 mm), 16 gauge, factory primed. Finish in field to match adjacent finish.
8. Frame Material: Same material, thickness, and finish as door.
9. Latch and Lock: Self-closing, self-latching door hardware, operated by key.

2.4 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316. Remove tool and die marks and stretch lines, or blend into finish.

E. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063.

F. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

G. Frame Anchors: Same material as door face.

H. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.5 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded-metal lath and exposed casing bead welded to perimeter of frames.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling. Provide access sleeves for each latch operator and install in holes cut through finish.

1. For recessed doors with plaster infill, provide self-furring expanded-metal lath attached to door panel.

E. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.
3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

F. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.

a. Color: Match Architect's sample.

E. Stainless-Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.

a. Run grain of directional finishes with long dimension of each piece.
b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

3. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

SECTION 084413 – GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aluminum-framed curtain wall, with vision glazing and glass infill panels.

1.2 RELATED REQUIREMENTS

A. Section 051200 "Structural Steel Framing" for steel attachment members.

B. Section 055000 "Metal Fabrications" for steel attachment devices.

C. Section 079200 "Joint Sealants" for sealing joints between frames and adjacent construction.

D. Section 088000 "Glazing."

1.3 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

C. AAMA 501.4 - Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts; 2009.

D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

E. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2013.

F. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

H. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

I. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

K. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

L. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2015a.

M. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting 1 week before starting Work of this Section; require attendance by all affected installers.

1.5 SUBMITTALS

A. See Section 013300 "Submittal Procedures" for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit 2 samples, 2 by 4 inches in size illustrating finished aluminum surface, glazing, infill panels, and glazing materials.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.

G. Field Quality Control Submittals: Report of field testing for water leakage.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with not less than 3 years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least 3 years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this Section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.8 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.9 WARRANTY

A. See Section 017700 "Closeout Submittals" for additional warranty requirements.

B. Correct defective Work within a 5-year period after date of Substantial Completion.

C. Provide 5-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide 10-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Kawneer.

B. OldCastle Building Envelope.

C. Tubelite USA.

2.2 CURTAIN WALL

A. Aluminum-Framed Curtain Wall: Factory-fabricated, factory-finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

1. Inside glazed, with pressure plate and mullion cover, where indicated on Drawings.
2. Fabrication Method: Either shop/factory or field fabricated system.
3. Glazing Method: Either shop/factory or field glazed system.
4. Vertical Mullion Dimensions: As indicated on the Drawings.
5. Finish: Black Anodized, Class I finish.

    a. Factory finish surfaces that will be exposed in completed assemblies.
    b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
    c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

6. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
7. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
8. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.

1. Design Wind Loads: Comply with the requirements of ASCE 7.

    a. Member Deflection: For spans less than 13 feet 6 inches, limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4-inch, whichever is less and with full recovery of glazing materials.
    b. Member Deflection: For spans over 13 feet 6 inches and less than 40 feet, limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4-inch, with full recovery of glazing materials.

2. Seismic Loads: Design and size components to withstand seismic loads and sway displacement in accordance with requirements of ASCE 7.
3. Interstory Differential Lateral Movement: Meeting pass/fail criteria of AAMA 501.4 for Use Group I, Standard Occupancy, when tested at design displacement of 0.010 times greater adjacent story height, maximum, and 1.5 times design displacement, through 3 complete cycles.
4. Movement: Accommodate the following movement without damage to components or deterioration of seals:

    a. Expansion and contraction caused by 180 degrees F surface temperature.

b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12-hour period.
c. Movement of curtain wall relative to perimeter framing.
d. Deflection of structural support framing, under permanent and dynamic loads.

C. Water Penetration Resistance: No uncontrolled water on indoor face when tested as follows:

1. Test Pressure Differential: 10 psf.
2. Test Method: ASTM E331.

D. Air Leakage: Maximum of 0.06-cu. ft./min. sq. ft. of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.

E. Thermal Performance Requirements:

1. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.

2.3 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.

B. Glazing: As specified in Section 088000 "Glazing."

2.4 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Structural Steel Sections: ASTM A36/A36M; shop primed.

D. Structural Supporting Anchors: See Section 051200.

E. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.

F. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.

G. Exposed Flashings: Aluminum sheet, 20 gage, 0.032-inch-minimum thickness; finish to match framing members.

H. Weatherseal Sealant: Silicone, with adhesion in compliance with ASTM C794; compatible with glazing accessories.

I. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, and compatible with flashing material.

J. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

K. Glazing Accessories: As specified in Section 088000.

L. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

2.5 FINISHES

A. Black Anodized Finish: AA-M10C21A44, Class I, 0.7 mils minimum.

B. Color: Black, unless otherwise indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other related Work.

B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive Work of this Section.

C. Verify that anchorage devices have been properly installed and located.

3.2 INSTALLATION

A. Install curtain wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

H. Pressure Plate Framing: Install glazing in accordance with Section 088000, using glazing method required to achieve performance criteria.

I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06-inch every 3 feet non-cumulative, or 0.5-inch per 100 feet, whichever is less.

B. Maximum Misalignment of 2 Adjoining Members Abutting in Plane: 1/32-inch.

C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4-inch and minimum of 1/4-inch.

3.4 FIELD QUALITY CONTROL

A. Provide services of manufacturer's field representative to observe installation and submit report.

B. See Section 014000 "Quality Requirements" for general testing and inspection requirements.

C. Test installed curtain wall for water leakage in accordance with AAMA 501.2.

D. Replace curtain wall components that have failed field testing, and retest until performance is satisfactory.

3.5 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

3.6 PROTECTION

A. Protect installed products from damage until date of Substantial Completion.

END OF SECTION 084413

SECTION 09 84 00 - SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Acoustic Suspended Ceiling and Wall Panels.

B. Acoustic Wall Panels

1.02 RELATED SECTIONS

A. Section 05 31 00 - Steel Decking: for products being suspended from steel decking

B. Section 09 26 00 - Gypsum Board Assemblies: for products attaching to or coordinating with gypsum
C. Section 09 51 10 - Suspended Acoustical Ceilings: for grid supported ceilings
D. Section 09 90 00 - Paints and Coatings: for understanding and coordinating the finish of adjacent or coordinated surfaces
E. Section 23 00 00 – Heating, Ventilating, and Air Conditioning: for products being coordinated around ducts or air diffusers
F. Section 26 51 00 – Interior Lighting: for products integrating with or impact the lighting system

1.03 REFERENCES

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2009a.
B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
C. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2016.
D. CAN/ULC-S102.2 – Standard Method of Test for Surface Burning Characteristics; 2018.

1.04 SUBMITTALS

A. General: Submit manufacturer’s documentation for each type of product under provisions of Section 01 30 30 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, panel layout.

D. Selection Samples: Manufacturer's color charts for applicable material, indicating full range of material, colors, and patterns available.

E. Verification Samples: Fabricated samples of each type of product specified; 6” minimum length and width, showing construction, edge details.

F. Maintenance Materials: Furnish maintenance information and recommendations for Owners use.

1.05 QUALITY ASSURANCE

A. Source Limitations: All similar products to be obtained from a single manufacturer through one source providing a comprehensive material and installation package.

B. Installer Qualifications: Utilization of an installer with demonstrated experience and quality in projects of similar size and complexity.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation. Ensure all supplied hardware, material, and components are maintained until product is fully installed.

B. Store units flat, in dry, well-ventilated space; do not stand on end.

C. Protect edges from damage.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install materials until spaces are enclosed from the exterior environment, wet work in spaces is complete and dry, and HVAC system is maintaining an ambient temperature at occupancy levels during the remainder of the construction period.

B. Field Measurements: Installer to verify field measurements and dimensions as indicated in the Shop Drawings.

1. Coordinate location of other product and trades with product layout.

C. Ensure that Design Submittal signoffs and other required information are supplied in time to prevent interruption of construction process. Ensure that products of this section are supplied to affected trades in time to prevent interruptions.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturer: Turf Design: Located at 41 Prairie Pkwy, Gilberts, IL 60136; Phone: 844.TURF.OMG (844.887.3664); Email: hello@turf.design; Web: www.turf.design

B. Substitutions: Not permitted.

2.02 ACOUSTIC SUSPENDED CEILING AND WALL PANELS

A. Basis of Design:

1. Turf Design; Product: ‘Linear Panel’ ‘Linear’ https://turf.design/

B. Material Minimum Performance Attributes:

1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2. UL Tested ASTM E-84: Class A

3. Noise Reduction Coefficient (NRC):

a. ASTM E795: E400 Mounting (Ceiling with 400MM Plenum) - Each unit consisted of four (4) panels installed without gaps. Each panel measured 24”x 48”. The specimen consisted of four full units arranged in a continuous array.

1. Typical panel type L6: apparent NRC > 1.00 or greater.
2. Typical panel type L5: apparent NRC > 1.00 or greater.
3. Typical panel type L4: apparent NRC > .95 or greater.
4. Typical panel type L3: apparent NRC > .95or greater.

b. ASTM E795: F-13 Mounting (Wall – 13MM Standoff) - Each assembly consisted of four (4) panels installed without gaps. Each panel measured 24”x 120”. The specimen consisted of four full units arranged in a continuous array.

1. Typical panel type L6: apparent NRC > .8 or greater.
2. Typical panel type L5: apparent NRC > .85 or greater.
3. Typical panel type L4: apparent NRC > .85 or greater.
4. Typical panel type L3: apparent NRC > .8 or greater.

4. VOC: ASTM D5116 compliant

C. Product Attributes:

1. Panel Size: As indicated by manufacturer and per Architects approval.

2. Panel Thickness: As indicated by manufacturer and per Architects approval.

3. Edges: Exposed felt, machined edge.

4. Corners: Square, exposed felt, machined edge.

5. Material: Polyester (PET) felt, 60% pre-consumer recycled.

6. Color: As selected by Architect from manufacturer's full range.

7. Patterns: As selected by Architect from manufacturer's full range.

8. Mounting Method: Direct connection to 15/16” flat t-grid installed at 24” on center unless noted otherwise by manufacturer.

2.03 ACOUSTIC WALL PANELS

A. Basis of Design:

1. Turf Design; Product: ‘Wall Tile’ ‘Slat Wall Panel’ https://turf.design/

B. Material Minimum Performance Attributes:

1. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2. UL Tested ASTM E-84: Class A

3. Noise Reduction Coefficient (NRC):

a. Tested in accordance with ASTM C423 for Type A mounting (Direct to Wall), per ASTM E795.

1. Standard Slat Panel 8-1.5-1: Average NRC > 0.55
2. Standard Slat Panel 6-2-1.5: Average NRC > 0.55
3. Standard Slat Panel 4-3-2: Average NRC > 0.55
4. Standard Slat Panel 3-4-2: Average NRC > 0.50
5. Standard Slat Panel 4-3-2.5: Average NRC > 0.60
6. Standard Slat Panel 3-4-3: Average NRC > 0.55

C. Product Attributes:

1. Panel Size: 12” W x 120” L x .75” D

2. Edges: Exposed felt, machined edge.

3. Corners: Square, exposed felt, machined edge.

4. Material: Polyester (PET) felt, 60% pre-consumer recycled

5. Color: As selected by Architect from manufacturer's full range.

6. Patterns: As selected by Architect from manufacturer's full range and outlined in Cutsheet

7. Mounting Method:

    a. Z-Clip

    b. Construction Adhesive

2.04 FABRICATION

A. Acoustic Suspended Ceiling and Wall Panels: CNC fabricate panels to sizes, configurations, and patterns on PET felt assembly (9mm PET felt board with folded edge construction). Integrated support and mounting hardware factory installed.

B. Acoustic Wall Panels: CNC fabricate panels to sizes, configurations and patterns on 9 mm, 12 mm (9 mm laminated with 3 mm top), or 18 mm felt (9 mm laminated with 9 mm).

C. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and square-ness from corner to corner.

2.05 ACCESSORIES

A. Ceiling-Suspended Accessories:

1. Contractor to provide and install supporting components as required for installation. Refer to installation drawings (provided upon production kickoff) for hardware details, locations, and inclusions.

    a. Suspend product at elevations indicated by the Architects drawings.

2. Contractor to select and provide all anchors to building for mounting based on site requirements, conditions, and as appropriate for application.

3. Optional factory installed end caps for Linear Panels. Provided by request only, additional pricing may apply.

B. Wall Mounting Accessories: Manufacturer's standard accessories at locations indicated on each acoustical unit, sized appropriately for weight of acoustical unit.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected. Notify manufacturer immediately of any damage.

3.02 INSTALLATION

A. Install acoustical units in locations indicated, following manufacturer's installation instructions and in accordance with local jurisdiction authorities.

B. Align panels accurately, with edges plumb and top edges level.

C. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:

1. Plumb and level.
2. Flatness.
3. Width of joints.

D. This product cannot be field trimmed unless noted otherwise.

E. Acoustic Wall Panels:

1. Wall surface to be smooth, cleaned, and dry prior to installation of adhesive tile product.
2. Directly adhere to tile to wall surface with factory applied adhesive or installer applied construction adhesive non adhesive tiles.
3. Align panels accurately, with edges plumb and edges level. Scribe to fit accurately at adjoining work and penetrations.

3.03 CLEANING

A. Clean felt facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

B. Vacuum occasionally to remove any particulate matter and air-borne debris or dust. Compressed air can be used to dust the material in difficult to reach areas or for large assemblies.

3.04 PROTECTION

A. Provide protection of installed acoustical panels until completion of the work.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 142123.16 – MACHINE ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Machine-room-less electric traction elevators.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include Product Data for car enclosures, hoistway entrances, and operation, control, and signal systems.

B. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
2. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

C. Samples: For each type of exposed finish involving color selection.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.

B. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway and pit layout and dimensions, as indicated on Drawings, and electrical service including standby power generator, as shown and specified, are adequate for elevator system being provided.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard 1-year maintenance agreement, starting on date initial maintenance service is concluded.

1.5 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements provide products by the following or approved equal:

1. Schindler Elevator Corp.; Model 3300 XL (E001 and E002) and Model 3300 (E003).

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with requirements for accessible elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

2.3 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components are to be used, as included in standard elevator systems and as required for complete system.

B. Elevator E001: Model 3300 XL Hospital Service:

1. Rated Load: 5,000 pounds.
2. Rated Speed: 150 fps.
3. Travel: 18'-0".
4. Landings: 2
5. Front Openings: 2
6. Rear Openings: 1
7. Front Door Hand: Right
8. Rear Door Hand: Left
9. Interior Shaft Dimensions (Clear): 7'-6" width by 10'-8-3/4" depth, minimum.
10. Operation System: Selective-collective automatic operation.
11. Auxiliary Operations:

a. Battery-powered automatic evacuation.
b. Automatic dispatching of loaded car.
c. Nuisance-call cancel.
d. Loaded-car bypass.

e. Distributed parking.
f. Off-peak operation.
g. Automatic operation of lights and ventilation fans.

12. Security Features: Card reader.

a. Card reader notifies security of access request.
b. Image of the badge owner is displayed on security officer's screen.
c. Security to release door once badge identity is verified.

13. Car Enclosure:

a. Size: 5'-4-1/4" width by 8'-8-5/16" depth by 7'-9" height
b. Wall Panels: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
c. Reveals: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
d. Door Faces (Interior): Satin stainless steel, ASTM A480/A480M, No. 4 finish.
e. Door Sills: Aluminum.
f. Ceiling: Satin stainless steel, ASTM A480/A480M, No. 4 finish with 3 LED downlights on each side of car.
g. Handrails: 1/2- by 2-inch rectangular satin stainless steel, sides and rear of car.
h. Floor prepared to receive flooring as scheduled.

14. Hoistway Entrances:

a. Size: Two-speed side opening, 4'-0" wide by 7'-0" high doors.
b. Frames at All Floors: Stainless steel.
c. Doors at All Floors: Stainless steel.
d. Sills at All Floors: Aluminum.

15. Hall Fixtures at All Floors: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
16. Additional Requirements:

a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, ASTM A480/A480M, No. 4 finish.
b. Provide hooks for protective pads, 2 complete sets of full-height protective pads for elevator.

17. Power Supply: 480 volts, 3-phase, 60 Hz.

C. Elevator E002: Model 3300 XL Hospital Service:

1. Rated Load: 5,000 pounds.
2. Rated Speed: 150 fps.
3. Travel: 18'-0".
4. Landings: 26
5. Front Openings: 27
6. Rear Openings: 18
7. Front Door Hand: Left
8. Rear Door Hand: Right
9. Interior Shaft Dimensions (Clear): 7'-6" width by 10'-8-3/4" depth, minimum.

10. Operation System: Selective-collective automatic operation.
11. Auxiliary Operations:

    a. Battery-powered automatic evacuation.
    b. Automatic dispatching of loaded car.
    c. Nuisance-call cancel.
    d. Loaded-car bypass.
    e. Distributed parking.
    f. Off-peak operation.
    g. Automatic operation of lights and ventilation fans.

12. Security Features: Card reader.

    a. Card reader notifies security of access request.
    b. Image of the badge owner is displayed on security officer's screen.
    c. Security to release door once badge identity is verified.

13. Car Enclosure:

    a. Size: 5'-4-1/4" width by 8'-8-5/16" depth by 7'-9" height
    b. Wall Panels: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
    c. Reveals: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
    d. Door Faces (Interior): Satin stainless steel, ASTM A480/A480M, No. 4 finish.
    e. Door Sills: Aluminum.
    f. Ceiling: Satin stainless steel, ASTM A480/A480M, No. 4 finish with 3 LED downlights on each side of car.
    g. Handrails: 1/2- by 2-inch rectangular satin stainless steel, sides and rear of car.
    h. Floor prepared to receive flooring as scheduled.

14. Hoistway Entrances:

    a. Size: Two-speed side opening, 4'-0" wide by 7'-0" high doors.
    b. Frames at All Floors: Stainless steel.
    c. Doors at All Floors: Stainless steel.
    d. Sills at All Floors: Aluminum.

15. Hall Fixtures at All Floors: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
16. Additional Requirements:

    a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, ASTM A480/A480M, No. 4 finish.
    b. Provide hooks for protective pads, 2 complete sets of full-height protective pads for elevator.

17. Power Supply: 480 volts, 3-phase, 60 Hz.

D. Elevator E003: Model 3300 General Purpose Passenger:

1. Rated Load: 3,000 pounds.
2. Rated Speed: 150 fps.

3. Travel: 18'-0".
4. Landings: 26
5. Front Openings: 27
6. Rear Openings: 0
7. Front Door Hand: Right
8. Rear Door Hand: N/A
9. Interior Shaft Dimensions (Clear): 8'-6" width by 6'-3" depth, minimum.
10. Operation System: Selective-collective automatic operation.
11. Auxiliary Operations:

    a. Battery-powered automatic evacuation.
    b. Automatic dispatching of loaded car.
    c. Nuisance-call cancel.
    d. Loaded-car bypass.
    e. Distributed parking.
    f. Off-peak operation.
    g. Automatic operation of lights and ventilation fans.

12. Security Features: Card reader.

    a. Card reader notifies security of access request.
    b. Image of the badge owner is displayed on security officer's screen.
    c. Security to release door once badge identity is verified.

13. Car Enclosure:

    a. Size: 6'-9-15/16" width by 4'-10-7/8" depth by 7'-9" height.
    b. Wall Panels: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
    c. Reveals: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
    d. Door Faces (Interior): Satin stainless steel, ASTM A480/A480M, No. 4 finish.
    e. Door Sills: Aluminum.
    f. Ceiling: Satin stainless steel, ASTM A480/A480M, No. 4 finish with 3 LED downlights on each side of car.
    g. Handrails: 1/2- by 2-inch rectangular satin stainless steel, sides and rear of car.
    h. Floor prepared to receive flooring as scheduled.

14. Hoistway Entrances:

    a. Size: Two-speed side opening, 3'-6" wide by 7'-0" high doors.
    b. Frames at All Floors: Stainless steel.
    c. Doors at All Floors: Stainless steel.
    d. Sills at All Floors: Aluminum.

15. Hall Fixtures at All Floors: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
16. Additional Requirements:

    a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, ASTM A480/A480M, No. 4 finish.
    b. Provide hooks for protective pads, 2 complete sets of full-height protective pads for elevator.

17. Power Supply: 480 volts, 3-phase, 60 Hz.

2.4 TRACTION SYSTEMS

A. Elevator Machines: Permanent magnet, variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.

1. Provide regenerative or nonregenerative system.
2. Limit total harmonic distortion of regenerated power to 5 percent in in accordance with IEEE 519.
3. Provide means for absorbing regenerated power when elevator system is operating on standby power.
4. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

B. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.

C. Guides: Roller guides or polymer-coated, nonlubricated sliding guides. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

A. Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.

B. Auxiliary Operations:

1. Group Standby Power Operation: On activation of standby power, cars are returned, 1 at a time, to a designated floor and parked with doors open. If a car cannot be returned, it is removed from the system. When all cars have been returned or removed from the system, 1 car can be put in service on standby power by a selector switch in control panel located at fire-command station.
2. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after 5 minutes and are re-energized before car doors open.
3. Independent Service: Key switch in car-control station removes car from group operation and allows it to respond only to car calls. Key cannot be removed from key switch when car is in independent service. When in independent service, doors close only in response to door close button.
4. Priority Service: Service is initiated by a key switch, card reader, remote switch at designated floors. One elevator is removed from group operation and directed to the floor where service was initiated. On arriving at the floor, elevator opens its doors and parks. Car is placed in operation by selecting a floor and pressing door close button or by operating key switch to put car in independent service. After responding to floor selected or being removed from independent service, car is returned to group operation. If car is not placed in operation within a preset time after being called, it is returned to group operation.

C. Security features are not to affect emergency firefighters' service.

1. Card-Reader Operation: System uses card readers at car-control stations to authorize calls. Security system determines which landings and at what times calls require authorization by card reader. Allow space for card reader in car.

a. Security access system equipment is specified in Section 281500 "Access Control Hardware Devices."

2. Key Switch Operation: Push buttons are activated and deactivated by security key switches at car-control stations.

2.6 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of 1 or more light beams cause doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer sounds and doors begin to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

A. Provide enameled or powder-coated steel car enclosures to receive removable wall panels, with removable car roof, access doors, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.

B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Stainless Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless steel sheet.
2. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet.
3. Sight Guards: Provide sight guards on car doors.
4. Sills: Extruded or machined metal, with grooved surface, 1/4-inch thick.
5. Light Fixture Efficiency: Not less than 35 lumens/W.
6. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

2.8 HOISTWAY ENTRANCES

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile to accommodate hoistway wall construction.

1. Where gypsum board wall construction is indicated, frames are to be self-supporting with reinforced head sections.

B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies comply with NFPA 80 and are to be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible in accordance to NFPA 252 or UL 10B.

1. Fire-Protection Rating: 1 hour with 30-minute temperature rise of 450 degrees F.

C. Materials and Fabrication: Manufacturer's standards, but not less than the following:

1. Enameled or Powder-Coated Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
2. Stainless Steel Frames: Formed from stainless steel sheet.
3. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches high, on both jambs of hoistway door frames.
4. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet.
5. Sight Guards: Provide sight guards on doors matching door edges.
6. Sills: Extruded or machined metal, with grooved surface, 1/4-inch thick.
7. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.9 SIGNAL EQUIPMENT

A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide vandal-resistant buttons and lighted elements illuminated with LEDs.

B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.

1. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Firefighters' 2-Way Telephone Communication Service: Provide flush-mounted cabinet in each car and required conductors in traveling cable for firefighters' 2-way telephone communication service.

E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

F. Hall Push-Button Stations: Provide 1 hall push-button station at each landing for each single elevator or group of elevators, but not less than 1 station for each 4 elevators in a group.

G. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide manufacturer's standard wall-mounted units, for mounting above entrance frames.

H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

I. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed.

J. Fire-Command-Center Annunciator Panel: Provide panel containing illuminated position indicators for each elevator, clearly labeled with elevator designation; include illuminated signal that indicates when elevator is operational and when it is at the designated emergency return level with doors open. Provide standby power elevator selector switch(es), as required by ASME A17.1/CSA B44, adjacent to position indicators. Provide illuminated signal that indicates when normal power supply has failed.

K. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide sign at each hall push-button station unless otherwise indicated.

L. No smoking.

2.10 FINISH MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.

C. Stainless-Steel Sheet: ASTM A240/A240M, Type 304.

D. Stainless-Steel Bars: ASTM A276/A276M, Type 304.

E. Stainless-Steel Tubing: ASTM A554, Grade MT 304.

F. Aluminum Extrusions: ASTM B221, Alloy 6063.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

B. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

C. Leveling Tolerance: 1/8-inch, up or down, regardless of load and travel direction.

D. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

E. Locate hall signal equipment for elevators as follows unless otherwise indicated:

1. For groups of elevators, locate hall push-button stations between 2 elevators at center of group or at location most convenient for approaching passengers.
2. Place hall lanterns either above or beside each hoistway entrance.
3. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.2 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

3.3 PROTECTION

A. Temporary Use: Limit temporary use for construction purposes to only Elevator E001. Comply with the following requirements for elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
3. Engage elevator Installer to provide full maintenance service.
4. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.4 DEMONSTRATION

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

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service to include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity.

END OF SECTION 142123.16

SECTION 224600 - LIGATURE RESISTANT PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless steel water closets.
2. Stainless steel lavatories.
3. Stainless steel drinking fountains.
4. Stainless steel showers.
5. Flushometer valves.
6. Supports.
7. Electronic Controls.

1.2 DEFINITIONS

A. Front-Access Fixture: Security plumbing fixture designed to mount on wall with installation and removal from fixture side of wall, and with piping and other components accessible only from access panel in fixture.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for security plumbing fixtures.
2. Rated capacities, operating characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For ligature resistant plumbing fixtures and components.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each product type from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Comply with ASME A112.19.3/CSA B45.4 for stainless steel plumbing fixtures.

B. Comply with ASSE 1037/ASME A112.1037/CSA B125.37 for flush valves.

C. Comply with ASME A112.19.5/CSA B45.15 for flush valves and spuds for water closets.

D. Comply with ASME A112.18.1/CSA B125.1 for plumbing supply fittings.

E. Comply with ASME A112.18.2/CSA B125.2 for plumbing waste fittings.

F. Comply with ASME A112.6.1M for plumbing fixture supports.

G. Comply with ICC A117.1 for ADA-compliant, accessible plumbing fixtures and installation.

H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

I. Faucets and bubblers intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61/NSF 372; or are certified in compliance with NSF 61/NSF 372 by an ANSI-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.3 STAINLESS STEEL WATER CLOSETS

A. Water Closets - Stainless Steel, Front Access, On Floor, Floor Outlet, Extended Bowl:

1. Basis of Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Acorn Engineering Company.
    b. Metcraft, Inc.
    c. Whitehall Manufacturing.
    d. Willoughby Industries.

2. Material: 14-gauge or 16-gauge, Type 304 stainless steel, seamless welded construction. Toilet to be able to withstand a 5000 lb (22 kN) load without deflection and/or damage.
3. Finish: Exterior surfaces shall be powder coated white. Satin polished finish on interior surfaces.
4. Optional Features: ADA compliant where noted.
5. Bowl:

    a. Type, for Bottom-Outlet Water Closets: Elongated, with top inlet, integral trap, and siphon-jet design with bottom outlet, and access panel.
    b. Length to Wall: Minimum of 25 inches (635 mm).
    c. Seat Surface: Ligature Resistant ABS toilet seat cover.

6. Mounting: Bolts from fixture-mounted flanges into wall.
7. Mounting Height: Standard or Accessible as indicated.
8. Flushometer Valve: Diaphram.

2.4 LAVATORIES

A. Lavatories - Wall hung, Front Access:

1. Basis of Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Acorn Engineering Company.
    b. Bradley.
    c. Metcraft, Inc.
    d. Whitehall Manufacturing.
    e. Willoughby Industries.

2. Fixture:

    a. Material: Basin of Solid Surface Polymer Resin. Stainless Steel enclosure with powder coat finish.
    b. Tempered- and Cold-Water Supply Valves: Pneumatic, push-button, tempered and cold, metering or Electronic, piezo tempered and cold, metering as indicated type with individual check stops, and deck-mounted spouts. Non-hold-open valve.
    c. Drain: Integral punched grid with NPS 1-1/4 (DN 32) minimum horizontal waste and trap.
    d. Optional Features: ADA compliant and ligature resistant.

3. Mounting: wall carrier rated at 750 pounds.
4. Mounting Height: Accessible.

B. Lavatories – integral to countertop:

1. Furnish Tempered and Cold Water Supply Valves, pneumatic, push-button metering or electronic piezo tempered and cold metering as indicated on the plans. Individual check stops and deck mounted spouts.
2. Drain: Integral punched grid with 1-1/4” minimum horizontal waste and trap.

2.5 STAINLESS STEEL DRINKING FOUNTAINS

A. Drinking Fountains - Stainless Steel, Front Access:

1. Basis of Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Acorn Engineering Company.
    b. Metcraft, Inc.
    c. Whitehall Manufacturing.
    d. Willoughby Industries.

2. Fixture:

    a. Material: 14- or 16-gauge, Type 304 stainless steel, seamless welded construction with fire-resistant sound-deadening material in interior.
    b. Finish: powder coat finish.
    c. Receptor: Bowl with backsplash.
    d. Bubbler Supply Valve: battery operated sensor actuation
    e. Drain: Integral punched grid with NPS 1-1/4 (DN 32) tailpiece.

f. Optional Features: ADA compliant and ligature resistant.

3. Waste Fittings: NPS 1-1/4 (DN 32) minimum waste and trap.
4. Mounting: Bolts from fixture-mounted flanges into floor mounted carrier.
5. Mounting Height: Accessible.

2.6 STAINLESS STEEL SHOWERS

A. Showers - Stainless Steel, Front Access, Recessed:

1. Basis of Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. Acorn Engineering Company.
b. Bradley.
c. Metcraft, Inc.
d. Whitehall Manufacturing.
e. Willoughby Industries.

2. Fixture:

a. Material: 14, 16 or 18 -gauge, Type 304 stainless steel, seamless welded construction.
b. Finish: powder coating.
c. Type and Configuration: Wall, with two conical showerheads.
d. Tempered - and Cold-Water Supply Valves: ASSE 1016 control valve with individual checkstops, Pneumatic push-button metering or electronic piezo tempered and cold water metering as indicated on the plans.
e. Shower: Vandal-resistant, fixed-type head.
f. Access to Internal Components: Vandal-resistant access panels.
g. Optional Features: ADA compliant and ligature resistant

3. Mounting: Mounting frame.

B. Bathtub/Showers - Stainless Steel, Front Access, Recess mounted:

1. Basis of Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. Acorn Engineering Company.
b. Metcraft, Inc.
c. Whitehall Manufacturing.
d. Willoughby Industries.

2. Fixture:

a. Type and Configuration: Wall, with showerhead, control valve, tub spout and diverter valve.
b. Tempered and Cold-Water Supply Valves: ASSE 1016 control valve with individual check stops. ADA compliant.
c. Optional Features: ADA compliant and ligature resistant.

3. Mounting: Bolts from fixture-mounted flanges into wall.

2.7 FLUSHOMETER VALVES

A. Flushometer Valves - Diaphragm:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. Acorn Engineering Company.
b. Bradley Corporation.
c. Metcraft, Inc.
d. Sloan Valve Company.
e. Whitehall Manufacturing.
f. Willoughby Industries.
g. Zurn Water LLC.

2. Minimum Pressure Rating: 125 psig (860 kPa).
3. Features: Integral check stops and backflow-prevention device.
4. Material: Brass body with corrosion-resistant components.
5. Actuator: Hydraulic, push button, or Electronic piezo as indicated. Style: Concealed.
6. Cover: Panel and exposed surfaces, powder coated stainless steel.
7. Consumption: 1.6 gal. (6 L) per flush.
8. Minimum Inlet: NPS 1 (DN 25).
9. Minimum Outlet: NPS 1-1/4 (DN 32).

2.8 ELECTRONIC CONTROLS FOR WATER MANAGEMENT SYSTEM

A. Electronic Controls: Electronic Networked Water Management System.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on the drawings or a comparable product by one of the following:

a. Acorn Engineering Company.
b. Metcraft, Inc.
c. Sloan Valve Company.
d. Whitehall Manufacturing.
e. Willoughby Industries.

2. Description:

a. Water Management System: PC-based server (operator workstation) running on Windows 8 or newer operating system. Network communications shall be CAN-bus based providing proactive, prioritized communications of status of controller inputs/activities to operator workstation. Polling-type networks shall not be permitted. PC shall serve as the operator interface serving single or multiple individual trunks of networked Cell Valve Controllers (CVC's). The PC operator workstation shall display all fixtures and indicate their operation and state graphically. Provide a BMS (Building Management System by others) connection that supplies an access port to connect the

facilities BMS to the Water Management Server. This connection allows the BMS to remote operate and enable/disable valves on the Water Management Server computer by using Modbus protocol. PC shall be equipped with:

1) Monitor: 19 inch (483 mm) or larger with HD resolution of 1366 by 768 pixels minimum.
2) Touchscreen Monitor: Yes.
3) RAM: 4 GB minimum.
4) Hard Drive: 64 GB minimum.
5) Wireless keyboard.
6) Wireless mouse.
7) USB Ports: 4 minimum.
8) CAN-bus interface device(s) for network communication to Cell Valve Controllers (CVC's).
9) Water Management Software: Installed on PC, configured, and tested prior to installation to provide control and monitoring of security plumbing fixtures flush valves, lavatory valves, and shower valves connected to the CAN-bus networked control system.

b. WMS II operator workstation shall be located where indicated on the drawings.
c. Screen Graphics: Floor Plan Screen Layout. Layout information (areas and room numbers and fixtures controlled by networked system) shall be supplied to system supplier in DWG file format. Based on information supplied:

1) Level 1 screen shall:

a) Display top-level layout of defined sections of the facility.
b) Provide selected areas identified by shape, color, and label to link Level 1 screen to Level 2 screens with enlarged details and fixtures of individual facility sections.

2) Level 2 screens shall:

a) Provide magnified detail and fixture icons.
b) Provide identification of each fixture by location on the screen layout, icon type, and labeling (e.g., cell number of its location).
c) It shall be acceptable to use only a Level 1 screen if all fixtures can be displayed legibly and logically by functional area on one screen.
d) Provide graphical indication of fixture status.

d. Individual microprocessor-driven Cell Valve Controllers (CVCs) shall be located in the plumbing chase(s) or above ceiling in the adjacent corridor and shall control the operation of electronic lavatory valves, electronic shower valves, and electronic-hydraulic flush valves. An option shall also be available to control the operation of master shut-off valve(s) that provide(s) water to an area of several cells or fixtures.
e. CVC's shall require 24 volts AC for operation. System manufacturer shall supply 120/24 VAC step-down transformers for each CVC supplied. Transformers shall be UL Class 2, overload protected.

f. CVC's shall be modular and capable of operating in a fully networked or stand-alone configuration.
g. Valve output LEDs on the CVC shall provide the status of all valve outputs. An additional set of status LEDs shall indicate the presence and type of any inhibit or lockout condition on valve function.
h. Diagnostic LEDs: Provided on CVC to indicate the presence of incoming AC control power, that the CVC is operational, communication status, and input status.

    1) HB LED (heartbeat): Flashes to show controller is not only powered, but that the program in the controller is running. It flashes on and off.
    2) COM LED: Indicating when there is network communications activity occurring.
    3) ERR LED: Indicating a communication error occurred.
    4) IN LED: Indicating one of the input switches is closed. (It can be used to diagnose input switch problems.)

i. Diagnostic pushbuttons on the CVC shall be provided to enable maintenance personnel to manually activate valves from the controller.
j. Valve activation shall come from vandal-resistant stainless steel internally sealed pushbuttons.

    1) Pushbuttons shall require less than 5 lbf (22.2 N) to activate.
    2) Pushbutton housings shall be electrically isolated from system voltages.
    3) PZPB Piezo Electric Push-Button.

k. All solenoid valves shall be non-hold open (normally closed), but all metering times shall be independently adjustable.

    1) Metering time shall be:

        a) Adjustable from one (1) to sixty (60) seconds for each lavatory valve.
        b) Adjustable from one (1) to ten (10) seconds for each flush valve.
        c) Adjustable from one (1) second to nine (9) minutes and fifty-nine (59) seconds for each shower valve.

    2) Metering cycles shall be interruptible with a second pushbutton.
    3) All settings shall be settable for a single fixture or a group selection of all fixtures of the same type on the PC screen.

l. Each controller shall be programmed at the factory to the following settings but can be adjusted as necessary in the field:

    1) Lavatory Valve Cycle: Fifteen (15) seconds hot water run time, fifteen (15) seconds cold water run time.
    2) Flush Valve Cycle (Water Closets): Two (2) seconds on time.
    3) Shower: Upon initiation, two (2) minute run time. If the user finishes the shower before the two (2) minute period, user may press pushbutton to terminate the cycle. Pressing the pushbutton during the run time shall not extend the cycle.

m. A programmable re-initiate delay feature function (toilets, lavatories, showers) shall be provided to control their amount of use to a preset threshold, after which the function will be locked out for a preset period of time of up to four hours.
n. A programmable initiate delay feature for the fixture function (toilets, lavatories, showers) shall be provided to enable a timed delay between the pushbutton switch activation and the subsequent valve activation.
o. System shall provide overuse control consisting of:

    1) Individual toilet, lavatory, and shower use limits.
    2) Programmable response to overuse condition of notification at the operator workstation, latched lockout of fixture, or auto-limit of fixture operation to prevent its overuse. All overuse notifications shall appear on the operator workstation.
    3) Configurable overuse limitation to a given number (adjustable) of valve actuations for flushing devices or a given amount of cycle-on time (adjustable) for showers, and lavatories within a given time period (adjustable) of up to 24 hours.
    4) Concurrent operation with other use-control features of the system.

p. The operator workstation shall be capable of networks of up to 508 CVC nodes and up to 3,048 valves.
q. Network Wiring: Twisted 3-pair cable of CAT 3 rating shall be used for all network wiring. Installer shall follow system manufacturer's instructions for installation and verification testing. Each network shall not exceed 4,000 feet (1220 meters) in total length from operator workstation to the last CVC in the network string.
r. In the event of a loss of network communications or loss of power, system timing parameters shall be retained in each CVC to allow fixtures to operate in the same way that they operated prior to the loss of power or the loss of network communications.
s. The networked system shall be capable of:

    1) Enabling or disabling an individual fixture or an entire group of fixtures from the operator workstation.
    2) Controlling the maximum number of simultaneous flushes (adjustable from 1 to 999) that can occur within a given time period (adjustable from 1 to 60 seconds).
    3) Automatically flushing a toilet or actuating a non-flushing fixture after an adjustable period of non-use has passed to prevent drying out or creating stagnate water.
    4) Allowing for remote actuation of fixtures from the operator workstation.
    5) Providing ability from the operator station to dynamically lock or reset (unlock) a fixture.
    6) Providing up to 4 scheduled permit time periods per day and week for selected fixtures.
    7) Logging of time, date, and function of all valve activity chronologically, including:

        a) On and off times of each fixture function.
        b) Lockout times.

c) Network status changes by node.

t. The networked system shall provide 4 levels of security accessed via user name and password depending on system settings (Each level includes the functions of the previous lower level).

1) View-only Security Level:

a) Move between display screens.
b) Observe fixture activity on screens.
c) Observe any loss of communications to fixture controllers.
d) Log into a higher-security level.

2) Operator Security Level:

a) Remote valve actuation.
b) Fixture lockout/reset.
c) Clear alarms (overflow and overuse).

3) Supervisor Security Level:

a) Set and adjust valve timing.
b) Set and adjust initiate and re-initiate delays.
c) Set and adjust permit (lockout) schedules.
d) Set and adjust overuse limits and responses.
e) Set alarm display options.
f) Access fixture event log (if enabled by administrator).
g) Use log files to analyze water-consumption history.
h) Enable and disable sound effects.
i) Access system user activity log files (if enabled by administrator).
j) Optional selection of a 24-hour point at which all overuse counts will be reset.

4) Administrator Security Level:

a) Create system user accounts with user name, password, and security level defined.
b) Set and adjust network communications settings.
c) Enable and configure remote client connections to server.
d) Configure fixture event log files and user activity log files.

5) Set sound files to be used when sound feature is enabled.

u. Client-server Networking System shall be capable of linking client sessions on other Windows-based PCs to the main server via an Ethernet network. Control and monitor functions possible on the central operator station may be performed on a client PC based on user security level.

1) Server will be located where indicated on drawings.

2) Water management software shall be installed, configured, and verified by system integrator with assistance from water management software supplier.

v. Solenoids compatible with voltage, power, and mating connections of the outputs of the CVC.
w. Supply shut off valve: One valve for each water supply.
x. Controller (CVC) Housing: Water resistant enclosure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install plumbing fixtures level and plumb.

B. Install front-access, fixtures as follows:

1. Install fixture support or mounting bracket.
2. Install fixture on support; mount components inside of or attached to fixture.
3. Extend supply piping to fixture.
4. Install trap below fixture and extend soil and waste piping into wall.

C. Install fixture outlets with gasket seals.

D. Install fixtures designated "accessible" in accordance with ICC A117.1 for heights, dimensions, and clearances.

E. Seal joints between fixtures, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings.

G. If networked electronic controls are utilized, network wiring “provided by others” shall be installed and tested per the plumbing control system supplier’s instructions.

3.3 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Division 26.

B. Ground equipment in accordance with Division 26

C. Install electrical devices furnished by manufacturer, but not factory mounted in accordance with NFPA 70.

3.5 ADJUSTING

A. Operate and adjust flushometer valves and flow-control valves on fixtures. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at fixtures to produce proper flow.

C. Install new batteries in battery-powered, electronic-sensor mechanisms.

3.6 CLEANING AND PROTECTION

A. After installing fixtures, inspect and replace damaged finishes.

B. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed fixtures and fittings.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224600

SECTION 230900 – DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes control equipment and installation for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-furnished controls.

1.2 RELATED DOCUMENTS

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

1. Section 013300 – Submittal Requirements.
2. Section 230800 – Commissioning of HVAC.
3. Section 230500 – Common Work Results for HVAC.
4. Section 230593 – Testing, Adjusting, and Balancing for HVAC.
5. Section 260500 – Common Work Results for Electrical.
6. Section 260519 – Low Voltage Electrical Power Conductors and Cables.
7. Section 260533 – Raceway and Boxes for Electrical Systems.
8. Section 262923 – Motor Controllers.
9. Section 262900 – Motors.

1.3 DEFINITIONS

A. BACnet: An industry standard data communication protocol for Building Automation and Control Networks. Refer to AHSRAE standard 135-2010.

B. BIBB: BACnet Interoperability Building Blocks.

C. DDC: Direct digital controls.

D. IP: Internet Protocol.

E. I/O: Input/Output.

F. LAN: Local area network.

G. TCP: Transfer Control Protocol.

H. LonTalk: Communications based on the EIA-709.1.

I. SNVT: LonTalk standard network variable.

J. Scope Terminology.

1. Provide = Furnish equipment, engineer, program and install.
2. Furnish = Furnish equipment, engineer, and program.
3. Mount = securely fasten or pipe.

4. Install = mount and wire.
5. Wire = wire only.

1.4 SYSTEM DESCRIPTION

A. System Communications.

1. Each workstation, building controller, and equipment controller communication interface shall utilize the BACnet™ protocol with an Ethernet (IEEE 802.3, 802.11), RS485 (EIA-485), or Zigbee® (802.15.4) physical interface and an appropriate data link technology as defined in ANSI®/ASHRAE® Standard 135-2012. (e.g. BACnet over IP, BACnet over IPv6, BACnet over MS/TP, BACnet Zigbee).
2. All system controllers shall be BTL listed as a BACnet Building Controller (B-BC) as defined in ANSI®/ASHRAE® Standard 135-2012.
3. All documented status and control points, schedule, alarm, and data-log services or objects shall be available as standard object types as defined in ANSI®/ASHRAE® Standard 135-2012.
4. Each System Controller shall communicate with a network of Custom Application and Application Specific Controllers utilizing one or more of the interfaces documented within Field Bus Communications below.

B. Field Bus Communications

1. BACnet™:

a. All equipment and plant controllers shall be BTL listed as a BACnet Application Specific Controller (B-ASC) or a BACnet Advanced Application Controller (B-AAC) as defined in ANSI®/ASHRAE® Standard 135-2012.
b. All communication shall conform to ANSI®/ASHRAE® Standard 135-2012.
c. System Controller shall function as a BACnet router to each unit controller providing a globally unique BACnet Device ID for all BACnet controllers within the system.
d. BACnet over Zigbee®:

1) Communication between System Controller and equipment/plant controllers shall utilize BACnet over Zigbee as defined in ANSI®/ASHRAE® Standard 135-2012.
2) Each equipment controller wireless communication interface shall self-heal to maintain operation in the event of network communication failure.
3) Each zone sensor wireless communication interface shall be capable of many-to-one sensors per controller to support averaging, monitoring, and multiple zone applications. Sensing options shall include temperature, relative humidity, C02, and occupancy.

e. BACnet over MS/TP

1) Communication between System Controller and equipment/plant controllers shall utilize BACnet over MS/TP as defined in ANSI®/ASHRAE® Standard 135-2012.

C. Provide standalone controls called for on the drawings or sequences.

1.5 WORK INCLUDED

A. The installation of the control system shall be performed under the direct supervision of the controls manufacturer with the shop drawings, flow diagrams, bill of materials, component designation, or identification number and sequence of operation all bearing the name of the manufacturer.

B. Furnish a complete distributed direct digital control system in accordance with this specification section. This includes all system controllers, logic controllers, and all input/output devices. Items of work included are as follows:

1. Provide a submittal that meets the requirements below for approval.
2. Coordinate installation schedule with the mechanical contractor and general contractor.
3. Provide installation of all panels and devices unless otherwise stated.
4. Provide all low voltage (less than 50v) control wiring for the DDC system.
5. Provide engineering and technician labor to program and commission software for each system and operator interface. Submit commissioning reports for approval.
6. Participate in commissioning for all equipment that is integrated into the BAS (Refer to Commissioning sections of the equipment or systems in other parts of this specification.)
7. Provide testing, demonstration and training as specified below.

1.6 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 5 seconds.
2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 5 seconds.
3. Object Command: Reaction time of less than 5 seconds between operator command of a binary object and device reaction.
4. Object Scan: Transmit change of state and change of analog values to control units or workstation within 5 seconds.
5. Alarm Response Time: Annunciate alarm at workstation within 2 seconds. Multiple workstations must receive alarms within five seconds of each other.
6. Program Execution Frequency: Programmable controllers shall execute DDC PI control loops, and scan and update process values and outputs at least once per second.
7. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:

a. Water Temperature: Plus or minus 1 deg F.
b. Water Flow: Plus or minus 5 percent of full scale.
c. Water Pressure: Plus or minus 2 percent of full scale.
d. Space Temperature: Plus or minus 1 deg F.
e. Ducted Air Temperature: Plus or minus 1 deg F.
f. Outside Air Temperature: Plus or minus 2 deg F.
g. Dew Point Temperature: Plus or minus 3 deg F.
h. Temperature Differential: Plus or minus 0.25 deg F.

i. Relative Humidity: Plus or minus 2 percent.
j. Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
k. Airflow (Measuring Stations): Plus or minus 5 percent of full scale.
l. Airflow (Terminal): Plus or minus 10 percent of full scale.
m. Air Pressure (Space): Plus or minus 0.01-inch wg.
n. Air Pressure (Ducts): Plus or minus 0.1-inch wg.
o. Carbon Monoxide: Plus or minus 5 percent of reading.
p. Carbon Dioxide : Plus or minus 50 ppm.
q. Electrical: Plus or minus 5 percent of reading.

1.7 SUBMITTALS

A. Provide submittals for fast-track items that need to be approved and released to meet the schedule of the project. Provide submissions for the following items separately:

1. Valve schedule and cut sheets including size, pipe size, pressure drop, close off pressure, Cv and voltage.
2. Damper schedule and cut sheets and actuators including size, actuator torque, voltage, and flow characteristics.
3. Variable frequency drive cut sheets.
4. Airflow measuring stations cut sheets.
5. Thermostat locations.

B. Provide a complete submittal with all controls system information for approval prior to construction. Include the following:

1. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
2. Wiring Diagrams: Power, signal, and control wiring.
3. Details of control panel, including arrangement of gutters, conduits, Panduit, power supplies, transformers, convenience receptacles, control hardware, instruments, and labeling.
4. If dampers are furnished by other, submit a damper actuator schedule coordinating actuator sizes, torque rating and voltage with the damper schedule. Schedule must include damper size and minimum actuator torque, and normal position.
5. Written description of the Sequence of Operations.
6. Network riser diagram showing wiring types, network protocols, locations of floor penetrations and number of control panels. Label control panels with network addresses and/or device instance numbers. Show all routers, switches, hubs, and repeaters.
7. Point list for each system controller including both inputs and outputs (I/O), point numbers, controlled device associated with each I/O point, and location of I/O device. Refer to points summary shown on control details.
8. Points list containing alarm definitions including type, threshold limits, return to normal, delays, modes, and parent points. Refer to points summary shown on control details.
9. Points list containing trend definitions including type, number of samples, and intervals. Refer to points summary shown on control details.
10. Starter and variable frequency drive wiring details of all automatically controlled motors.

11. Reduced size floor plan drawings showing locations of control panels, thermostats and any devices mounted in occupied space.
12. Factory mounting and wiring diagrams and cut sheets.
13. Floor plan showing proposed communications cable routing.
14. Once control system has been started, submit completed point to point I/O report.
15. Submit training agenda as described in part 3 sections.

C. Product Data: Include manufacturer's technical literature for each control device indicated, labeled with setting or adjustable range of control. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated. Submit a write-up of the application software that will be used on the operator workstation including revision level, functionality and software applications required to meet the specifications.

D. Submit a description of the application software that will be used on the operator workstation including revision level, functionality and software applications required to meet the specifications.

E. Wiring Diagrams: Detail the wiring of the control devices and the panels. Show point-to-point wiring from field devices to the control panel. Show point-to-point wiring of hard-wired interlocks. Show a ladder diagram or schematic of wiring internal to the panels, including numbered terminals. Clearly designate wiring that is done at a factory, at a panel shop or in the field.

F. Variance letter: Submit a letter detailing each item in the submission that varies from the contract specification or sequence of operation in any way.

G. After the BAS system is approved for construction, submit operator workstation graphics for typical systems for approval. Print and submit the graphics that the operator will use to view the systems, change setpoints, modify parameters and issue manual commands. Programming shall not commence until typical graphics are approved.

1.8 QUALITY ASSURANCE

A. Codes.

1. Perform all wiring in accordance with Division 26, NEC, local codes, and Owner’s requirements.
2. International Building Code (IBC).
3. International Energy Code.
4. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
5. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems."
6. Comply with ASHRAE 135-2010 BACNet: A Data Communication Protocol for Building Automation and Control Networks.
7. All equipment shall be UL listed and approved and shall meet with all applicable NFPA standards, including UL 916 - PAZX Energy Management Systems,
8. Provide UL 864 – UUKL Smoke Control, where controllers and networks are used for that purpose.

a. Provide written approvals and certifications after installation has been completed.

9. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

B. Qualifications

1. Installer Qualifications: An experienced installer who is the authorized representative of the building automation system manufacturer for both installation and maintenance of controls required for this Project.
2. Engineering, drafting, programming, and graphics generation shall be performed by the local branch engineers and technicians directly employed by the Building Automation System Contractor.
3. Supervision, checkout, and commissioning of the system shall be by the local branch engineers and technicians directly employed by the Building Automation System Contractor. They shall perform commissioning and complete testing of the BAS system.

C. The BAS contractor shall maintain a service organization consisting of factory trained service personnel and provide a list of ten (10) projects, similar in size and scope to this project, completed within the last five years.

D. Final determination of compliance with these specifications shall rest solely with the Engineers and Owner who will require proof of prior satisfactory performance.

E. For any BAS system and equipment submitted for approval, the BAS contractor shall state what, if any, specific points of system operation differ from these specifications.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.

1.10 COORDINATION

A. Coordinate location of thermostats, humidistats, panels, and other exposed control components with plans and room details before installation.

B. Coordinate equipment with Section 260000 "Fire Alarm" to achieve compatibility with equipment that interfaces with that system.

C. Coordinate power for control units and operator workstation with electrical contractor.

D. Coordinate equipment with provider of starters and drives to achieve compatibility with motor starter control coils and VFD control wiring.

E. Coordinate scheduling with the mechanical contractor and general contractor. Submit a schedule for approval based upon the installation schedule of the mechanical equipment.

F. Products Furnished but Not Installed Under This Section.

1. Hydronic Piping:

a. Control Valves.
b. Temperature Sensor Wells and Sockets.
c. Flow Switches.
d. Flow Meters.

2. Refrigerant Piping.

a. Pressure and Temperature Sensor Wells and Sockets.

3. Sheetmetal accessories.

a. Dampers.
b. Airflow Measuring Stations.

G. Integrate to equipment as called for in the automation riser details and sequence of operations.

1.11 WARRANTY

A. Conform to the warranty requirement of the Contract Documents, General Requirements and this section or a minimum of 12 months from owner acceptance.

B. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of three years from completion of system demonstration.

C. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours.

D. During normal building occupied hours, failure of items that are critical for system operation shall be provided within 4 hours of notification from the Owner's Representative.

E. This warranty shall apply equally to both hardware and software.

PART 2 - PRODUCTS

2.1 ACCEPTABLE SYSTEMS

A. Provide a Building Automation System based upon the following:

1. Trane Tracer SC+ installed by Trane Wichita Branch
2. Johnson Controls Metasys installed by JCI Wichita Branch
3. Siemens Building Automation installed by Building Controls and Services
4. TAC / Schneider Electric Building Automation installed by Sandifer Engineering
5. Automated Logic installed by Dynamic Controls, Inc.

2.2 ENTERPRISE SYSTEM – GENERAL DESCRIPTION

A. Provide an Enterprise Operator Interface System with the required building controllers to integrate and control all mechanical equipment associated with this project as listed in the project plans and specifications.

B. The Enterprise operator interface is a web-based, systems integration solution that provides facility managers an online, enterprise-wide view and control over of all their buildings and systems, from any device with a web browser on the network. (PC, laptop, tablet, smart phone).

C. The system shall collect and display data from other systems via BACnet™ IP, providing users the critical information needed to make enterprise-wide decisions for optimized performance.

D. The Enterprise operator web interface shall be accessible via a web browser without requiring any “plug-ins” (i.e. JAVA Runtime Environment (JRE), Adobe Flash).

E. The Enterprise operator interface software shall be provided as a cloud-based service, the manufacture shall include a two-year cloud base service as part of this contract.

F. As an option, the Enterprise operator interface software can be installed on a local server provided by the building owner. The server hardware and any System level controllers are to reside on the building owner’s network. (Note: The central server hardware, associated server operating system software, network cabling and switches is to be provided by others).

2.3 BAS NETWORK

A. All networked control products provided for this project shall be comprised of an industry standard open protocol internetwork. Communication over ethernet between web server, user workstation and building control units shall conform to ASHRAE 135-2010 BACnet standard. Communication between equipment controllers and building level controllers shall be BACnet or LonTalk protocol over TP/FT-10 channel type using transceivers that conform to the ISO/IEC 14908-2 Free-Topology Twisted Pair Channel Specification.

B. Access to system data shall not be restricted by the hardware configuration of the building management system. The hardware configuration of the BAS network shall be totally transparent to the user when accessing data or developing control programs.

1. Software applications, features, and functionality, including administrative configurations, shall not be separated into several network control engines working together.

C. Provide BAS Server with server application software for each site.

D. BAS Server shall be capable of simultaneous direct connection and communication with BACnet/IP, OPC and TCP/IP corporate level networks without the use of interposing devices.

E. Any break in Ethernet communication from the PC to the controllers on the Primary Network shall result in a notification at the PC.

F. The network architecture shall consist of three levels of networks:

1. The Management level shall utilize BACnet/IP over Ethernet along with other standardized protocol, such as web services, html, JAVA, SOAP, XML, etc., to transmit data to non-BAS software and databases.
2. The Automation level network shall be BACnet/IP over Ethernet. It shall network the Automation Server, Operator workstations, and building level controllers. Provide network media converters, routers, and switches as necessary for a complete network.
3. The Floor level network shall be BACnet MSTP or LonTalk over twister pair cable conforming to EIA-709.1. It shall network to all of the DDC controlled equipment on a floor or in a system and network to a router that connects to the Automaton level BAS backbone.
4. Acceptable floor level network alternative shall be BACnet Zigbee wireless communication.

G. The primary backbone network between the building level controllers, BAS Server and Operator Workstations shall be based upon BACnet/IP.

H. The Building Level Controllers shall be able to support subnetwork protocols that may be needed depending on the type of equipment or application. Subnetworks shall be limited to:

1. BACnet MS/TP.
2. LonWorks.
3. Modbus.

I. BACnet MSTP Setup rules.

1. Addressing for the MSTP devices shall start at 00 and continue sequentially for the number of devices on the subnetwork.
2. No gaps shall be allowed in the addresses.
3. Set the MaxMaster property to the highest address of the connected device.
4. MaxMaster property shall be adjusted when devices are added to the subnetwork.
5. For existing networks, addressing must be approved by owner’s representative.

J. Application specific controllers for smaller single zone, supplemental or special systems can reside on the BACnet/IP network or on a subnetwork.

K. Floor level controllers, terminal units, package AC units, auxiliary equipment, VFDs, meters shall reside on one of the subnetworks above.

L. Provide all communication media, connectors, repeaters, bridges, switches, and routers necessary for the internetwork.

M. Use fiber optic cabling for all Ethernet runs longer than 300 ft and between buildings.

N. Controllers and software shall be BTL or LonMark listed at the time of installation.

O. Provide all communication media, connectors, repeaters, bridges, switches, and routers necessary for the internetwork.

P. The system shall meet peer-to-peer communication services such that the values in any one enterprise or AAC level controller can be read or changed from all other controllers with the need for intermediary devices. The software shall provide transparent transfer of all data, control programs, schedules, trends, and alarms from any one controller through the internetwork to any other controller, regardless of subnetwork routers.

Q. Systems that use variations of BACnet using Point-to-Point (PTP) between controllers, gateways, bridges, or networks that are not peer-to-peer are not allowed.

R. Remote Communications: Provide a TCP/IP compatible communication port for connection to the Owner's network for remote communications. Remote communications must be capable of viewing entire system from a single IP address. Viewing via multiple connections is not acceptable. Provide coordination with the Owner for addressing and router configuration on both ends of the remote network.

S. Where a smoke control application is required, provide UUKL listed network switches, and NFPA approved cabling, enclosures, and installation methods.

T. The system shall be installed with a 30% spare capacity on each subnetwork for the addition of future controllers.

2.4 DISTRIBUTED CONTROL REQUIREMENTS

A. The loss of any one DDC controller shall not affect the operation of other HVAC systems, only for the points connected to the DDC controller.

B. The system shall be scalable in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, DDC Controllers, and operator devices.

C. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC Controller shall operate independently by performing its own specified control, alarm management, operator I/O, and data collection. The failure of any single component or network connection shall not interrupt the execution of any control strategy, reporting, alarming, and trending function, or any function at any operator interface device.

D. The DDC control panel shall be mounted in the same mechanical room as the equipment being controlled, or an adjacent utility room.

E. Multiple systems can be programmed on the same controller as long as they are in the same room. Systems on separate floors shall have separate controllers.

F. VAV boxes subnetworks shall be connected to the AHU controller that feeds those boxes. If multiple subnetworks are needed, then the VAV shall be grouped into subnetworks in an orderly method, such as per floor, per wing, etc. No subnetworks may attach more than 30 devices.

G. Remote sensors shall be wired to the control panel of the equipment it is controlling, not across the network.

H. Signals to remote motor control centers shall be hard wired to the control panel, not across the network.

I. Terminal units shall each have their own controller. Only exceptions are:

1. Auxiliary heating coils.
2. Groups of exhaust fans.

2.5 BUILDING AUTOMATION SERVER HARDWARE

A. Where required and as indicated in floor plans, provide a PC for the BAS Server database. Provide workstation that has been tested and recommended by the software manufacturer. PC shall operate on the latest version of manufacture approved operating system and contain the latest model of the nominal speed, RAM and memory as recommended by software supplier. Minimum requirements and accessories shall be:

1. USB Ports.
2. NIC Card.
3. 101 key enhanced keyboard, Mouse, power strip.
4. UPS for 15-minute backup.

B. Provide an active-matrix LCD, flat panel type monitor that is Energy Star compliant. The display shall have a minimum of 20-inch visible area in diagonal measurement. Separate controls shall be provided for color, contrasts, and brightness. The screen shall be non-reflective.

C. Printer: Provide a compatible inkjet or laser printer for alarms, operator transactions and system reports. Provide drivers.

D. Locate the BAS Server in a clean, secure, dry, and temperature-controlled environment. Coordinate with owner for exact location.

E. The server shall reside on the same BACnet/IP protocol network as the System Controllers.

F. Provide software licenses for interfacing to the BAS. Load software, configure and setup for viewing the BAS system.

G. Software: Provide the following application software licenses, preloaded on the laptop for the Owner: MS Office or owner approve word processing software, PC anywhere or terminal services, owner approved internet browser, owner approved email client, Bluebeam Revu. Set up an icon on the desktop to take the Owner directly to the BAS system login page.

2.6 OPERATOR INTERFACE APPLICATION SOFTWARE

A. Graphical User Interface (GUI): The GUI shall provide a completely interactive user interface and must offer the following features as a minimum:

1. View Trending.
2. View Scheduling.

3. Downloading Memory to field devices.
4. Real time 'live' Graphic Programs with auto refresh.
5. System Name and Geographic Navigation methods.
6. Parameter changes of all adjustable object properties.
7. Setpoint Adjustments.
8. Viewing Alarms and Events.
9. Operators' Usage.
10. Hyperlinks.
11. Online help menus.

B. BACNET:

1. The BAS server and Operator Workstations shall meet the BACnet device profile of an Advanced Workstation Server (B-AWS) and Operator Workstation (B-OWS) and shall support the following BACnet BIBBs:

   a. Data Sharing.

      1) Data Sharing-Read Property-Initiate, Execute (DS-RP-A, B).
      2) Data Sharing-Read Property Multiple-Initiate, Execute (DS-RPM-A, B).
      3) Data Sharing-Write Property-Initiate, Execute (DS-WP-A, B).
      4) Data Sharing-Write Property Multiple-Initiate (DS-WPM-A).
      5) Data Sharing-COV-Initiate (DS-COV-A).

   b. Scheduling.

      1) Scheduling-Initiate (SCHED-A).

   c. Trending.

      1) Trending-Viewing and Modifying Trends-Initiate (T-VMT-A).
      2) Trending-Automated Trend Retrieval-Initiate (T-ATR-A).

   d. Network Management.

      1) Network Management-Connection Establishment-Initiate (NM-CE-A).

   e. Alarming.

      1) Alarm and Event-Notification-Initiate (AE-N-A).
      2) Alarm and Event-ACK-Initiate (AE-ACK-A).
      3) Alarm and Event –Alarm Summary-Initiate (AE-ASUM-A).
      4) Alarm and Event –Enrollment Summary-Initiate (AE-ESUM-A).
      5) Alarm and Event –Information-Initiate (AE-INFO-A).

   f. Device Management.

      1) Device Management-Dynamic Device Binding- Initiate, Execute (DM-DDB-A, B).
      2) Device Management-Dynamic Object Binding- Initiate, Execute (DM-DOB-A, B).

3) Device Management-Device Communication Control- Initiate (DM-DCC-A).
4) Device Management-Private Transfer- Initiate, Execute (DM-PT-A, B).
5) Device Management-Text Message-Execute (DM-TM-B).
6) Device Management-Time Synchronization- Initiate (DM-TS-A).
7) Device Management-UTC Time Synchronization- Initiate (DM-UTC-A).
8) Device Management-Reinitialize Device- Initiate (DM-RD-A).
9) Device Management-Backup and Restore- Initiate (DM-BR-A).
10) Device Management-List Manipulation- Initiate, Execute (DM-LM-A, B).
11) Device Management-Object Creation and Deletion- Initiate (DM-OCD-A).

2. The BAS Server and Workstations shall support the following Data Link Layers:

   a. BACnet IP Annex J.
   b. BACnet IP Annex J Foreign Device.
   c. ISO 8802-3, Ethernet (Clause 7).

3. The BAS Server and Workstations shall be able to interact with all of the BACnet objects in the controllers. In addition, the software shall be able to support the following objects as they relate to features in the workstation software:

   a. Calendar – Creatable, Deletable.
   b. Command – Creatable, Deletable.
   c. Event Enrollment – Creatable, Deletable.
   d. Notification Class – Creatable, Deletable.
   e. Schedule - Creatable, Deletable.

4. The BAS Server and Workstations shall support transmitting and receiving segmented messages.

C. Provide software (or all software if there are multiple) used to program and download sequences to controllers. Provide a backup of the programs used in the system for storage by the Owner. Determine the number of seats required by owner prior to submission of bid.

D. The system software shall have the following Base features:

1. System software applications will run as a service to allow communication with Primary Network Controllers without the need for user log in. Closing the application or logging off shall not prevent the processing of alarms, network status, panel failures, and trend information.
2. System Database Save and Restore. The software shall store on the hard disk a copy of the current database of each DDC Controller. This database shall be updated whenever an operator initiates a save command.
3. Manual Database Save and Restore. A system operator with the proper password clearance shall be able to save the database from any DDC controller. The operator shall be able to clear a panel database via the network and may initiate a download of a specified database to any panel in the system from the network.

4. System Configuration. The software shall provide a method of configuring the system. This shall allow for future system changes or additions by users under proper password protection.
5. Security. Each operator shall be required to log on to the system with a username and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system supervisor shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the functions accessible to viewing and/or changing each system application.
6. Alarm Processing. Any object in the system shall be configurable to alarm in and out of normal state. The operator shall be able to configure the alarm limits, alarm limit differentials, states, and reactions for each object in the system.
7. 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 upon acronyms or other mnemonics.
8. Alarm Reactions. The operator shall be able to determine (by object) what if any actions are to be taken during an alarm. Actions shall include logging, printing, starting programs, displaying messages, dialing out to remote stations, paging, providing audible annunciation.
9. Trend Logs. The operator shall be able to define a custom trend log for any data object in the system. This definition shall include change-of-value digital, change-of-value analog, time interval, start time, and stop time. Trend data shall be sampled and stored on the DDC controller and be uploaded and archived on the hard disk and be retrievable for use in spreadsheets and standard database programs.
10. Alarm and Event Log. The operator shall be able to view all system alarms and change of states from any location in the system. Events shall be listed chronologically. An operator with the proper security level may acknowledge and clear alarms.
11. Object and Property Status and Control. Provide a method for the operator to view, and edit if applicable, the status of any object and property in the system. The status shall be available by menu, on graphics, or through custom programs. The software shall have the capability to create, delete and support the following Objects:

    a. Analog input, analog output, and analog value.
    b. Binary input, binary output, and binary value.
    c. Calendar.
    d. Device.
    e. Event Enrollment (Alarming).
    f. File.
    g. Loop (PID).
    h. Notification Class.
    i. Program.
    j. Schedule.
    k. Trend Log.

12. Report Generation.

    a. Reports shall be generated on demand schedule, and directed to PC displays, printers, files, or email address.

b. The Operator shall be able to trigger the report from an event in the system, such that recent data is captured with the event happens.
c. As a minimum, provide the following pre-defined templates:

1) A general listing of all or selected points in the network.
2) List of all points currently in alarm.
3) List of all points currently in override status.
4) List of all disabled points.
5) List of all points currently locked out.
6) List of user accounts and access levels.
7) List all weekly schedules and events.
8) List of holiday programming.
9) List of control limits and deadbands.
10) System diagnostic reports including, list of Building panels online and communicating, status of all Building terminal unit device points.
11) List of programs.
12) List of point definitions.
13) List of logical point groups.
14) List of alarm strategy definitions.
15) List of Building Control panels.
16) Point totalization report.
17) Point Trend data listings.
18) Initial Values report.
19) User activity report.

d. Provide templates for reports that are defined the Sequence of Operations.

2.7 ELECTRONIC DOCUMENTATION

A. Provide software applications and files to view documentation through the GUI.

B. Provide all controls cut sheets in PDF format. Make them available to any user accessing the system over the Internet.

C. Provide a text version of the sequence of operation. Make the written sequence available from the graphic that represents each system. The sequence shall pop up in a printable format such as HTML or PDF.

2.8 CONTROLLER SOFTWARE (I.E. BUILDING CONTROLLER SOFTWARE, DDC SOFTWARE, FIELD PANEL SOFTWARE)

A. Provide a full capability user license to the owner for the operator to be able to see, modify, create, upload, download and save control programs to the DDC controllers.

B. The software program shall be provided as an integral part of DDC Controllers and shall not be dependent upon any higher-level computer or another controller for execution.

C. The software application shall be accessible from a PC using the Windows environment but shall use all of its own services and data files so as to not be susceptible to Microsoft Windows operating systems-based viruses.

D. The software shall be provided with an interactive HELP function to assist operators with syntax, abbreviations, commands and saving programs.

E. Point naming and communication format:

1. All points, panels, and programs shall be identified in accordance with owners naming standards. In the absence of owner standards, identification shall be in accordance with control contractors written standards.

F. System Security

1. User access shall be secured using individual security passwords and usernames.
2. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.
3. User Log On/Log Off attempts shall be recorded.
4. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.
5. Use of workstation resident security as the only means of access control is not an acceptable alternative to resident system security in the DDC controller software.

G. User Defined Control Applications: The applications software shall program DDC routines to meet the sequences of operations.

1. Building Controllers shall have the ability to perform energy management routines including but not limited to time-of-day scheduling, calendar-based scheduling, holiday scheduling, temporary schedule overrides, start stop time optimization, automatic daylight savings time switch over, night setback control, enthalpy switch over, peak demand limiting, temperature-compensated duty cycling, heating/cooling interlock, supply temperature reset, priority load shedding, and power failure restart.
2. Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.
3. Each controller shall support plain language text comment lines in the operating program to allow for quick troubleshooting, documentation, and historical summaries of program development.

H. Peer-to-peer access to other DDC controllers

1. It shall be possible to use any actual or virtual point data or status, any system calculated data, a result from any process, or any user-defined constant in any controller in the system.
2. Any process shall be able to issue commands to points in any and all other controllers in the system.
3. Processes shall be able to generate operator messages and advisories to other operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of an advanced annunciation feature, such as:

a. Generate a report.
b. Annunciate an alarm.
c. Issue a text message or email.

I. Alarm Management:

1. Alarm management shall be provided within the controller software to monitor and direct alarm information to operator devices.
2. Each Building Controller shall perform distributed, independent alarm analysis, minimize network traffic, and prevent alarms from being lost. At no time shall the Building Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device, or communications with other panels on the network.
3. Conditional alarming shall allow generation of alarms based upon user defined multiple criteria such as system modes or status of parent equipment.
4. An Alarm “shelving” feature shall be provided to disable alarms during testing. (Pull the Plug, etc.).
5. Binary Alarms. Each binary alarm object shall be set to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.
6. Analog Alarms. Each analog alarm object shall have both high and low alarm limits. Alarming must be able to be automatically and manually disabled.
7. All alarms shall include the point's user-defined language description and the time and date of occurrence.
8. Alarm reports and messages shall be routed to user-defined list of operator workstations, or other devices based on time and other conditions. An alarm shall be able to start programs, print reports, be logged in the event log, generate custom messages, and display graphics.
9. The user shall be able to add a 200-character alarm message to each alarm point to more fully describe the alarm condition or direct operator response. Each Building Controller shall be capable of storing a library of at least 50 alarm messages. Each message may be assigned to any number of points in the Controller.
10. Operator-selected alarms shall be capable of initiating a trigger to an advanced annunciation, such as text, email, etc.
11. An alarm history log shall report the start of the alarm condition, acknowledgement by a user and return of the alarm to normal condition.

J. Scheduling:

1. Provide a comprehensive menu driven program to automatically start and stop designated multiple objects or events in the system according to a stored time.
2. Schedules shall reside in the building controller and shall not rely on external processing or network.
3. It shall be possible to define a group of objects as a custom event (i.e., meeting, athletic activity, etc.). Events can then be scheduled to operate all necessary equipment automatically.
4. For points assigned to one common load group, it shall be possible to assign variable time delays between each successive start and/or stop within that group.
5. The operator shall be able to define the following information:

    a. Time, day.
    b. Commands such as on, off, auto, etc.
    c. Time delays between successive commands.
    d. There shall be provisions for manual overriding of each schedule by an authorized operator.

6. It shall be possible to schedule calendar-based events up to one year in advance based on the following:

    a. Weekly Schedule. Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, stop, optimal start, optimal stop, and night economizer. When a group of objects are scheduled together as an Event, provide the capability to adjust the start and stop times for each member.
    b. 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 is executed, it will be discarded and replaced by the standard schedule for that day of the week.

K. Automatic Daylight Savings Time Switchover. The system shall provide automatic time adjustment for switching to/from Daylight Savings Time.

L. Loop Tuning:

1. Building Controllers shall also provide high resolution sampling capability for verification of DDC control loop performance. Documented evidence of tuned control loop performance shall be provided on a monthly, seasonal, quarterly, annual period.
2. For PID control loops, operator-initiated automatic and manual loop tuning algorithms shall be provided for all operator-selected PID control loops. Evidence of tuned control loop performance shall be provided via graphical plots or trended data logs for all loops.

    a. In automatic mode, the controller shall perform a step response test with a minimum one-second resolution, evaluate the trend data, calculate the new PID gains and input these values into the selected LOOP statement.
    b. Loop tuning shall be capable of being initiated either locally at the Building Controller, from a network workstation or remotely using dial-in modems. For all loop tuning functions, access shall be limited to authorized personnel through password protection.

M. Staggered Start:

1. This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts, shall be user definable in an application and shall not require written scripts or ladder logic.
2. Upon the resumption of power, each Building Controller shall analyze the status of all controlled equipment, compare it with normal occupancy scheduling and turn equipment on or off as necessary to resume normal operations.

N. Totalization Features:

1. Run-Time Totalization. Building Controllers shall automatically accumulate and store run-time hours for all digital input and output points. A high runtime alarm shall be assigned, if required, by the operator.

2. Consumption totalization. Building Controllers shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis for all analog and digital pulse input type points.
3. Event totalization. Building Controllers shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event totalization shall be performed on a daily, weekly, or monthly basis for all points. The event totalization feature shall be able to store the records associated with events before reset.

O. Data Collection:

1. A variety of historical data collection utilities shall be provided to manually or automatically sample, store, and display system data for all points.
2. Building Controllers shall store point history data for selected analog and digital inputs and outputs:
3. Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each Building Controllers point group.
4. Each Building Controller shall have a dedicated RAM-based buffer for trend data and shall be capable of storing a minimum of 10,000 data samples.
5. Trend data shall be stored at the Building Controllers and uploaded to the workstation when retrieval is desired. Uploads shall occur based upon either user-defined interval, manual command or when the trend buffers are full. All trend data shall be available for use in third-party personal computer applications.

2.9 BUILDING CONTROLLERS (B-BC)

A. Provide all necessary hardware for a complete operating system as required or inferred by control details. The Building Controller shall be able to operate as a standalone panel and shall not be dependent upon any higher-level computer or another controller for operation.

B. Building level controller (BLC):

1. The Building Level Controller shall support transmitting and receiving segmented messages.
2. The Building Level Controller shall have the capability to be the BACnet/IP Broadcast Management Device (BBMD) and support foreign devices.
3. The Building Level Controller shall have the capability to act as a BACnet router between MS/TP, Modbus RS-485 and LonTalk subnetworks and BACnet/IP.

C. This level of controller shall be used for the following types of systems:

1. Chiller plant systems.
2. Heating plant systems.
3. Cooling Towers.
4. Pumping systems.
5. VAV air handlers.
6. Air handlers over 15,000 cfm.
7. Systems with over 16 input/output points.

D. Input and Output Points Hardware:

1. Input/output point modules as required including spare capacity.
2. Monitoring of the status of all hand-off-auto switches.
3. Monitoring of all industry standard types of analog and digital inputs and outputs, without the addition of equipment to the primary control panel.

4. Local status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device. Each primary control panel shall perform diagnostics on all inputs and outputs and a failure of any input or output shall be indicated both locally and at the operator workstation.
5. Graduated intensity LEDs or analog indication of value for each analog output.

E. Code compliance

1. Approvals and standards: UL916; CE; FCC.

F. Accessories:

1. Appropriate NEMA rated metal enclosure.
2. Power supplies as required for all associated modules, sensors, actuators, etc.

G. The operator shall have the ability to manually override automatic or centrally executed commands at the primary control panels via local, point discrete, on-board hand/off/auto operator override switches. If on board switches are not available, provide separate control panels with HOA switches. Mount panel adjacent to primary control panel. Provide hand/off/auto switch for each digital output, including spares.

H. Each Building Level Control Panel shall continuously perform self-diagnostics on all hardware modules and network communications. The System Level Control Panel shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication with any system.

I. Panel setup, point definitions, and sequencing diagrams shall be backed up on EEPROM memory.

J. Power loss. In the event of the loss of power, there shall be an orderly shutdown of all Building Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 30 days.

K. Building Level control panels shall provide at least two serial data communication ports for operation of operator I/O devices such as industry standard printers, operator terminals, modems, and portable laptop operator's terminals. Primary control panels shall allow temporary use of portable devices without interrupting the normal communications, operation of permanently connected modems, printers, or terminals.

L. Building Level Controllers shall have the capability to serve as a gateway between Modus subnetworks and BACnet objects. Provide software, drives and programming.

M. Isolation shall be provided at all primary control panel terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standards 587-1980.

N. Spare Capacity: Provide enough inputs and outputs to handle the equipment shown to be “future” on drawings and 10% more of each point type. Provide all hardware modules, software modules, processors, power supplies, communication controllers, etc. required to ensure adding a point to the spare point location only requires the addition of the appropriate sensor/actuator and field wiring/tubing.

O. Environment.

1. Controller hardware shall be suitable for the anticipated ambient conditions.
2. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 32°F to 120°F.
3. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 32°F to 120°F.

P. Immunity to power and noise.

1. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.
2. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 ft.
3. Isolation shall be provided at all primary network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:

    a. RF-Conducted Immunity (RFCI) per ENV 50141 (IEC 1000-4-6) at 3V.
    b. Electrostatic Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact.
    c. Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500V signal, 1 kV power.
    d. Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max).

4. Isolation shall be provided at all Building Controller’s AC input terminals to suppress induced voltage transients consistent with:

    a. IEEE Standard 587 1980.
    b. UL 864 Supply Line Transients.
    c. Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11).

2.10 ADVANCED APPLICATION CONTROLLERS

A. Provide all necessary hardware for a complete operating system as required. The Advanced Application-level control panel shall be able to operate as a standalone panel and shall not be dependent upon any higher-level computer or another controller for operation.

B. Communication between system controller and equipment/plant controllers

1. BACnet over Zigbee as defined in ANSI®/ASHRAE® Standard 135-2012. Each equipment controller wireless communication interface shall self-heal to maintain operation in the event of network communication failure. Each zone sensor wire-

less communication interface shall be capable of many-to-one sensors per controller to support averaging, monitoring, and multiple zone applications. Sensing options shall include temperature, relative humidity, CO2, and occupancy.

2. BACnet over MS/TP.

C. This level of controller shall be used for the following types of systems:

1. Systems with custom sequences that meet the criteria below:

a. Secondary Pumping systems that are remote from Central Plants.
b. Air handlers up to 15,000 cfm.
c. Systems up to 16 input/output points.
d. Room control sequences that do not fit into an ASC controller.
e. BAS Network or Architecture or Sequences do not require the system to be on an IP network.
f. Systems that require integration to meters, VFDs or other smart equipment integration to smart thermostats is allowed.

D. Input/Outputs:

1. Inputs shall be 16-bit minimum digital resolution.
2. Outputs shall be 10-bit minimum digital resolution.
3. The following I/O port types shall be available on the controller.

a. Universal Input (software configurable):

1) Digital Input choices:
a) Pulse Accumulator.
b) Contact Closure Sensing.
c) Dry Contact/Potential Free inputs only.
d) Digital Input (10 ms settling time).
e) Counter inputs up to 20 Hz, minimum pulse duration 20 ms (open or closed).

2) Analog Input Choices:
a) 0-10 Vdc.
b) 4-20 mA.
c) 1K Ni RTD @ 32°F (Siemens, JCI, DIN Ni 1K).
d) 1K Pt RTD (375 or 385 alpha) @ 32°F.
e) 10K NTC Type 2 or Type 3 Thermistor.
f) 100K NTC Type 2 Thermistor.

b. Universal Input or Output (software configurable):

1) All of the above input types.
2) Analog Output Types:
a) 0 to 10 Vdc @ 1 mA max.

c. Super Universal Input or Output (software configurable):

1) All of the above input types.

2) All of the above output types.
3) Super digital output type:
   a) 0 to 24 Vdc, 22 mA max. (for controlling pilot relay).

4) Super Analog Output Choices:
   a) 0 to 20 mA @ 650 Ω max.

4. Provide software configurable I/O ports such that a programmer can make a port either an input or an output.

E. Each System Level Control Panel shall, at a minimum, be provided with:

1. Each Advanced Application Controller shall have sufficient memory, to support its own operating system and databases, including control processes, and operator I/O.
2. Local status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.
3. Each control panel shall perform diagnostics on all inputs and outputs and a failure of any input or output shall be indicated both locally and at the operator work-station.

F. Power loss. In the event of the loss of power, there shall be an orderly shutdown of all controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for the operating system software and firmware.

1. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.
2. Brownout protection and power recovery circuitry protect the controller board from power fluctuations.
3. Battery backup shall be provided to support the real-time clock for 10 years
4. The program and database information stored SDRAM memory shall be battery backed for a minimum of 30 days and up to 60 days. This eliminates the need for time consuming program and database re-entry in the event of an extended power failure.

G. Database Restore: Each AAC controller shall automatically save the latest programmed database. The controller shall be able to automatically restore a lost or corrupt database without involvement from the operator.

2.11 APPLICATION SPECIFIC CONTROLLERS

A. Each Application-Level Control Panel shall operate as a stand-alone controller capable of performing its user selectable control routines independently of any other controller in the system. Each application specific controller shall be a microprocessor-based, multi-tasking, real-time digital control processor.

B. This controller shall have the LonMark or BTL listing.

C. The following types of equipment (if applicable):

1. Constant Air Volume (CAV) boxes.

2. Fan coil Units.
3. Fan Powered Variable Air Volume (VAV) Boxes.
4. Reheat Coils.
5. Supplemental AC units.
6. Variable Air Volume (VAV) Boxes.
7. Other terminal equipment.

D. Each Application Specific Controller shall, at a minimum, be provided with:

1. Power supplies as required for all associated modules, sensors, actuators, etc.
2. Software as required for all sequences of operation, logic sequences and energy management routines.
3. A portable operator terminal connection port.
4. Each controller measuring air volume shall include provisions for manual and automatic calibration of the differential pressure transducer in order to maintain stable control and insuring against drift over time.
5. Each controller measuring air volume shall include a differential pressure transducer.
6. Approvals and standards: UL916; CE; FCC.

E. Each Application Specific Controller shall continuously perform self-diagnostics on all hardware and secondary network communications. The Application Specific Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failure to establish communication to the system.

F. Provide each Application Specific Controller with sufficient memory to accommodate point databases, operating programs, local alarming, and local trending. All databases and programs shall be stored in non-volatile EEPROM, EPROM and PROM. The controllers shall be able to return to full normal operation without user intervention after a power failure of unlimited duration.

G. The Application Specific Controller shall be powered from a 24 VAC source provided by this contractor and shall function normally under an operating range of 18 to 28 VAC (-25% to +17%), allowing for power source fluctuations and voltage drops. Install plenum data line and sensor cable in accordance with local code and NEC.

The controllers shall also function normally under ambient conditions of 32 to 122 F and 10% to 95%RH (non-condensing). Provide each controller with a suitable cover or enclosure to protect the intelligence board assembly.

2.12 ROUTERS

A. Provide a router for each subnetwork to connect the floor level network to the base building backbone level network. The router shall connect BACnet subnetworks to BACnet over Ethernet.

B. The router shall be capable of handling all of the BACnet objects, Layers and protocols that are listed for the controller that reside on the subnetwork.

C. ZigBee wireless communications operating at 2.4 GHz or 915 MHz complying with IEEE 802.15.4

2.13 CONTROL PANELS

A. Controllers in mechanical rooms shall be mounted in NEMA 1 enclosures.

B. Mount on walls at an approved location or provide a free-standing rack.

C. Enclosure mounting must include a wiring trough 6” longer than the enclosure width and have a minimum of 5 raceway connecting the trough and the enclosure. (3) 2” raceway feed left, middle and right wire ways. (2) 1” raceway are used for line voltage and communication cabling.

D. Panels shall be constructed of 16-gauge, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with ANSI 61 polyester-powder painted finish, UL listed. Provide common keying for all panels.

E. Provide power supplies for control voltage power.

F. Dedicate 1 power supply to the DDC controller. Other devices shall be on a separate power supply unless the power for the control device is derived from the controller terminations. Control panel should a minimum of have two power supplies.

G. Power supplies for controllers shall be a transformer with a fuse or circuit breaker. Power supplies for other devices can be plain transformers.

H. All power supplies for 24V low voltage wiring shall be class 2 rated and less than 100VA. If low voltage devices require more amps, then provide multiple power supplies. If a single device requires more amps, then provide a dedicated power supply in a separate enclosure and run a separate, non-class 2 conduit to the device.

I. Backplane mounted uninterruptible power supply sized for 200% of the theoretical ampacity of the control panel and associated end devices including actuators, transmitters, and accessories. UPS shall provide 30 minutes or battery capacity.

J. Surge transient protection shall be incorporated in design of system to protect electrical components in all DDC Controllers and operator’s workstations.

K. All devices in a panel shall be permanently mounted, including network switches, modems, media converters, etc.

L. Provide a pocket to hold documentation.

2.14 GENERAL SPECIFICATIONS FOR DEVICES

A. Provide mounting hardware for all devices, including actuator linkages, wells, installation kits for insertion devices, wall boxes and fudge plates, brackets, etc.

B. If a special tool is required to mount a device, provide that tool.

2.15 SENSORS

A. Terminal Unit Space Thermostats:

1. Each controller performing space temperature control shall be provided with a matching room temperature sensor.

   a. Plain Space Temperature Sensors – Wired: Where called for in the sequences or on the drawings, provide sensors with plain covers. Wireless sensors may be used at if requested in writing and approved by owner an engineer.
   b. The sensing element for the space temperature sensor shall be thermistor type providing the following.

      1) Element Accuracy: + /- 1.0°F.
      2) Operating Range: 55 to 95°F.
      3) Set Point Adjustment Range: 55 to 95°F.
      4) Calibration Adjustments: None required.
      5) Installation: Up to 100 ft. from controller.
      6) Auxiliary Communications Port: as required.
      7) Local LCD Temperature Display: as required.
      8) Setpoint Adjustment Dial as required.
      9) Occupancy Override Switch as required.

   c. Auxiliary Communication Port. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the controller. RS-232 communications port shall allow the operator to query and modify operating parameters of the local room terminal unit from the portable operator's terminal.

2. Digital Display temperature sensor specifications – Wired: Wireless sensors may be used at if requested in writing and approved by owner an engineer.

   a. As called for in the sequences of operations or on the drawings, provide temperature sensors with digital displays.
   b. The sensing element for the space temperature sensor must be IC-based and provide the following.

      1) Digitally communicating with the Application Specific Controller.
      2) Mountable to and fully covering a 2 x 4 electrical junction box without the need for an adapter wall plate.
      3) IC Element Accuracy: +/- 0.9°F.
      4) Operating Range: 55 to 95°F.
      5) Setpoint Adjustment Range: User limiting, selectable range between 55 and 95°F.
      6) Display of temperature setpoint with numerical temperature values.
      7) Display of temperature setpoint graphically, with a visual Hotter/Colder setpoint indication.
      8) Calibration: Single point, field adjustable at the space sensor to +/- 5°F.
      9) Installation: Up to 100 ft. from controller.
      10) Auxiliary Communications Port: included.
      11) Local OLED Temperature Display: included.
      12) Display of Temperature to one decimal place.
      13) Temperature Setpoint Adjustment included.

14) Occupancy Override Function included.

c. Auxiliary Communication Port. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the controller. RS-232 communications port shall allow the operator to query and modify operating parameters of the local room terminal unit from the portable operator's terminal. Alternatively, room temperature sensor may have wireless connectivity to tool software in lieu of aux communication port.

3. Provide the following options as they are called for in the sequences or on the drawings:

a. Setpoint Adjustment. The setpoint adjustment function shall allow for modification of the temperature by the building operators. Setpoint adjustment may be locked out, overridden, or limited as to time or temperature through software by an authorized operator at any central workstation, Building Controller, room sensor two-line display, or via the portable operator's terminal.
b. Override Switch. An override button shall initiate override of the night setback mode to normal (day) operation when activated by the occupant and enabled by building operators. The override shall be limited to two (2) hours (adjustable.) The override function may be locked out, overridden, or limited through software by an authorized operator at the operator interface, Building Controller, room sensor two-line display or via the portable operator's terminal.
c. Space Combination Temperature and Humidity Sensors. Each controller performing space temperature control shall be provided with a matching room temperature sensor, which also includes the ability to measure humidity for either monitoring or control purposes. The combination temperature and humidity sensors shall have the same appearance as the space temperature sensors. Humidity elements shall measure relative humidity with a +/- 2% accuracy over the range of 10 to 90% relative humidity. Humidity element shall be an IC (integrated circuit) sensing element. Humidity sensing elements shall be removable and field replaceable if needed.

B. Temperature Sensors

1. All temperature sensors shall meet the following specifications:

a. Accuracy: Plus or minus 0.2 percent at calibration point.
b. Vibration and corrosion resistant.

2. Space temperature sensors shall meet the following specifications:

a. 10k ohm or higher type 2 thermistors.

3. Insertion Elements in Ducts shall meet the following specifications:

a. Single point 10k or 100k ohm thermistor.
b. Use where not affected by temperature stratification.
c. The sensor shall reach more than 1/3 the distance from the duct wall.

d. Junction box for wire splices.

4. Averaging Elements in Ducts shall meet the following specifications:

   a. 72 inches long.
   b. Flexible.
   c. Use where prone to temperature stratification, in front of coils, or where ducts are larger than 9 sq. ft.
   d. Junction box for wire splices.

5. Insertion Elements for Liquids shall meet the following specifications:

   a. Platinum RTD with 4-20mA transmitter.
   b. Threaded mounting with matching well.
   c. Brass well with minimum insertion length of 2-1/2 inches for pipes up to 4" diameter.
   d. Brass well with insertion length of 6 inches for pipes up to 10" diameter.
   e. Junction box for wire splices.

6. Outside-Air Sensors Platinum RTD with 4-20mA transmitter:

   a. Watertight enclosure, shielded from direct sunlight.
   b. Circulation fan.
   c. Watertight conduit fitting.

C. Where called for in the sequences of operations, provide the following feature on space sensors and thermostats:

1. Security Sensors: Stainless-steel cover plate with insulated back and security screws.
2. Space sensors with setpoint adjust: Plain white plastic cover with slide potentiometer to signal a setpoint adjustment to the DDC.
3. Space Sensors with LCD display:

   a. Operator buttons for adjusting setpoints, setting fans speeds and overriding unit to on/off.
   b. Graphical LCD icons for signaling heating/cooling mode, fans speed, schedule mode, actual temperature and current setpoint.

D. Humidity Sensors shall meet the following specifications:

1. Bulk polymer sensor element.
2. Accuracy: 2 percent full range with linear output.
3. Room Sensors: With locking cover matching room thermostats, span of 0 to 100 percent relative humidity.
4. Duct and Outside-Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

E. Air Static Pressure Transmitter shall meet the following specifications:

1. Non-directional sensor with suitable range for expected input, and temperature compensated.
2. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
3. Output: 4 to 20 mA.
4. Building Static-Pressure Range: 0 to 0.25 inches wg.
5. Duct Static-Pressure Range: 0 to 5 inches wg.
6. Pre-Filter Range: 0 to 2 inches.
7. Final Filter Range: 0 to 2 inches.

F. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; proportional output 4 to 20 mA.

G. Equipment operation sensors as follows:

1. Status Inputs for Fans: Adjustable type current sensing relay or current transformer with 4-20 mA transmitter attached.
2. Status Inputs for Pumps: Adjustable type current sensing relay or current transformer with 4-20 mA transmitter attached.
3. Status Inputs for direct drive electric motors: Current-sensing relay with current transformers, adjustable and sized for 175 percent of rated motor current.
4. Status inputs for belt drive electric motors: Adjustable type current sensing relay or current transformer with 4-20 mA transmitter attached.

H. Electronic Valve/Damper Position indication: Visual scale indicating percent of travel. Feedback is required where multiple actuators share the same control signal.

I. Water-Flow Switches: Pressure-flow switches of bellows-actuated mercury or snap-acting type, with appropriate scale range and differential adjustment, with stainless-steel or bronze paddle. For chilled-water applications, provide vapor proof type.

J. Air Differential Pressure Switches: Diaphragm type air differential pressure switches with die cast aluminum housing, adjustable setpoint, minimum 5-amp switch rating at 120VAC, SPDT switches, and the switch pressure range shall be suited for the application. Provide Dwyer or equal. These switches shall be utilized for filter status.

K. Leak detectors: Provide spot leak detectors that can be secured to the floor or secured to a drain pan. The detection shall use a microchip controlled energized probes. The detector shall operate on 24Vor less. Provide a way to adjust the height of the leak probes. The SPDT contacts shall be inside a watertight enclosure.

L. Current switches: Adjustable trip point. Detection of belt loss and motor failure and LED status. Dry contract output. Sizing according to motor load.

M. Turbine Flow Meter: ONICON MODEL F-1210 Dual Turbine. The flow meter shall be hand-insertable up to 400 psi. The flow meter shall have two contra-rotating axial turbines, with electronic impedance-based sensing and an averaging circuit to reduce measurement errors due to swirl and flow profile distortion. Wetted metal components shall be nickel-plated brass (unless optional 316 SS is otherwise specified). Optional 316 SS construction is required for HW applications operating over 250º F, and for any application in non-metallic pipe. The maximum operating temperature shall be 280º F, 300º F peak. Each flow meter shall be individually wet calibrated against a primary volumetric

standard that is accurate to within ± 0.1% and traceable to N.I.S.T.*. The manufacturer's certificate of calibration shall be provided with each flow meter. Accuracy shall be within ± 0.5% of rate at the calibrated velocity, within ± 1% of rate over a 10:1 turndown (3.0 to 30 ft/s) and within ± 2% of rate over a 50:1 turndown (from 0.4 to 20 ft/s). The flow meter shall include two integral analog output(s), 4-20 mA, 0-10 V, (Optional 0-5 V). The flow meter shall be covered by the manufacturer's two-year warranty.

N. Airflow Monitoring Station: Ebtron Gold Series flow station. Approved equals are Air Monitor Corp model OAM II or Trane Traq damper. Provide where indicated, a complete, dedicated Outdoor Airflow Measurement System capable of directly measuring the airflow through an outside air inlet / opening and providing the measured airflow values via a local display, multiple analog outputs, and a single serial output for BACnet or Modbus.

1. The Outdoor Airflow Measurement System shall consist of a dedicated monitor / transmitter and flow sensing element(s) combined to create a complete system. The System shall be factory calibrated and configured based on the application and type of installation. The Airflow Measurement System shall be tested in accordance with ANSI/AMCA standard 610 and licensed to bear the AMCA Certified Ratings program seal for airflow measurement accuracy in accordance with AMCA Publication 611.
2. Flow Measurement Technology: The Airflow Measurement System shall utilize the uniform static differential pressure field created by air moving across a fixed inlet that has a factory calibrated and AMCA certified flow equation. The system shall use the actual air stream temperature and absolute pressure to provide Actual and Standardized instantaneous airflow rate information.
3. Transmitter: The transmitter shall be housed in a NEMA 1 enclosure [NEMA 4X enclosure; NEMA 4X enclosure with heater and insulation], with an integral color graphic display and four button keypads for use during the configuration and field characterization process. The display shall be configurable to indicate four (4) measured process variables (volume, velocity, temperature, pressure) during normal operation. The transmitter shall utilize a pair of stacked transducers for each channel. The transmitter shall incorporate an absolute pressure sensing system in order to provide automatic airflow compensation at the installed elevation. The transmitter shall incorporate temperature sensor input(s) as required to perform continuous airflow density compensation for each channel.
4. The Transmitter shall provide BACnet MS/TP (MODBUS RTU) and four (4), field configurable analog outputs designed to interface with the building automation system (BAS). The ability to perform configuration changes and field characterization shall be accomplished via the user interface/display, the need for additional utility software shall not be required. The transmitter shall be the Air Monitor OAM II.
5. Flow sensing elements (For use with Louvers and Rain Hoods): The flow sensing element(s) shall be constructed of 316 SS and only materials that are designed to resist corrosion due to the presence of salt or chemicals in the airstream. The flow sensing element(s) shall not be affected by the presence of moisture, dirt or debris in the airstream and shall not be affected by gusting wind. Flow sensing element types adversely affected by moisture in the airstream, such as thermal dispersion, shall not be allowed. The flow sensing element(s) shall be the Air Monitor unisensor type.
6. Airflow Station, flow sensing elements mounted in a factory constructed frame (For use in ducts and plenum openings): The flow sensing element(s) shall be constructed of 316 SS and other materials that resist corrosion due to the presence of

salt or chemicals in the airstream. Sensors shall be factory mounted in an airflow station constructed of 14 ga. [18 ga. for circular units] galvanized steel, 8" deep casing with 90º connecting flanges and a galvanized expanded metal sheet. The airflow station shall have the flow elements manifolded together with ¼" SS tubing and ¼" compression fittings for field installation. The reference airflow temperature sensor shall be mounted in the Airflow Station. The airflow station shall be the Air Monitor OAM II – AFS type.

7. The Outdoor Airflow Measurement System shall provide airflow measurement accuracy of +/- 5% of reading within the factory calibrated velocity range. The System shall be capable of measuring outdoor airflow velocities from 100 to 3000 SFPM. The System's readings shall not be affected by the presence of moisture, dirt or debris in the airstream and shall be unaffected by gusting wind. The measured airflow shall be density corrected for ambient temperature variances and atmospheric pressure due to site altitude.
8. The Outdoor Airflow Measurement System shall be the OAM II as manufactured by Air Monitor Corporation, Santa Rosa, California.

2.16 ELECTRO-MECHANICAL THERMOSTATS

A. Electric Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point. Setpoint shall be adjustable.

1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.
3. Automatic low limits in all classroom equipment and air handling equipment that has limited access to the equipment. Manual reset limits used on all RTU's and AHU's.

B. Electric space thermostats: Provide a charged element type stat with snap acting SPDT switch. The switch shall be rated for 16A or 1HP at 120V.

C. Aquastat: Provide a charged element type stat with snap acting SPDT switch. The switch shall be rated for 16A or 1HP at 120V.

2.17 AUTOMATIC CONTROL VALVES

A. Manufacturers:

1. Belimo.
2. Siemens.
3. Johnson Controls.
4. Seibe Environmental.

B. General:

1. All automatic control valves shall be fully proportioning, unless specified otherwise. The valves shall be quiet in operation and fail-safe in either normally open or normally closed position in the event of control air failure. All valves shall be capable of operating at varying rates of speed to correspond to the exact dictates of the

controllers and variable load requirements. The valves shall be capable of operating in sequence with other valves and/or dampers when required by the sequence of operation. All control valves shall be sized by the control vendor and shall be guaranteed to accommodate the flow rates as scheduled. All control valves shall be suitable for the pressure conditions and shall close against the differential pressures involved. Body pressure rating and connection type construction shall conform to fitting and valve schedules. Control valve operators shall be sized to close against a differential pressure equal to the design pump heads plus 10 percent.

2. Power for control valves, unless specifically stated otherwise, shall be 24VAC.
3. Cold water, and hot water, throttling type, and bypass valves shall have equal percentage flow characteristics. Full port ball valves are unacceptable.
4. Unless otherwise specified, control valves 2 inches and smaller shall have cast iron or bronze bodies with screwed NPT connections.
5. Valves between 2-1/2 inch and larger shall have cast iron bodies with flanged connections.
6. All automatic control valves installed exposed to the elements shall be provided with electric actuators with operating characteristics and accessories as described in herein. Actuators shall have nema 4X enclosure and heater to prevent condensation.
7. All automatic control valves controlled by the BAS shall be furnished by the controls contractor unless noted otherwise in these documents.
8. All automatic control valves shall be installed by the mechanical trade.
9. Sizing of modulating water control valves shall not cause a pressure drop exceeding 3.5 PSI.
10. The controls contractor shall provide wiring as follows:

    a. Power wiring for electric valve actuators shall be provided by the controls contractor and installed by a licensed electrician. Coordinate with electrical trade.
    b. All wiring between the central building automation system (BAS) and the valve actuator shall be wired by the controls contractor.
    c. All wiring between the valve actuator and their associated thermostats, pressure switches, control devices, etc. shall be wired by the controls contractor.
    d. All wiring shall comply with code requirements. Segregate high and low voltage wiring & circuits and segregate the FAS and controls (BAS) terminals.

C. Hot Water / Condenser Water / Control Valves

1. Single-seated.
2. Fully proportioning with modulating plug or V-port inner valves.
3. Body pressure rating and connection type construction shall conform to fitting and valve schedules. The ANSI rating of the valve shall match the ANSI rating of the piping in which the valve is installed. Minimum ANSI rating shall be ANSI 125.
4. Stainless steel stems and trim.
5. Spring loaded Teflon packing
6. Quiet in operation.
7. Fail-safe in either normally open or normally closed position in the event of power failure.
8. Capable of operating in sequence with other valves and/or dampers when required by the sequence of operation.

9. Capable of operating at varying rates of speed to correspond to the exact dictates of the controller and variable load requirements.

D. Differential Pressure Control Valves:

1. Provide for all water systems where modulating water flow conditions are required to prevent excessive pump pressure build-up. Provide a valve for each closed loop water system. Valve to be globe type. Provide valves 2" and smaller with screwed end bodies and provide valves 2-1/2" and larger with flanged ends.

E. Butterfly Valves

1. Furnish automatic butterfly valves for isolation requirements as shown on the drawings or required herein.
2. Butterfly valves shall have body ratings in accordance with the piping specifications.
3. Valves that are in high static locations or where flanges are ANSI300 per the piping design shall be high performance, fully lugged with carbon steel body ANSI 300 as required by pipe specifications.
4. Valves that are in locations where ANSI150 flanges are allowed shall be ANSI 150 valves.
5. Valves shall be bubble tight with 316 stainless steel disc, stainless steel shaft and reinforced Teflon seat.
6. Actuators shall be fail in place with factory mounted open and closed position limit switches mounted.
7. Provide fail in place, electric actuators with waterproof enclosure and crankcase heater for actuator and accessories mounted outside.
8. Provide manual override hand wheels for each valve.
9. Butterfly valves will only be approved for cooling tower bypass and all two-position (open or close) applications.
10. Valves must have full lug type body connections.

2.18 ELECTRONIC ACTUATOR SPECIFICATION

A. Manufactures:

1. Belimo.
2. Siemens.

B. ELECTRONIC VALVE ACTUATORS

1. Actuator shall be fully modulating, floating (tri-state), two position, and/or spring return as indicated in the control sequences. Specified fail safe actuators shall require mechanical spring return.
2. Modulating valves shall be positive positioning, responding to a 2-10VDC or 4-20mA signal. There shall be a visual valve position indicator.
3. The actuator shall have the capability of adding auxiliary switches or feedback potentiometer if specified.
4. Actuator shall provide minimum torque required for proper valve close-off. The actuator shall be designed with a current limiting motor protection. A release button

(clutch) or handle on the actuator shall be provided to allow for manual override (except when actuator is spring return type).

5. Actuators shall be UL listed.

C. ELECTRONIC DAMPER ACTUATORS

1. Actuator shall be direct coupled (over the shaft), enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The actuator-to-shaft clamp shall use a "V" bolt and "V" shaped, toothed cradle to attach to the damper shaft for maximum holding strength. Single bolt or set screw type fasteners are not acceptable.
2. Actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator. End switches to deactivate the actuator at the end of rotation or magnetic clutch are not acceptable.
3. For power-failure/safety applications, a mechanical, spring return mechanism shall be used.
4. Actuators with spring return mechanisms shall be capable of either clockwise or counterclockwise spring return operation by simply changing the mounting orientation.
5. Proportional actuators shall accept a 2-10VDC, 4-20mA signal.
6. All actuators shall have an external manual gear release (clutch) or manual crank to aid in installation and for allowing manual positioning when the actuator is not powered.
7. All actuators shall have an external direction of rotation switch to aid in installation and to allow proper control response.
8. Actuators shall be provided with a factory-mounted 3-foot electrical cable and conduit fitting to provide easy hook-up to an electrical junction box.
9. Actuators shall be listed under Underwriters Laboratories Standard 873 and Canadian Standards Association. They must be manufactured under ISO 9001.
10. Dampers actuators shall be sized for not less than 7 in-lbs. per square foot of damper section.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the architect/engineer for resolution before rough-in work is started.

B. 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.

C. 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—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor’s work with the work of others.

3.2 INSTALLATION

A. Provide all relays, switches, sources of emergency and UPS battery back-up electricity and all other auxiliaries, accessories, and connections necessary to make a complete operable system in accordance with the sequences specified. All field wiring shall be by this contractor.

B. Install controls so that adjustments and calibrations can be readily made. Controls are to be installed by the control equipment manufacturer.

C. Mount surface-mounted control devices on brackets to clear the final finished surface on insulation.

D. Install equipment level and plumb.

E. Install control valves horizontally with the power unit up.

F. Unless otherwise noted, install wall mounted thermostats and humidistat 48" above the floor measured to the center line of the instrument but level with adjacent light switching devices. or as otherwise directed by the Architect.

G. Install averaging elements in ducts and plenums in horizontal crossing or zigzag pattern.

H. Install outdoor sensors in perforated tube and sunshield.

I. Install damper motors on outside of duct in protected areas, not in locations exposed to outdoor temperatures.

J. Install labels and nameplates on each control panel listing the name of the panel referenced in the graphics and a list of equipment numbers served by that panel.

K. Furnish hydronic instrument wells, valves, and other accessories to the mechanical contractor for installation.

L. Furnish automatic dampers to mechanical contractor for installation.

3.3 ELECTRICAL WIRING SCOPE

A. This contractor shall be responsible for power that is not shown on the electrical drawings, to controls furnished by this contractor. If power circuits are shown on the electrical drawings, this contractor shall continue the power run to the control device. If power circuits are not shown, this contractor shall coordinate with the electrical contractor to provide breakers at distribution panels for power to controls. This contractor is then responsible for power from the distribution panel.

1. Coordinate panel locations. If enclosures for panels are shown on the electrical drawings, furnish the enclosures according to the electrician's installation schedule.

B. This contractor shall not be responsible for power to control panels and control devices that are furnished by others unless it is part of the control interlock wiring.

C. Refer to Coordination section for what devices this contractor is responsible to mount, and which are turned over to others to mount.

D. This contractor shall be responsible for wiring of any control device that is furnished as part of this section of specification.

E. Wiring for controls furnished by others:

1. Provide control wiring for HVAC controls furnished by others. Wiring may include, but not limited to, the following items:

a. Thermostats.
b. Condensers.
c. Chiller control devices shipped loose.
d. Leak detectors.
e. Humidifier controls.
f. Refrigerant leak monitoring systems.
g. Exhaust or Purge fans.
h. Manual switches for HVAC equipment (not shown on electrical drawings).
i. Emergency ventilation switches (not shown on electrical drawings).
j. Emergency shutdown switches (not shown on electrical drawings).

F. Provide network wiring for equipment that is called to be integrated to the BAS.

3.4 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. All low voltage control wiring shall be class 2. Control wiring that is not class 2 shall be run in separate conduits from class 2 wiring.

B. Floor level network wiring between terminal units can be combined with thermostat and other low voltage wiring in the same conduit. All other network wiring shall be in dedicated conduits.

C. Install raceways, boxes, and cabinets according to Division 26 Section "Raceways and Boxes."

D. Install building wire and cable according to Division 26 Section "Conductors and Cables."

E. Installation shall meet the following requirements:

1. Conceal cable and conduit, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway or conduit.
3. Install concealed cable using plenum rated cable.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of building automation system, except local individual room control cables.
7. All wiring in lab areas shall be in conduit.

8. All unsupported risers shall be rigid steel conduit. Supported risers shall be EMT.

F. Raceway located outdoors shall be in rigid conduit shall be steel, hot dip galvanized, threaded with couplings, ¾ inch minimum size, manufactured in accordance with ANSI C-80-1. Electrical metallic tubing (EMT) with compression fittings or intermediate metallic conduit (IMC) may be used as conduit or raceway where permitted by the NEC.

G. Concealed control conduit and wiring shall be provided in all spaces except in the Mechanical Equipment Rooms and in unfinished spaces. Install in parallel banks with all changes in directions made at 90 degree angles.

H. Install conduit adjacent to machine to allow service and maintenance.

I. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

J. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

K. Ground equipment.

3.5 COMMUNICATION WIRING

A. Network cable jacket color must meet owner cable standards. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.

B. Do not install communication wiring in raceway and enclosures containing Class 1 wiring.

C. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.

D. Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.

E. Cable bundling:

1. Cabling run open air in accessible areas can be bundled with other class 2 low voltage cabling.
2. Cabling run between terminal units in conduits above ceilings or under floors or in inaccessible areas can be bundled with other class 2 low voltage cabling.
3. Cabling run between floors shall be in a communication only conduit.
4. Conduit run long distances between utility rooms or between buildings shall be in a communication only conduit.
5. Ethernet cabling shall be in a communication only conduit.
6. Fiber optics can be run with Ethernet and RS485/ TP/FT-10 cabling as long as the conduit is bent to fiber optic standards and junction boxes are sized for fiber optic use.

F. RS485 Cabling:

1. RS485 shall use plenum rated low capacitance, 20-24 gauge, twisted shielded pair.
2. The shields shall be tied together at each device.
3. The shield shall be grounded at one end only and capped at the other end.
4. Provide end of line (EOL) termination devices at each end of the RS485 network or subnetwork run, to match the impedance of the cable, 100 to 120ohm.

G. TP/FT-10 channel type Cabling:

1. Uses transceivers that conform to the ISO/IEC 14908-2 Free-Topology Twisted Pair Channel Specification.

H. Ethernet Cabling:

1. Ethernet shall not be run with any Class 1 or low voltage Class 2 wiring.
2. CAT5e or CAT6, unshielded twisted pair (UTP) cable shall be used for BAS Ethernet.
3. Solid wire shall be used for long runs, between mechanical rooms and between floors. Stranded cable can be used for patch cables and between panels in the same mechanical room up to 50 feet away.
4. When the BAS Ethernet connects to an Owner's network switch, document the port number on the BAS As-builts.

I. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lightning arrestor shall be installed according to the manufacturer's instructions.

J. All runs of communication wiring shall be unspliced length when that length is commercially available.

K. All communication wiring shall be labeled to indicate origination and destination data. All communication wiring must have a purple jacket.

L. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

3.6 IDENTIFICATION

A. Control Equipment and Device labeling:

1. Labels and tags shall match the unique identifiers shown on the as-built drawings.
2. All Enclosures shall be labeled to match the as-built drawing by either control panel name or the names of the DDC controllers inside.
3. All sensors and actuators shall be labeled.
4. Airflow measurement arrays shall be tagged to show flow rate range for signal output range, duct size, and pitot tube AFMS flow coefficient.
5. Duct static pressure taps shall be tagged at the location of the pressure tap.
6. Each device inside enclosures shall be tagged.
7. Terminal equipment need only have a tag for the unique terminal number, not for each device. Match the unique number on:

a. First, the design drawings, or
b. Second, the control as-builts, or
c. Third, the DDC addressing scheme.

8. Tags on the terminal units shall be displayed on the Operator Workstation Graphics.

B. Tags shall be mechanically printed on permanent adhesive backed labeling strips, 12 point height minimum.

C. Manufacturers' nameplates and UL or CSA labels are to be visible and legible after equipment is installed.

D. Identification of Wires

1. Tag each wire with a common identifier on each end of the wire, such as in the control panel and at the device termination. Use shrink wrap labels.
2. Tag each network wire with a common identifier on each end. Network cabling must be in purple jackets.
3. Tag each 120V power source with the panel and breaker number it is fed by.

E. Identification of Conduits:

1. Identify the low voltage conduit runs as BAS conduit, power feeds not included.
2. Identify each electric box, junction box, utility box and wiring tray with a blue paint mark or blue permanent adhesive sticker.
3. For conduit runs that run more than 8 ft between junction boxes in 1 room, place a blue identifier at least every 8 feet.
4. Place a blue identifier on each side of where a conduit passed through a wall or other inaccessible path.
5. Identify all BAS communication conduits the same as above.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
3. Calibration test controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

B. Replace damaged or malfunctioning controls and equipment.

1. Start, test, and adjust building automation systems.
2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.

3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

3.8 DDC TEMPERATURE CONTROLS CONTRACTOR (TCC) BALANCER COORDINATION

A. First Day: The TCC shall have a technical representative present with the Balancer on the first day of balancing for a minimum of 4 hours of active balancing - temperature controls coordination.

B. Remainder of Balancing: The TCC shall either:

1. Have a technical representative continuously present at each step of the continuation of the balancing OR
2. Furnish the Balancer with the latest DDC software any required interface device for the duration of the balancing process. This option includes instructing the Balancer in the use of the software until the Balancer is proficient in the use of the software. Software and interface device shall be returned to TCC when balance report has been accepted. There shall be no charge to the owner or to the Balancer for the use of the software, OR
3. Furnish the Balancer with the latest DDC software and any required interface device, and a portable computer for the duration of the balancing process. This option includes instructing the Balancer in the use of the portable computer and the software until the Balancer is proficient in the use of the software. Portable computer, interface device, and software shall be returned to the TCC when balance report has been accepted. There shall be no charge to the Owner or to the Balancer for the use of the software or portable computer.

3.9 SYSTEM CHECKOUT AND STARTUP

A. Inspect each termination in the control panels and devices to make sure all wires are connected according to the wiring diagrams and all termination are tight.

B. After the controls devices and panels are installed and power is available to the controls, perform a static checkout of all the points, including the following. Submit a Point-To-Point report to the engineer including BAS values, measured values, successful function and issues found:

1. Inspect the setup and reading on each temperature sensor against a thermometer to verify its accuracy.
2. Inspect the setup and reading on each humidity sensor against a hygrometer to verify its accuracy.
3. Inspect the reading on each CO2 sensor using a calibration kit to verify the sensor range accuracy matches the DDC setup.
4. Inspect the reading of each status switch to verify the DDC reads the open and close correctly.
5. Command each relay to open and close to verify its operation.
6. Command each 2-position damper actuator to open and close to verify operation.
7. Command each 2-position valve to open and close to verify operation.
8. Ramp each modulating actuator to 0%, 25%, 50%, 75% and 100% to verify its operation.

9. Ramp each modulating output signal, such as a VFD speed, to verify its operation.
10. Test each safety device with a real life simulation, for instance check freezestats with ice water, water detectors with water, etc.

C. Document that each point was verified and operating correctly. Correct each failed point before proceeding to the dynamic startup.

D. Verify that each DDC controller communicates on its respective network correctly.

E. After all of the points are verified, and power is available to the mechanical system, coordinate a startup of each system with the mechanical contractor. Include the following tests:

1. Start systems from DDC.
2. Verify that each setpoint can be met by the system.
3. Change setpoints and verify system response.
4. Change sensor readings to verify system response.
5. Test safety shutdowns.
6. Verify time delays.
7. Verify mode changes.
8. Adjust filter switches and current switches for proper reactions.
9. Adjust proportional bands and integration times to stabilize control loops.

F. Perform all program changes and debugging of the system for a fully operational system.

G. Verify that all graphics at the operator workstations correspond to the systems as installed. Verify that the points on the screens appear and react properly. Verify that all adjustable setpoints and manual commands operate from the operator workstations.

H. Setup and test alarms described in the sequence of operation and points summary.

I. After the sequence of operation is verified, setup the trends that are listed in the sequence of operations and points summary for logging and archiving.

3.10 SYSTEM COMMISSIONING, DEMONSTRATION AND TURNOVER

A. At the time of project turnover, time schedules, alarm definitions and trend history definitions must be defined and programmed.

1. Time schedules:

a. Define multiple schedules. As a minimum, schedule shall be defined as follows, owner request additional schedules be defined. All schedules may be linked to a master schedule for the building.

1) Administration.
2) Gyms.
3) Multipurpose rooms.
4) Cafeteria.
5) Waiting Room.
6) Storage Areas.

7) Office Areas.

B. Integrations will have the following meet the following conditions:

1. All physical I/O must be reflected in the graphical environments.
2. Objects shall be mapped with both read and write capabilities to the extent possible. Minimum write points are as follows.

   a. Occupied mode.
   b. Unoccupied mode.
   c. Warmup mode.
   d. Economizer.
   e. Room setpoint (or room setpoint parameters).

3. All control loop setpoints shall be unbundled/mapped and reflected in the graphical environment. Some examples of control loop setpoints are:

   a. Room occ temp setpoint.
   b. Room unocc cooling setpoint.
   c. Room unocc heating setpoint.
   d. Room occ max setpoint.
   e. Room occ min setpoint.
   f. Discharge temp setpoint.
   g. Fan speed setpoint.
   h. Bldg. pressure setpoint.
   i. VAV cool min flow setpoint.
   j. VAV cool max flow setpoint.
   k. VAV heat min flow setpoint.
   l. VAV heat max flow setpoint.

4. All modes points will be reflected in the graphical environments:

   a. Occupied mode.
   b. Unoccupied mode.
   c. Warmup mode.
   d. Cooldown mode.
   e. Economizer mode.
   f. Dehum mode.

5. Optimization sequences present in the parent system shall be implemented in integrated systems.

   a. Pressure reset based on damper position.
   b. Discharge temp reset based on valve or damper position or outside air condition.
   c. Warmup based on room temp, time schedule and mass algorithm.
   d. Central plant or Air handler notification of heat/cool request.

6. Alarm notifications shall occur as defined in district standard details.

a. Alarm modes, time delays and parent systems shall be observed to prevent nuisance alarms.
b. All alarms will exist in the parent system. Alarm objects within the integrated system's environment may are not acceptable.

C. Functional Testing: The BAS Contractor shall demonstrate functional aspects for the owner engineer testing all aspects of controls operation including modes, control loops, alarm functions, trending, and time of day scheduling. This process will occur until engineer and owner acceptance has been obtained.

D. Building Automation System Commissioning: If specified, the BAS contractor shall conduct functional testing in accordance with commissioning specifications.

1. 230800 Commissioning of Mechanical System.

E. The BAS contractor shall fix punch list items within 30 days of acceptance.

F. When the system performance is deemed satisfactory in whole or in part by these observers, the system parts will be accepted for beneficial use and placed under warranty.

G. User Occupancy Meeting: The BAS contractor shall prepare documentation describing thermostat operation, thermal zoning, and user operation for owners use during user occupancy presentation.

H. Pre - User Occupancy Testing: Prior to user occupancy and after testing and balance activities are complete, BAS contractor shall conduct a pre-user occupancy test period that last one week. During the test period BAS contractor defines temporary trending and alarm conditions (beyond what has been specified) in an attempt to verify operation and reveal hidden functional issues. Contractor will call the project each day for 1 full week to check trending, alarms, and search for issues. At the end of the week, BAS contractor shall submit to engineer for review observations made during the week and trend documentation showing issues or function.

I. Post user occupancy Monitoring: Temporary trending and alarms are removed and for a period of one month, the BAS contractor calls the project each morning and searches for issues such as untuned loops, poor system response, temperature, humidity, or pressure that are out of range. In addition, BAS contractor optimizes system setpoints for efficiency comfort. During the user occupancy monitoring period, BAS contractor submits to the engineer, weekly reports containing observations on his activities.

3.11 PROJECT RECORD DOCUMENTS

A. Project Record Documents: Submit three (3) copies of record (as-built) documents upon completion of installation. Submittal shall consist of:

1. Project Record Drawings. As-built versions of the submittal shop drawings provided as AutoCAD compatible files in electronic format and as 11 x 17 inch prints.
2. Testing and Commissioning Reports and Checklists submitted electronically in PDF format. Completed versions of reports, checklists, and trend logs used to meet requirements in the Building Automation system Demonstration and Acceptance section of this specification.

3. Operation and Maintenance (O & M) Manual submitted electronically in PDF format.

    a. As-built versions of the submittal product data.
    b. Names, addresses, and 24-hour telephone numbers of installing contractors and service representatives for equipment and building automation systems.
    c. Operator's Manual with procedures for operating building automation systems, logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
    d. Programming manual or set of manuals with description of programming language and of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
    e. 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.
    f. Documentation of all programs created using custom programming language, including setpoints, tuning parameters, and object database.
    g. Graphic files, programs, and database on electronic media.
    h. List of recommended spare parts with part numbers and suppliers.
    i. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware, including computer equipment and sensors.
    j. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
    k. Licenses, guarantees, and warranty documents for equipment and systems.

B. Operating manual to serve as training and reference manual for all aspects of day-to-day operation of the system submitted electronically in PDF format. As a minimum include the following:

    1. Sequence of operation for automatic and manual operating modes for all building systems. The sequences shall cross-reference the system point names.
    2. Description of manual override operation of all control points in system.
    3. BAS system manufacturers complete operating manuals.

C. Provide maintenance manual to serve as training and reference manual for all aspects of day-to-day maintenance and major system repairs. As a minimum include the following:

    1. Complete as-built installation drawings for each building system.
    2. Overall system electrical power supply schematic indicating source of electrical power for each system component. Indicate all battery backup provisions.
    3. Photographs and/or drawings showing installation details and locations of equipment.
    4. Routine preventive maintenance procedures, corrective diagnostics troubleshooting procedures, and calibration procedures.
    5. Parts list with manufacturer's catalog numbers and ordering information.

6. Lists of ordinary and special tools, operating materials, supplies, and test equipment recommended for operation and servicing.
7. Manufacturer's operation, set-up, maintenance, and catalog literature for each piece of equipment.
8. Maintenance and repair instructions.
9. Recommended spare parts.

D. Provide Programming Manual to serve as training and reference manual for all aspects of system programming. As a minimum include the following:

1. Complete programming manuals, and reference guides.
2. Details of any custom software packages and compilers supplied with system.
3. Information and access required for independent programming of system.
4. If owner already possess items listed above, then do not provide another copy.

3.12 TRAINING

A. During System commissioning and at such time as acceptable performance of the Building Automation System hardware and software has been established, the BAS contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction during normal working hours shall be performed by a competent building automation contractor representative familiar with the Building Automation System's software, hardware, and accessories.

B. Training Plan: Contactor shall submit for approval by owner’s representative and engineer, a training agenda describing who will be conducting training, documentation used, and training topics. Training may not proceed until agenda has been approved by owner’s representative and engineer.

C. At a time mutually agreed upon, during System commissioning as stated above, the BAS contractor shall give 16-hours (or approved lesser number of hours) of onsite training on the operation of all BAS equipment. Describe its intended use with respect to the programmed functions specified. Operator orientation of the automation system shall include, but not be limited to:

1. Explanation of drawings and operator’s maintenance manuals.
2. Walk-through of the job to locate all control components.
3. Operator workstation and peripherals.
4. BLC Controller and ASC operation/sequence.
5. Operator control functions including scheduling, alarming, and trending.
6. Explanation of adjustment, calibration, and replacement procedures.

D. Additional 8-hours of training shall be given after the 30 day power user occupancy period.

END OF SECTION 230900

SECTION 236426.13 - AIR-COOLED, ROTARY-SCREW WATER CHILLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Packaged, air-cooled chillers.

1.3 DEFINITIONS

A. COP: Coefficient of performance. The ratio of the rate of heat removal to the rate of energy input using consistent units for any given set of rating conditions.

B. DDC: Direct digital control.

C. EER: Energy-efficiency ratio. The ratio of the cooling capacity given in terms of Btu/h to the total power input given in terms of watts at any given set of rating conditions.

D. IPLV: Integrated part-load value. A single-number part-load efficiency figure of merit calculated per the method defined by AHRI 550/590 and referenced to AHRI standard rating conditions.

E. kW/Ton (kW/kW): The ratio of total power input of the chiller in kilowatts to the net refrigerating capacity in tons (kW) at any given set of rating conditions.

F. NPLV: Nonstandard part-load value. A single-number part-load efficiency figure of merit calculated per the method defined by AHRI 550/590 and intended for operating conditions other than AHRI standard rating conditions.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories.
2. Performance at AHRI standard conditions and at conditions indicated.
3. Performance at AHRI standard unloading conditions.
4. Minimum and maximum evaporator flow rates.
5. Refrigerant capacity of chiller.
6. Oil capacity of chiller.
7. Fluid capacity of evaporator.
8. Characteristics of safety relief valves.

9. Minimum entering condenser-air temperature.
10. Maximum entering condenser-air temperature.
11. Performance at varying capacities with constant-design, entering condenser-air temperature. Repeat performance at varying capacities for different entering condenser-air temperatures from design to minimum in 10 deg F (6 deg C) increments.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For certification required in "Quality Assurance" Article.

B. Source quality-control reports.

C. Field Test Reports: Include startup service reports.

D. Sample Warranty: For AHRI special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each chiller to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. AHRI Certification: Certify chiller according to AHRI 590 certification program(s).

B. AHRI Rating: Rate chiller performance according to requirements in AHRI 550/590.

C. ASHRAE Compliance:

1. ASHRAE 15 for safety code for mechanical refrigeration.
2. ASHRAE 147 for refrigerant leaks, recovery, and handling and storage requirements.

D. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

E. ASME Compliance: Fabricate and label chiller to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, and include an ASME U-stamp and nameplate certifying compliance.

F. Comply with NFPA 70.

G. Comply with requirements of UL and UL Canada and include label by a qualified testing agency showing compliance.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Ship each chiller with a full charge of refrigerant. Charge each chiller with nitrogen if refrigerant is shipped in containers separate from chiller.

B. Ship each oil-lubricated chiller with a full charge of oil.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of chillers that fail in materials or workmanship within specified warranty period.

1. Extended warranties include, but are not limited to, the following:

a. Complete chiller including refrigerant and oil charge.
b. Parts and labor.
c. Loss of refrigerant charge for any reason.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Site Altitude: Chiller shall be suitable for altitude in which installed without affecting performance indicated. Make adjustments to affected chiller components to account for site altitude.

B. Performance Tolerance: Comply with the following in lieu of AHRI 550/590:

1. Allowable Capacity Tolerance: Zero percent.
2. Allowable IPLV/NPLV Performance Tolerance: Zero percent.

2.2 PACKAGED, AIR-COOLED CHILLERS

A. Approved Manufacturers:

1. Daikin.
2. Quantech.
3. York.
4. Trane.
5. Owner and Engineer pre-approved equal.

B. Description: Factory-assembled and run-tested chiller complete with base and frame, condenser casing, compressors, compressor motors and motor controllers, evaporator, condenser coils, condenser fans and motors, VFD’s, electrical power, controls, and accessories.

C. Cabinet:

1. Base: Corrosion resistant coated galvanized-steel base extending the perimeter of chiller. Secure frame, compressors, and evaporator to base to provide a single-piece unit.
2. Frame: Rigid corrosion resistant coated galvanized-steel frame secured to base and designed to support cabinet, condenser, control panel, and other chiller components not directly supported by base.
3. Casing: Corrosion resistant coated galvanized steel.
4. Finish: Coat base, frame, and casing with a corrosion-resistant coating.
5. Sound-reduction package designed to reduce sound level without affecting performance and consisting of the following:

    a. Acoustic enclosure around compressors.
    b. Reduced-speed fans with acoustic treatment.

D. Compressors:

1. Description: Positive displacement, semi-hermetically sealed. units must have electrically insulated, ceramic bearings to mitigate bearing and/or lubricant damage from stray electric current passage. Compressor shall be able to control compression ratio to optimize efficiency at all operating conditions.
2. Casing: Cast iron, precision machined for minimum clearance about periphery of rotors.
3. Rotors: Manufacturer's standard one- or two- rotor design.
4. Each compressor provided with suction and discharge shutoff valves, crankcase oil heater, and suction strainer.

E. Service: Easily accessible for field inspection and field service.

F. Capacity Control:

1. Maintain stable operation throughout range of operation. Configure to achieve most energy-efficient operation possible.
2. Operating Range: From 100 to 15 percent of design capacity.
3. Condenser-Air Unloading Requirements over Operating Range: Constant-design, entering condenser-air temperature.
4. Units shall be equipped with a variable-frequency controller, capacity control shall be both "valveless" and "stepless," requiring no slide valve or capacity-control valve(s) to operate at reduced capacity.

G. Oil Lubrication System: Consisting of pump if required, filtration, heater, cooler, factory-wired power connection, and controls.

1. Provide lubrication to bearings, gears, and other rotating surfaces at all operating, startup, shutdown, and standby conditions including power failure.
2. Thermostatically controlled oil heater properly sized to remove refrigerant from oil.
3. Factory-installed and pressure-tested piping with isolation valves and accessories.
4. Oil compatible with refrigerant and chiller components.
5. Positive visual indication of oil level.

H. Vibration Control:

1. Vibration Balance: Balance chiller compressors and drive assemblies to provide a precision balance that is free of noticeable vibration over the entire operating range.

    a. Overspeed Test: 25 percent above design operating speed.

2. Isolation: Mount individual compressors on vibration isolators.

I. Compressor Motors:

1. Motors shall be high torque, two pole, semi-hermetic type with inherent thermal protection on all three phases and cooled by suction gas.

J. Compressor Motor Controllers:

1. Each compressor shall be equipped with a VFD providing compressor speed control as a function of the cooling load. Each VFD shall provide controlled motor acceleration and deceleration, and shall provide protection for the following conditions: electronic thermal overload, over/under current, stalled motor, input and output phase loss, high load current, and current unbalance. The VFD shall provide a minimum 95% displacement power factor at all load points. Compressors used in VFD controlled units must have electrically insulated, ceramic bearings to mitigate bearing and/or lubricant damage from stray electric current passage. Compressor shall be able to control compression ratio to optimize efficiency at all operating conditions.
2. Variable-Frequency Controller:

    a. Motor controller shall be factory mounted and wired on the chiller to provide a single-point, field-power termination to the chiller and its auxiliaries.
    b. Description: Listed and labeled as a complete unit and arranged to provide variable speed by adjusting output voltage and frequency.
    c. Enclosure: Unit mounted, NEMA 250, Type 3R with hinged full-front access door with lock and key.
    d. Integral Disconnecting Means: Door-interlocked, UL 489, instantaneous-trip circuit breaker with lockable handle. Minimum withstand rating shall be as required by electrical power distribution system, but not less than 50,000 kA.
    e. Motor current at start shall not exceed the rated load amperes, providing no electrical inrush.

K. Refrigerant Circuits:

1. Refrigerant Type: R-513A. Classified as Safety Group A1 according to ASHRAE 34.

    a. Additional refrigerant types to be submitted for review by Owner and Engineer.

2. Refrigerant Compatibility: Chiller parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.

3. Refrigerant Circuit: Each shall include a thermal- or electronic-expansion valve, refrigerant charging connections, a hot-gas muffler, compressor suction and discharge shutoff valves, a liquid-line shutoff valve, a replaceable-core filter-dryer, a sight glass with moisture indicator, a liquid-line solenoid valve, and an insulated suction line.
4. Pressure Relief Device:

    a. Comply with requirements in ASHRAE 15 and in applicable portions of ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
    b. ASME-rated, spring-loaded pressure relief valve; single- or multiple-reseating type.

L. Evaporator:

1. Description: Shell-and-tube design.

    a. Direct-expansion type with single pass fluid flowing through the shell, and single pass refrigerant flowing through the tubes within the shell.

2. Code Compliance: Tested and stamped in accordance with ASME Section VIIII requirements.
3. Shell Material: Carbon steel.
4. Shell Heads: Removable carbon-steel heads located at each end of the tube bundle.
5. Fluid Nozzles: Terminated with flanged end connections for connection to field piping.
6. Tube Construction: Individually replaceable copper tubes with enhanced fin design, expanded into tube sheets.

M. Air-Cooled Condenser:

1. Coil: Coil shall be microchannel design and shall have a series of flat tubes containing multiple, parallel flow microchannels layered between the refrigerant manifolds. Tubes shall be 9153 aluminum alloy. Tubes made of 3102 alloy or other alloys of lower corrosion resistance shall not be accepted. Coils shall consist of a twopass arrangement. Each condenser coil shall be factory leak tested with high-pressure air under water. Coils shall withstand 1000+ hour acidified synthetic sea water fog (SWAAT) test (ASTM G85-02) at 120°F (49°C) with 0% fin loss and develop no leaks.
2. Fans: Condenser fans shall be propeller type arranged for vertical air discharge and individually driven by direct drive fan motors.
3. Fan Motors: Fan motors shall be weather protected, three-phase, direct-drive, TEAO, totally enclosed air-over motors with class F insulation or better.
4. Fan Guards: Steel safety guards with a heavy gauge vinyl coated corrosion-resistant coating.

N. Electrical Power:

1. Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point, field-power connection to chiller.

2. House in a unit mounted, NEMA 250, Type 3R enclosure with hinged access door.
3. Wiring shall be numbered and color-coded to match wiring diagram.
4. Install factory wiring outside of an enclosure in a raceway.
5. Field-power interface shall be to UL 489, instantaneous-trip circuit breaker with lockable handle.

    a. Disconnect means shall be interlocked with door operation.
    b. Minimum withstand rating shall be as required by electrical power distribution system, but not less than 50,000 kA.

6. Provide branch power circuit to each motor and to controls with one of the following disconnecting means:

    a. NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 60947-4-1.
    b. UL 489, motor-circuit protector (circuit breaker) with field-adjustable, short-circuit-trip set point.

7. Provide each motor with overcurrent protection.
8. Overload relay sized according to UL 1995 or an integral component of chiller control microprocessor.
9. Phase-Failure and Undervoltage Relays: Solid-state sensing with adjustable settings.
10. Provide power factor correction capacitors to correct power factor to 0.95 at full load.
11. Control Relays: Auxiliary and adjustable time-delay relays.
12. For chiller electrical power supply, indicate the following:

    a. Current and phase to phase for all three phases.
    b. Voltage, phase to phase, and phase to neutral for all three phases.
    c. Three-phase real power (kilowatts).
    d. Three-phase reactive power (kilovolt amperes reactive).
    e. Power factor.
    f. Running log of total power versus time (kilowatt-hours).
    g. Fault log, with time and date of each.

O. Controls:

1. Standalone and microprocessor based.
2. Enclosure: Share enclosure with electrical power devices or provide a separate enclosure for remote mounting in the field.
3. Operator Interface: Multiple-character digital or graphic display with dynamic update of information and with keypad or touch-sensitive display located on front of control enclosure. In either imperial or metric units, display the following information:

    a. Date and time.
    b. Operating or alarm status.
    c. Operating hours.
    d. Outdoor-air temperature if required for chilled-water reset.

e. Temperature and pressure of operating set points.
f. Entering and leaving temperatures of chilled water.
g. Refrigerant pressures in evaporator and condenser.
h. Saturation temperature in evaporator and condenser.
i. No cooling load condition.
j. Elapsed time meter (compressor run status).
k. Antirecycling timer status.
l. Percent of maximum motor amperage.
m. Current-limit set point.
n. Number of compressor starts.

4. Control Functions:

a. Manual or automatic startup and shutdown time schedule.
b. Entering and leaving chilled-water temperatures, control set points, and motor load limits. Chilled-water leaving temperature shall be reset based on return-water temperature.
c. Current limit and demand limit.
d. External chiller emergency stop.
e. Antirecycling timer.
f. Automatic lead-lag switching.
g. Variable evaporator flow.
h. Thermal storage.

5. Manually Reset Safety Controls: The following conditions shall shut down chiller and require manual reset:

a. Low evaporator pressure or high condenser pressure.
b. Low chilled-water temperature.
c. Refrigerant high pressure.
d. High or low oil pressure.
e. High oil temperature.
f. Loss of chilled-water flow.
g. Control device failure.

6. Trending: Capability to trend analog data of up to five parameters simultaneously over an adjustable period and frequency of polling.
7. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: view only; view and operate; and view, operate, and service.
8. Control Authority: At least four conditions: Off, local manual control at chiller, local automatic control at chiller, and automatic control through a remote source.
9. Interface with DDC System for HVAC: Factory-installed hardware and software to enable the DDC system for HVAC to monitor, control, and display chiller status and alarms.

a. ASHRAE 135 (BACnet) communication interface with the DDC system for HVAC shall enable the DDC system for HVAC operator to remotely control and monitor the chiller from an operator workstation. Control features and monitoring points displayed locally at chiller control panel shall be available through the DDC system for HVAC.

P. Insulation:

1. Material: Closed-cell, flexible elastomeric, thermal insulation complying with ASTM C534, Type I for tubular materials and Type II for sheet materials.
2. Thickness: 3/4 inch (19 mm)
3. Factory-applied insulation over cold surfaces of chiller components.

    a. Adhesive: As recommended by insulation manufacturer and applied to 100 percent of insulation contact surface. Seal seams and joints.

4. Apply protective coating to exposed surfaces of insulation to protect insulation from weather.

Q. Accessories:

1. Factory-furnished, chilled-water flow switches either factory mounted or for field installation.
2. Individual compressor suction and discharge pressure gages with shutoff valves for each refrigerant circuit.
3. Factory-furnished neoprene isolators for field installation.
4. Tool Kit: Chiller manufacturer shall assemble a tool kit specially designed for use in serving the chiller(s) furnished. Include special tools required to service chiller components not readily available to Owner service personnel in performing routine maintenance. Place tools in a lockable case with hinged cover. Provide a list of each tool furnished and attach the list to underside of case cover.
5. Control Electrical Requirements:

    a. Power Connection: Fed through integral transformer.

2.3 SOURCE QUALITY CONTROL

A. Perform functional tests of chillers before shipping.

B. Factory run test each air-cooled chiller with water flowing through evaporator.

C. Factory test and inspect evaporator and condenser according to ASME Section VIIII.

D. For chillers located outdoors, rate sound power level according to AHRI 370.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine chillers before accepting delivery. Reject chillers that are damaged.

3.2 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Engage qualified mechanical contractor to install chiller and make final connections.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain chillers. Video record the training sessions.

END OF SECTION 236426.13

SECTION 321316 – DECORATIVE CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Top surface retarder.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of exposed color or texture indicated.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer of decorative concrete paving systems.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of decorative concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches by 96 inches.

PART 2 - PRODUCTS

2.1 TOP SURFACE RETARDER

A. Water-Based Top Surface Retarder: Factory-packaged, applied per manufacturer's standards and instructions to facilitate exposure of aggregates consistently.

1. Exposed Aggregate Concrete Type 1 – Finish:

a. Aggregate Exposure: 1/8-inch to 1/4-inch.
b. Aggregate Exposure Depth: 1/32-inch.

2. Exposed Aggregate Concrete Type 2 – Finish:

    a. Aggregate Exposure: 3/8-inch to 1/2-inch.
    b. Aggregate Exposure Depth: 5/32-inch.

3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

    a. Brickform; a division of Solomon Colors; Select-Etch.

PART 3 - EXECUTION

3.1 PREPARATION

A. Apply to concrete immediately after final finishing pass.

3.2 TOP SURFACE RETARDER

A. Top Surface Retarder Exposed Aggregate Concrete Type 1 – Finish: After final finishing pass, apply retarder to concrete according to manufacturer's written instructions.

B. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to paving surfaces according to manufacturer's written instructions and as follows:

    1. After final power floating, apply the following finish:

        a. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
        b. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
        c. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16- to 1/8-inch deep with a stiff-bristled broom, perpendicular to line of traffic.

END OF SECTION 321316

SECTION 321813 – SYNTHETIC TURF SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the Following: Synthetic turf surfacing, including artificial turf, subbase preparation and placement of aggregate base course, and turf infill.

1.2 REFERENCES

A. ASTM International (ASTM), www.astm.org:

1. ASTM D1335 - Test Method for Tuft Bind of Pile Yarn Floor Coverings.
2. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.
3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
4. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.
5. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
6. ASTM F1015 - Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces.
7. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment.
8. ASTM F1951 - Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.

B. International Play Equipment Manufacturers Association (IPEMA), www.ipema.org.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: Conduct conference at Project site following award of contract. Review methods and procedures related to synthetic turf surfacing installation including, but not limited to, the following:

1. Review survey of subbase conditions.
2. Review delivery, storage, and handling procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product specified.

B. Shop Drawings: Provide installation details including roll and seaming layout, methods of attachment and details at penetrations and terminations.

1. Show layout of marking plan if any, indicating details for specified activity areas.

C. Samples: For each type of synthetic turf surfacing indicated.

1. Minimum 12-by-12-inch square sample of synthetic turf surface with tufted perimeter line and carpet seam.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer.

B. Installation Schedule: Showing planned commencement and completion dates for each portion of the Work; include critical dates indicated on Owner's Project schedule.

C. Warranty: Sample warranty specified in this Section.

1.6 MAINTENANCE MATERIAL SUBMITTALS

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

1. Seaming Materials: Sufficient quantity for 100 sq. ft.
2. Synthetic Turf Fiber: Sufficient quantity for 100 sq. ft.
3. Infill Material: Sufficient quantity for 100 sq. ft., in weatherproof bags.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing synthetic turf surfacing materials similar to those specified for this Project, with a record of successful service for a minimum of 5 years.

B. Installer Qualifications: An experienced installer certified by the manufacturer, employing workers trained and approved by manufacturer, who has successfully installed work similar in design and extent to that required for the Project, in not less than 5 projects of similar scope.

C. Source Limitations: Obtain synthetic turf surfacing materials through 1 source from a single manufacturer.

1. Provide secondary materials including adhesives, paint, thread, and repair materials of type and from source recommended by manufacturer of synthetic turf surfacing materials.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit synthetic turf surfacing installation to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate installation of synthetic turf surfacing with installation of site paving, playground equipment, adjacent lawns, landscaping materials, site lighting, and related work.

1.10 WARRANTY

A. Manufacturer's Warranty: Submit manufacturer's standard published limited warranty form in which manufacturer agrees to repair or replace components of synthetic turf surfacing installation installed by manufacturer-certified installer that fail in materials under normal use and maintenance, or provide other relief, within specified warranty period.

1. Failures include ultraviolet degradation, backing integrity, more than 50 percent loss of face fiber, and loss of tuft bind strength.
2. Warranty Period: Life of product.

B. Installer Project Warranty: Submit synthetic turf surfacing installer's warranty, signed by installer, covering the Work of this Section, including installation of all components of synthetic turf surfacing system, for the following warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Subject to requirements of this Section, provide listed products of ForeverLawn, Louisville, OH 44641; (866) 992-7876, or approved equal.

B. Source Limitations: Obtain synthetic turf surfacing materials through 1 source from a single manufacturer.

1. Provide secondary materials including adhesives, paint, thread, and repair materials of type and from source recommended by manufacturer of synthetic turf surfacing materials.

2.2 PERFORMANCE REQUIREMENTS

A. Certification: Provide synthetic turf surfacing system with safety performance testing certified by IPEMA.

B. Shock Attenuation Value: Provide synthetic turf system with G-max value not exceeding 200 and Head Injury Criteria (HIC) not exceeding 1,000 in accordance with ASTM F1292, based upon application and fall height indicated on Drawings.

C. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

D. Exterior Fire-Test Exposure: Provide synthetic turf surfacing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for recreation surfaces.

1. Provide synthetic turf system meeting requirements of ASTM F1951.

2.3 SYNTHETIC TURF SURFACING

A. Synthetic Turf Surfacing: Complete surfacing system, consisting of synthetic yarns bound to water-permeable primary and secondary backing and accessory materials.

B. Synthetic Turf Surfacing: Complete surfacing system, consisting of delustered UV-stabilized antimicrobial synthetic yarns bound to water-permeable bio-based primary and secondary backing; IPEMA-certified; non-abrasive blades with low surface temperature; and anti-static and ultraviolet reflective pigment enhanced.

1. Basis of Design Product: ForeverLawn Select EL.
2. Artificial Turf Fiber and Construction Characteristics:

a. Primary Color: Field/Olive Green.
b. Secondary Color: Turf Green/Dark Tan.
c. Blades: Primary blades are a slit-film polyethylene with anti-microbial agent AlphaSan® integrated into the primary yarn. A patented anti-static technology must also be integrated into the construction so as to not allow static charge build-up. Secondary blade is a heat-textured nylon monofilament. Tufting construction requires dual primaries in the same row.
d. Weight: The product-face weight will be 50 ounces. With backing, the total weight of the product will be 105 ounces.
e. Tufting: Tufting gauge will be 3/8-inch, pile height 1-3/4 inches.

1) Tufting Configuration: Dual yarn, same row set up.

f. Backing: The backing shall be a multi-layered 3 parts.

1) First single layer (stabilized primary consisting of polyester, fiberglass, and polyurethane) is 18-pic construction and 6 ounces.
2) Second layer is a minimum 40-ounce urethane layer.
3) Third layer is nonwoven, recycled, geotextile fleece.

g. Seams: Primary seaming system shall be a micromechanical seam, utilizing hook and loop technology.
h. Resilient Subsurface Padding: SafetyFoam Pad which is a closed-cell expanded polypropylene panel.
i. Infill: Envirofill®, or T°Cool®.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine synthetic turf surfacing base and perimeter conditions, with installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.

1. Verify substrate meets profile required.
2. Confirm base material, compaction of substrate, permeability, and drainage system installation meets requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SUBBASE PREPARATION

A. General: Prepare substrates to receive surfacing products according to synthetic turf surfacing manufacturer's written instructions. Verify that substrates are sound and without high spots, ridges, holes, and depressions. Remove organic debris. Grade soil subgrade level and compact.

B. Finish grade soil subgrade with slope between 0.5 percent and 1.0 percent toward path of site drainage.

1. Compact subgrade in both directions with mechanical compacting equipment to achieve specified compaction at 90 percent standard Proctor.
2. Prepare subgrade to tolerance of within 0.5-inch of design grade.
3. Prepare subgrade within 0.25-inch in 10 feet in any direction from design grade over entire playing surface.

3.3 AGGREGATE COURSE INSTALLATION

A. Place aggregate base course, compact by tamping with plate vibrator to 90 percent of ASTM D1557 maximum laboratory density, and screed to depth indicated. Install 4-inch base course unless otherwise indicated.

1. Slope base course between 0.5 percent and 1.0 percent, measured from the longitudinal center of the installation towards the edges. Grade base course to tolerance of within 0.5-inch of design grade, and with a maximum variation of 0.25-inch in 10 feet in any direction.

3.4 SYNTHETIC TURF INSTALLATION

A. General: Comply with synthetic turf surfacing manufacturer's written installation instructions. Install synthetic turf surfacing over area and in thickness indicated.

B. Fall Pad: Place fall pads tightly abutted over area to receive synthetic turf surfacing. Tape seams with pad seam tape to secure pads in position prior to installing synthetic turf.

C. Artificial Turf: Loose-lay artificial turf and allow fabric to relax for period recommended by manufacturer. Stretch carpet and attach at perimeter in accordance with approved submittals.

D. Seaming: Form seams flat and snug, with no gaps or fraying. Remove yarns that are trapped within seams. Form seams as recommended in synthetic turf manufacturer's written instructions using manufacturer's provided or recommended materials.

E. Attachment: Attach turf fabric to perimeter restraint system as recommended by the manufacturer.

3.5 INSTALLATION, INFILL

A. Mix and install infill material components in accordance with manufacturer’s requirements for approved system. Groom material and leave surface ready for use.

3.6 PROTECTION

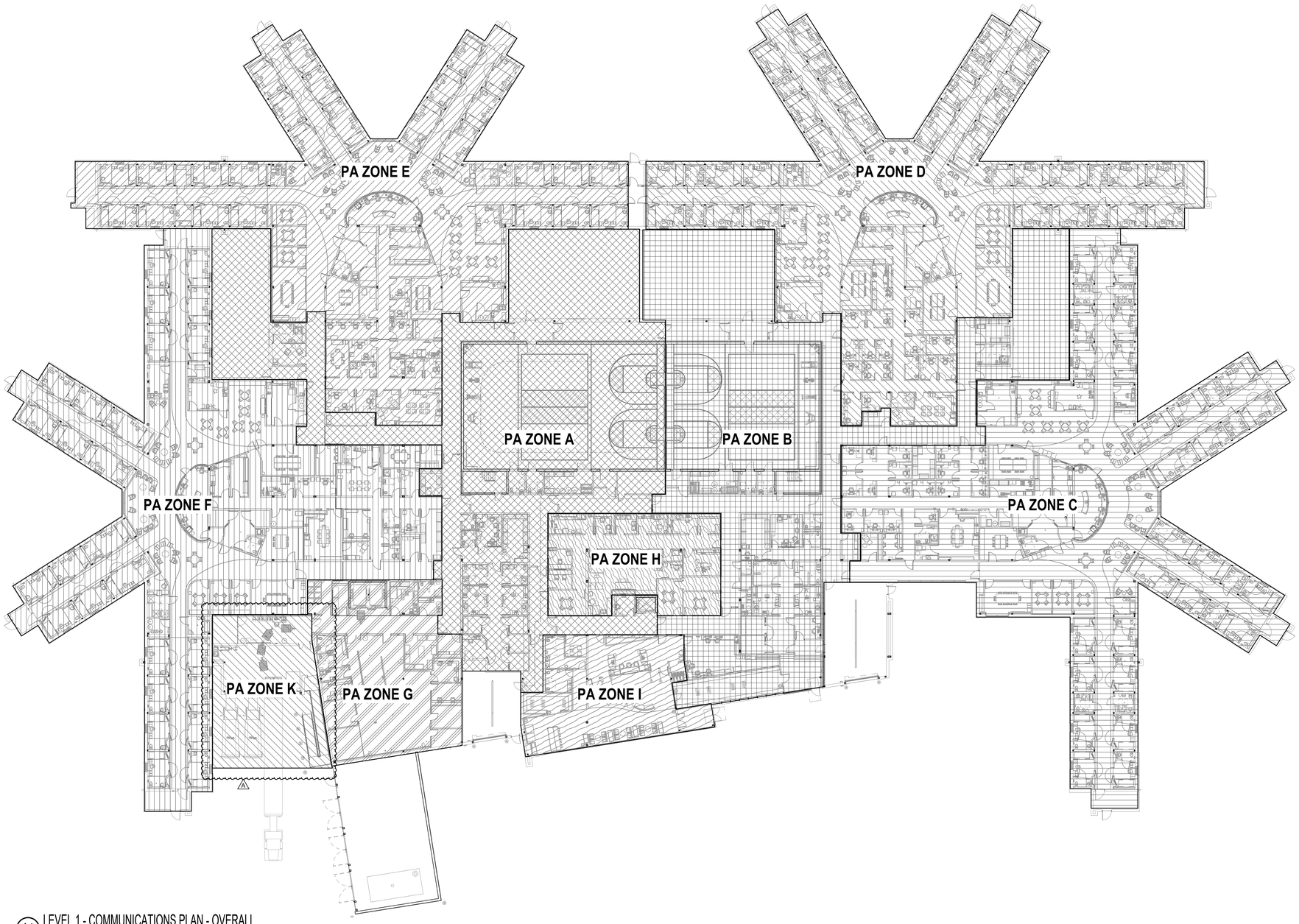
A. Protect completed installation from damage. Prevent traffic over system prior to acceptance by Owner.

3.7 DEMONSTRATION

A. Instruct Owner's personnel in proper inspection and maintenance of synthetic turf surfacing. Review manufacturer’s recommended maintenance procedures and warranty terms and conditions.

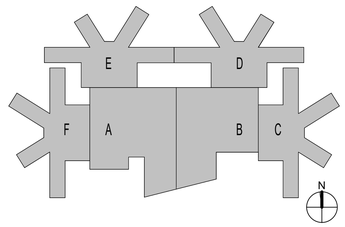
END OF SECTION 321813

ADDENDUM-01
2024.11.01



A1 LEVEL 1 - COMMUNICATIONS PLAN - OVERALL
1" = 20'-0"

KEY PLAN



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WICHITA, KANSAS

DATE:	2024.10.24
PROJECT #:	23179

	REVISION	DATE
A	ADDNENDUM A	11/01/2024

2TC1-100
LEVEL 1 - COMMUNICATIONS PLAN - OVERALL

3" = 1' - 0" 0" 3" 6" 1'
1 1/2" = 1' - 0" 0" 3" 6" 1' 2'
3/4" = 1' - 0" 0" 6" 1' 2' 4'
1/4" = 1' - 0" 0" 1' 2' 4' 8' 16'
1/8" = 1' - 0" 0" 2' 4' 8' 16' 32'
1/16" = 1' - 0" 0" 4' 8' 16' 32' 64'

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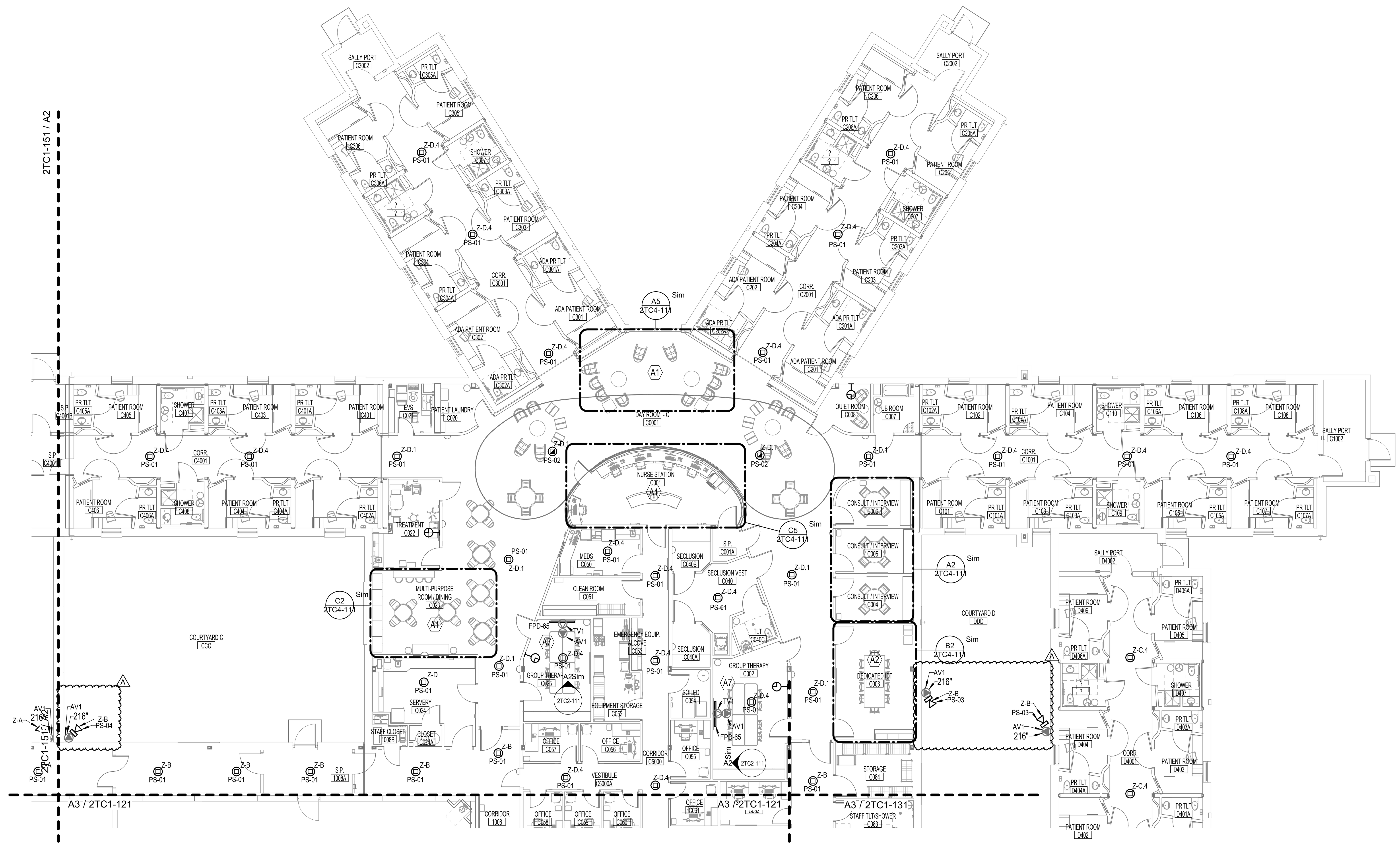


A2 LEVEL 1 - COMMUNICATIONS PLAN - AREA D

3/32" = 1'-0"

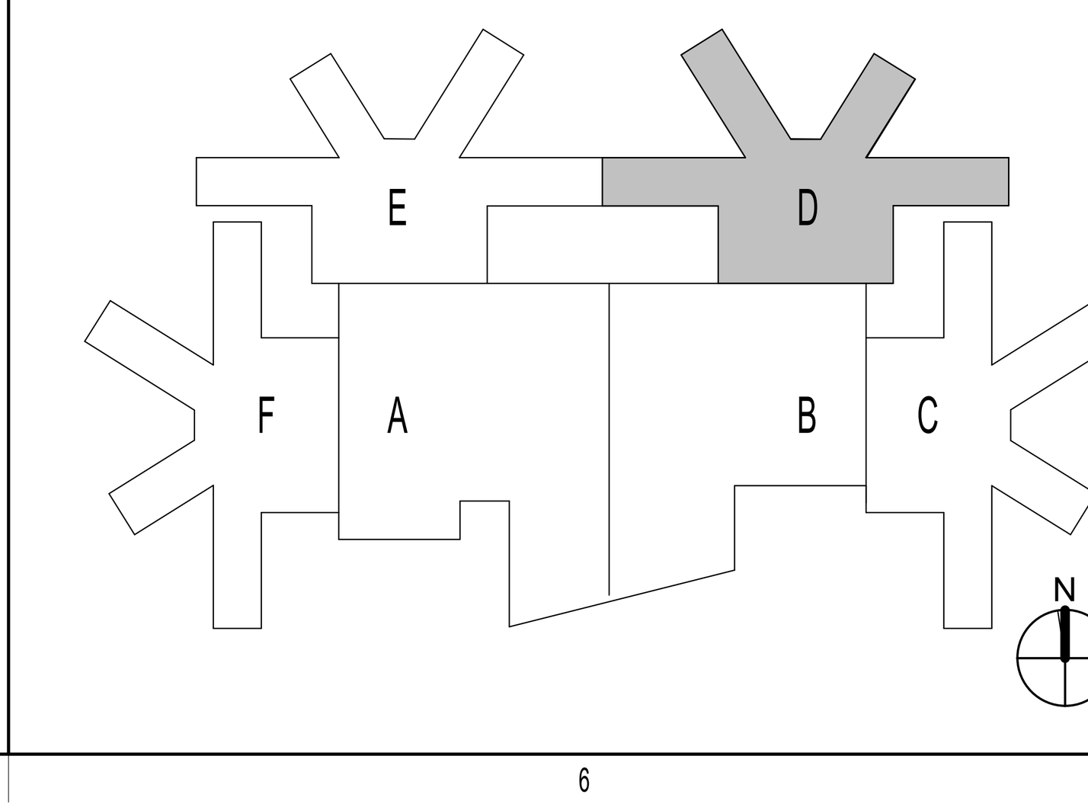
AUDIO-VISUAL GENERAL NOTES

1. REFER TO THE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR LOCATIONS OF FIRE RATED WALLS AND CEILINGS AND THE ASSOCIATED U.L. ASSEMBLY NUMBERS.
2. FOR ALL PENETRATIONS IN FIRE RATED WALLS AND CEILINGS, PROVIDE AN ASTM E814 COMPLIANT, U.L. LISTED THROUGH PENETRATION FIRE STOPPING SYSTEM THAT IS SPECIFIC TO THE WALL OR CEILING CONSTRUCTION ASSEMBLY. INSTALL SYSTEM IN STRICT COMPLIANCE WITH THE U.L. ASSEMBLY INDICATED IN THE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.
3. ALL PIPING, CONDUIT, AND OUTLET BOXES (ELECTRIC, TELEPHONE, COMPUTER, ETC.) IN FIRE RATED WALLS OR CEILING SHALL BE CONSTRUCTED OF NON-COMBUSTIBLE MATERIAL.
4. OUTLET BOXES (ELECTRIC, TELEPHONE, COMPUTER, ETC.) ON OPPOSITE SIDES OF FIRE RATED WALLS SHALL BE SEPARATED BY A HORIZONTAL DISTANCE OF 24 INCHES OR PROTECTED BY OTHER MEANS ALLOWED BY THE SPECIFIC U.L. ASSEMBLY.
5. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATIONS OF STC RATED WALLS. OUTLET BOXES (ELECTRIC, TELEPHONE, COMPUTER, ETC.) ON OPPOSITE SIDES OF STC RATED WALLS SHALL BE LIMITED TO TWO OUTLET BOXES PER STUD SPACE AND COVERED WITH "PUTTY PAD" TYPE MOLDABLE FIRE BARRIER.
6. **[INSTALL AUDIO VISUAL AUXILIARY DEVICES (ROOM SCHEDULERS, TOUCH PANELS, PROJECTORS, ETC.) AND ASSOCIATED CABLING IN OUTLET BOXES AND RACEWAY SYSTEMS DESIGNATED FOR THIS PURPOSE; SEE RELATED BUILDING CONSTRUCTION DOCUMENTS FOR ROUGH-IN PROVIDED BY OTHERS. ADDITIONAL OUTLET BOXES AND RACEWAY AS REQUIRED FOR A COMPLETE INSTALLATION SHALL BE PROVIDED AND INSTALLED BY THIS CONTRACTOR.]**

KEYNOTES

A1	SEE DETAIL 1/2TC5-103 FOR AUDIO-VISUAL RISER DIAGRAM.
A2	SEE DETAIL 7/2TC5-102 FOR AUDIO-VISUAL RISER DIAGRAM.
A7	SEE DETAIL 5/2TC5-102 FOR AUDIO-VISUAL RISER DIAGRAM.

KEY PLAN



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KIDS# 12345

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WICHITA, KANSAS

DATE: 2024.10.24
PROJECT #: 23179

#	REVISION	DATE
A	ADDNENDUM A	11/01/2024

2TC1-141
LEVEL 1 - COMMUNICATIONS PLAN - AREA D

3" = 1' - 0" 0" 3" 6" 1'
1 1/2" = 1' - 0" 0" 3" 6" 1' 2'
3/4" = 1' - 0" 0" 6" 1' 2' 4'
1/4" = 1' - 0" 0" 1' 2' 4' 8' 16'
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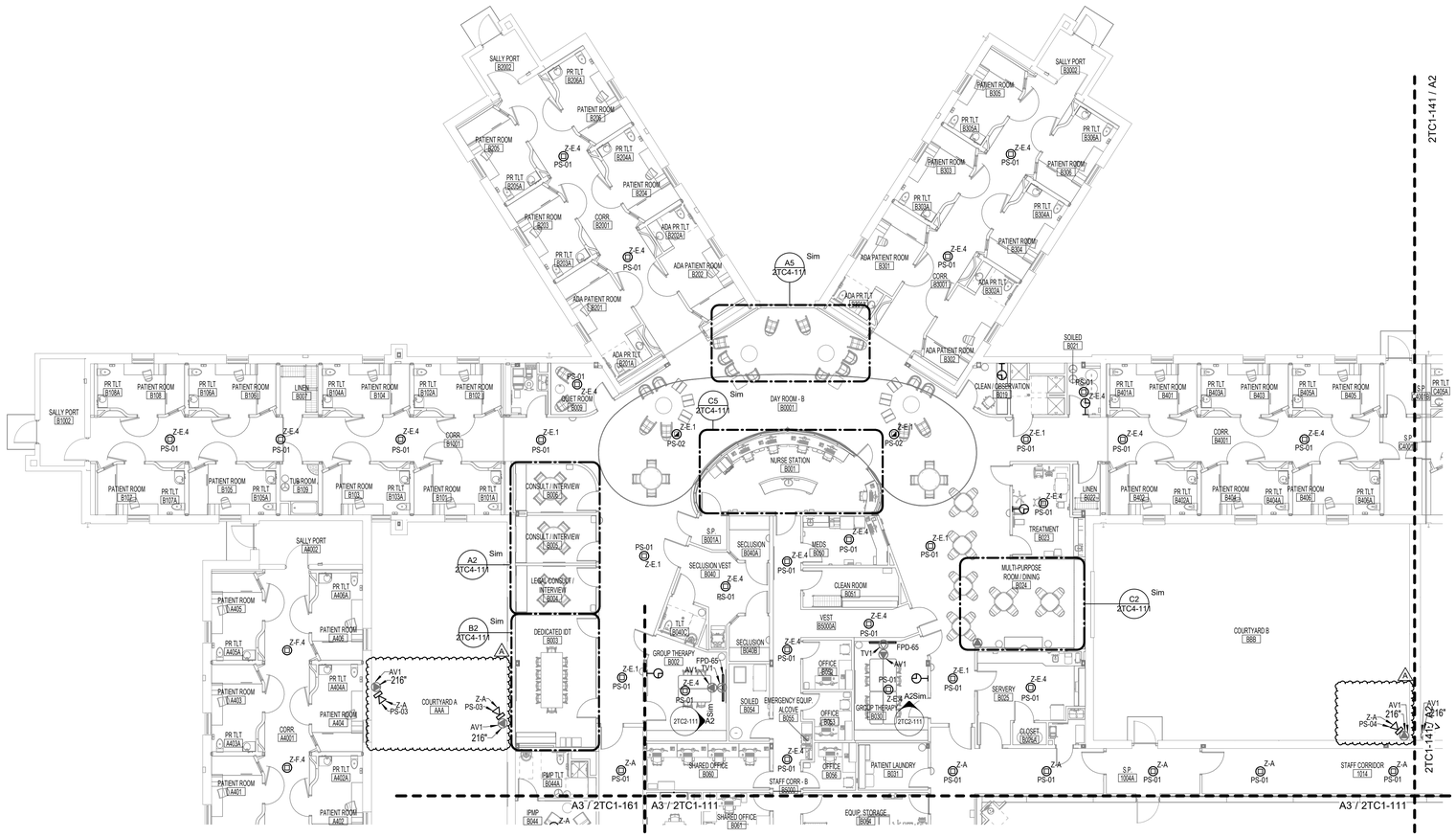

A2 LEVEL 1 - COMMUNICATIONS PLAN - AREA E

3/32" = 1'-0"

AUDIO-VISUAL GENERAL NOTES

1. REFER TO THE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR LOCATIONS OF FIRE RATED WALLS AND CEILINGS AND THE ASSOCIATED U.L. ASSEMBLY NUMBERS.
2. FOR ALL PENETRATIONS IN FIRE RATED WALLS AND CEILINGS, PROVIDE AN ASTM E814 COMPLIANT, U.L. LISTED THROUGH PENETRATION FIRE STOPPING SYSTEM THAT IS SPECIFIC TO THE WALL OR CEILING CONSTRUCTION ASSEMBLY. INSTALL SYSTEM IN STRICT COMPLIANCE WITH THE U.L. ASSEMBLY INDICATED IN THE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.
3. ALL PIPING, CONDUIT, AND OUTLET BOXES (ELECTRIC, TELEPHONE, COMPUTER, ETC.) IN FIRE RATED WALLS OR CEILING SHALL BE CONSTRUCTED OF NON-COMBUSTIBLE MATERIAL.
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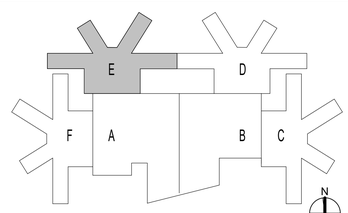
(#) KEYNOTES

KEY PLAN



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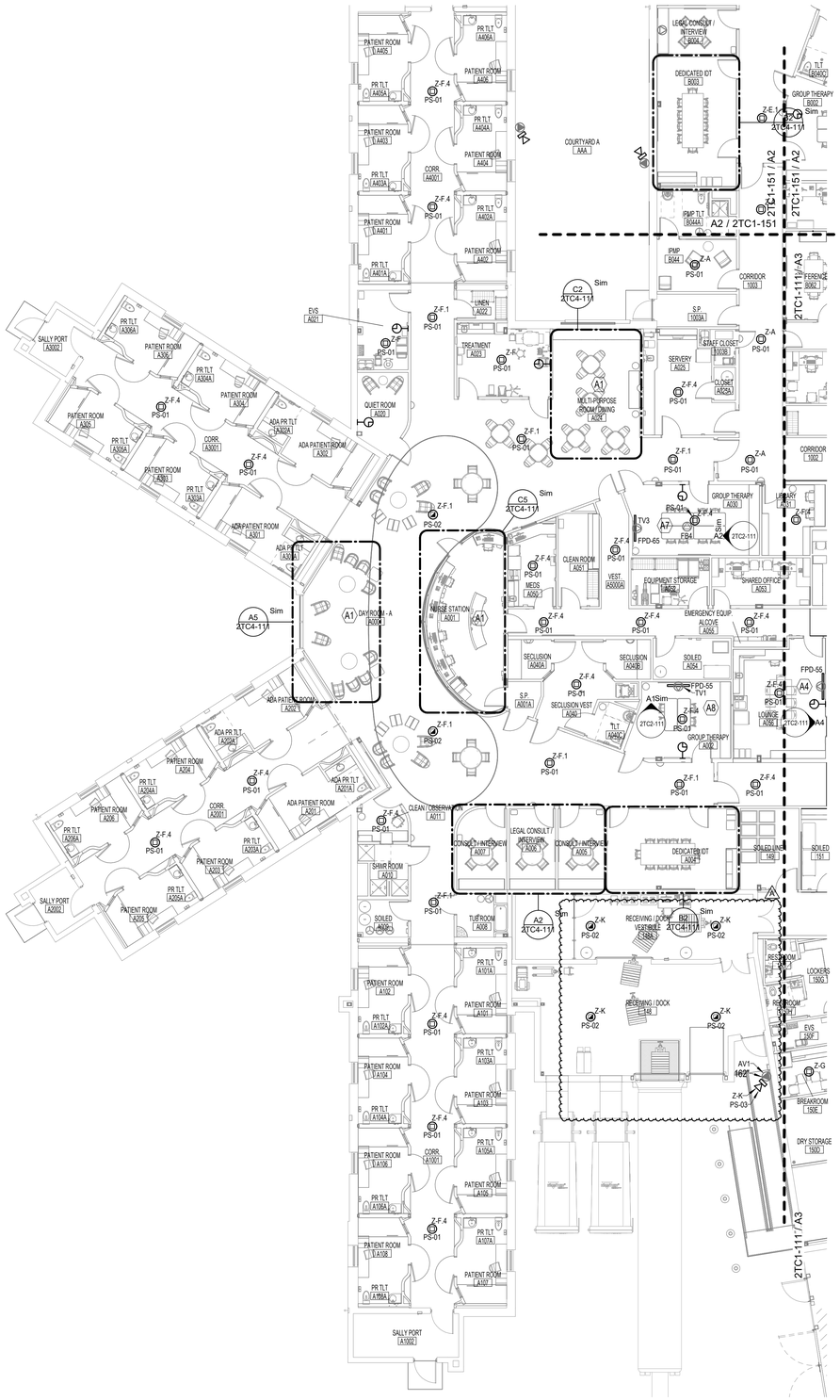
WICHITA, KANSAS

DATE: 2024.10.24
PROJECT #: 23179

	REVISION	DATE
A	ADDENDUM A	11/01/2024

2TC1-151
LEVEL 1 - COMMUNICATIONS PLAN - AREA E

3" = 1'-0" | 1 1/2" = 1'-0" | 3/4" = 1'-0" | 1/4" = 1'-0" | 1/8" = 1'-0" | 1/16" = 1'-0"



A3 LEVEL 1 - COMMUNICATIONS PLAN - AREA F
3/32" = 1'-0"

AUDIO-VISUAL GENERAL NOTES

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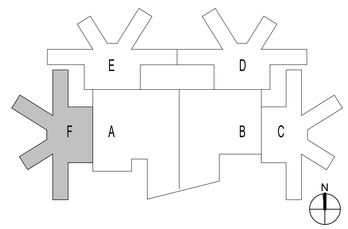
KEYNOTES

#	
A1	SEE DETAIL 1/2TC5-103 FOR AUDIO-VISUAL RISER DIAGRAM.
A4	SEE DETAIL 8/2TC5-102 FOR AUDIO-VISUAL RISER DIAGRAM.
A7	SEE DETAIL 5/2TC5-102 FOR AUDIO-VISUAL RISER DIAGRAM.
A8	SEE DETAIL 3/2TC5-102 FOR AUDIO-VISUAL RISER DIAGRAM.

KEY PLAN



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KCSM 12245

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KANSAS DEPARTMENT FOR AGING AND DISABILITY SERVICES
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WICHITA, KANSAS

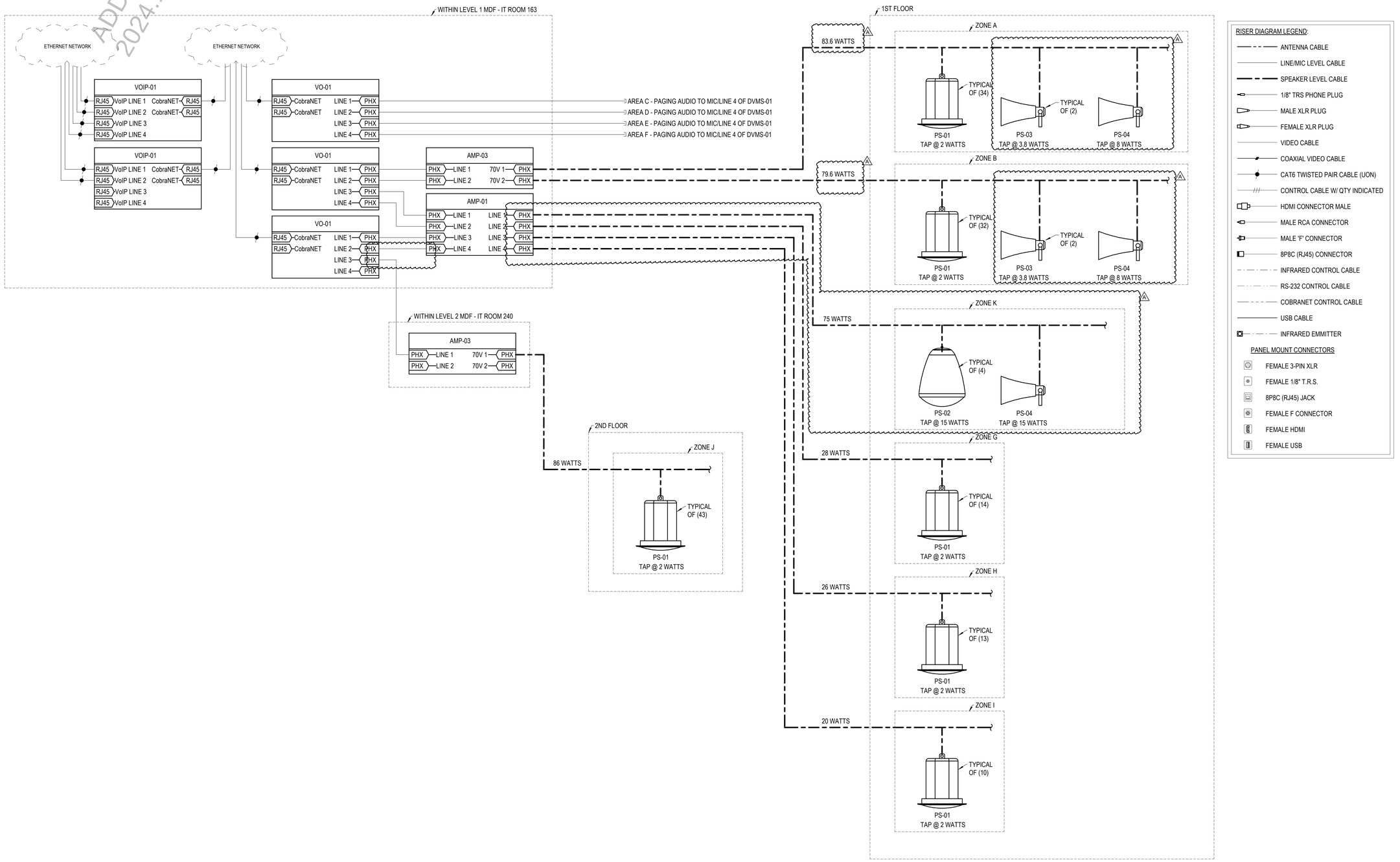
DATE: 2024.10.24
PROJECT #: 23179

#	REVISION	DATE
A	ADDNENDUM A	11/01/2024

2TC1-161
LEVEL 1 - COMMUNICATIONS PLAN - AREA F

3" = 1'- 0" 0" 3" 6" 1'
1 1/2" = 1'- 0" 0" 3" 6" 1' 2'
3/4" = 1'- 0" 0" 6" 1' 2' 4'
1/4" = 1'- 0" 0" 1' 2' 4' 8' 16'
1/8" = 1'- 0" 0" 2' 4' 8' 16' 32'
1/16" = 1'- 0" 0" 4' 8' 16' 32' 64'

ADDENDUM-01
2024.11.01



RISER DIAGRAM LEGEND:

- ANTENNA CABLE
- LINE/MIC LEVEL CABLE
- SPEAKER LEVEL CABLE
- 1/8" TRS PHONE PLUG
- MALE XLR PLUG
- FEMALE XLR PLUG
- VIDEO CABLE
- COAXIAL VIDEO CABLE
- CAT6 TWISTED PAIR CABLE (UON)
- CONTROL CABLE W/ QTY INDICATED
- HDMI CONNECTOR MALE
- MALE RCA CONNECTOR
- MALE 'F' CONNECTOR
- 8P8C (RJ45) CONNECTOR
- INFRARED CONTROL CABLE
- RS-232 CONTROL CABLE
- COBRANET CONTROL CABLE
- USB CABLE
- INFRARED EMMITTER

PANEL MOUNT CONNECTORS

- FEMALE 3-PIN XLR
- FEMALE 1/8" T.R.S.
- 8P8C (RJ45) JACK
- FEMALE F CONNECTOR
- FEMALE HDMI
- FEMALE USB

A1 PUBLIC ADDRESS RISER DIAGRAM

NTS

3" = 1' - 0" (0" 3" 6" 1')
1 1/2" = 1' - 0" (0" 3" 6" 1' 2')
3/4" = 1' - 0" (0" 6" 1' 2' 4')
1/4" = 1' - 0" (0" 1' 2' 4' 8' 16')
1/8" = 1' - 0" (0" 2' 4' 8' 16' 32')
1/16" = 1' - 0" (0" 4' 8' 16' 32' 64')

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SEDGWICK COUNTY KANSAS

SOUTH CENTRAL KANSAS REGIONAL PSYCHIATRIC HOSPITAL
KANSAS DEPARTMENT FOR AGING AND DISABILITY SERVICES
BID DOCUMENTS

WICHITA, KANSAS

DATE: 2024.10.24
PROJECT #: 23179

	REVISION	DATE
1 A	ADDNENDUM A	11/01/2024

2TC5-101

COMMUNICATIONS RISERS AND DETAILS

11/1/2024 8:36:59 AM

ADDENDUM-01
2024.11.01

AUDIO-VISUAL EQUIPMENT SCHEDULE

TAG	DESCRIPTION	MANUFACTURER	MODEL	COMMENTS
AMP-01	4CH, 80 WATT PER CHANNEL 70 VOLT AMPLIFIER	STEWART AUDIO	FLX-E-80-4-CV	
AMP-02	60 WATT MONO AMPLIFIER	EXTRON	MPA 601	
AMP-03	2 CHANNEL 100 WATT 70 VOLT AMPLIFIER	EXTRON	XPA U 1002-70V	MFR PART #60-1761-02
AUDI-01	DANTE TO LINE-LEVEL AUDIO INTERFACE	RDL	FP-NML2	
BT-01	2-GANG LINE-LEVEL AND BLUETOOTH AUDIO DANTE INTERFACE	RDL	DDS-BTN44	
CBAR-01	ALL-IN-ONE CONFERENCE BAR	CRESTRON	UC-SB1-CAM	
CBAR-02	ALL-IN-ONE UC CONFERENCE BAR	JABRA	PanaCAST 50 (BLACK)	PROVIDE WITH SCREEN MOUNT EQUAL TO JABRA PART #14207-72
CBAR-03	ALL-IN-ONE UC CONFERENCE BAR	LOGITECH	RALLY BAR	
CCUB-01	TABLE-TOP CABLE ACCESS ENCLOSURE FOR AV & POWER	EXTRON	CABLE CUBBY 222 US	SEE NOTE 3
CMIC-01	BEAMFORMING CEILING MICROPHONE ARRAY	SHURE	MXA920	
CPS-01	H.264 STREAMIGN MEDIA PROCESSOR	EXTRON	SMP 351	60-1324-01
CTRL-01	MEDIALINK PLUS CONTROLLER	EXTRON	MLC Plus 400	
DSP-02	DIGITAL SIGNAL PROCESSOR	BIAMP	X-400	
DVMS-01	10x8 4K SCALING MATRIX SWITCHER	EXTRON	DTP CrossPoint 108 4K IPCP Q MA 70	MFR PART #60-1381-93
DVR-01	HDMI OVER CATx RECEIVER	EXTRON	DTP HDMI 4K 230 RX	MFR PART #60-1271-13
DVT-01	HDMI OVER CATx TRANSMITTER	EXTRON	DTP HDMI 4K 230 TX	MFR PART #60-1271-12
DVT-02	DECORA STYLE 4K HDMI DTP TRANSMITTER	EXTRON	DTP T HWP 4K 231 D	MFR PART #60-1421-13
EPTZ-01	EPTZ USB CONFERENCE CAMERA	VADDIO	INTELLISHOT-M	
EXT-01	4K HDMI & USB OVER HDBaseT EXTENDER	CRESTRON	HD-EXT-USB-2000-C	
FPD-43	43" COMMERCIAL FLAT PANEL DISPLAY	PANASONIC	TH-43CQE2U	
FPD-55	55" COMMERCIAL FLAT PANEL DISPLAY	PANASONIC	TH-55CQE2U	
FPD-65	65" COMMERCIAL FLAT PANEL DISPLAY	PANASONIC	TH-65CQE2U	
FPD-75	75" COMMERCIAL FLAT PANEL DISPLAY	PANASONIC	TH-75CQE2U	
HDMI-01	ALUMINUM HDMI PASS-THROUGH PLATE WITH PIG TAIL	C2G	39870	
HDSW-01	FOUR INPUT 4K/60 HDMI SWITCHER WITH DTP2	EXTRON	DTP2 T 204	60-1626-52
NAV-01	PRO AV OVER IP SYSTEM MANAGER	EXTRON	NAVigator	MFR PART #60-1534-01
NAVD-01	1G PRO AV OVER IP SCALING DECODER	EXTRON	NAV SD 101	60-1525-14
NAVE-01	1G PRO AV OVER IP COMPACT ENCODER	EXTRON	NAV E 121	MFR PART #60-2040-01
NWS-01	48-PORT PoE+ NETWORK SWITCH FOR AV-OVER-IP	EXTRON	4200 SERIES	
OCCS-01	WORKSPACE AUTOMATION CONTROLLER WITH OCCUPANCY SENSOR	EXTRON	WC Pro 150 OCS	USE CEC COMMANDS
PS-01	6.5" TWO-WAY RECESSED IN-CEILING 70-VOLT SPEAKER	AtlasIED	FAP62T	
PS-02	4" PENDANT-MOUNTED 70-VOLT SPEAKER	CRESTRON	PD4T-W-T	VERIFY COLOR PRIOR TO ORDERING
PS-03	70 VOLT HORN PAGING SPEAKER	AtlasIED	AP-15T	
PS-04	70 VOLT HORN PAGING SPEAKER	AtlasIED	GA-15T	
PTP-01	DECORA BRUSH CABLE PASSTHROUGH PLATE	LEVITON	41075-DBW	
SBAR-01	ACTIVE STEREO SOUND BAR	CRESTRON	SAROS SB-200-P-B	
SR-01	6.5" IN-CEILING RECESSED 70-VOLT SPEAKER	EXTRON	SF 26CT	
TAP-01	UC ONE TOUCH FOR TEAMS AND ZOOM	LOGITECH	TAPMSTBASE	
TP-01	7" TABLE-TOP TOUCH PANEL	EXTRON	TLP Pro 725T	
TP-02	7" WALL MOUNTED TOUCH PANEL	EXTRON	TLP Pro 725M	
UCS-01	PRO 4K USB-C 10G DOCK	EXTRON	UCS 601	MANUFACTURER PART #60-2042-01
USBS-01	TWO INPUT USB SWITCHERS	EXTRON	SW2 USB	60-952-02
USBS-02	USB SWITCHER	LOGITECH	SWYTCH	
VO-01	4K/60 DTP3 RECEIVER	EXTRON	DTP3 R 201	
VOIP-01	4K/60 DTP3 RECEIVER	EXTRON	DTP3 R 201	
VOL-02	70V, 35 WATT COMMERCIAL ATTENUATOR	AtlasIED	AT35	STAINLESS STEEL
VWD-55	55"ULTRA NARROW BEZEL VIDEO WALL DISPLAY	SAMSUNG	LH55VMBUBGBXGO	

1. PROVIDE QUANTITIES AS SHOWN ON DRAWINGS. WHERE QUANTITIES LISTED, PROVIDE BRACKETS FOR RACK MOUNTING ALL EQUIPMENT AS REQUIRED. PROVIDE RACK SHELVES FOR ALL OWNER PROVIDED EQUIPMENT.

2. FOR ALL SURFACE MOUNTED DISPLAYS, PROVIDE LOW-PROFILE ARTICULATING WALL MOUNT, EQUAL TO CHIEF THINSTALL DUAL SWING ARM MOUNT.

3 PROVIDE WITH THE FOLLOWING ATTACHMENTS:
   (1) EXTRON - ONE RJ-45 FEMALE TO PUNCH DOWN FOR CAT 6 - (#70-314-17)
   (1) EXTRON - RETRACTOR HDMI - (#70-1065-04)
   (1) EXTRON - CABLE CUBBY 202 RETRACTOR BRACKET - (#70-1043-02)
   (1) EXTRON - RETRACTOR USB 2.0 - (#70-1065-05)
   (1) EXTRON - RETRACTOR FILLER MODULE - (#70-1065-35)

4. FOR ALL EXTRON RACK MOUTNED EQUIPMENT, PROVIDE EXTRON RACK SHELVES EQUAL TO #RSU-129.

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PEC PROJECT NUMBER: 230470-000
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KGS# 12245

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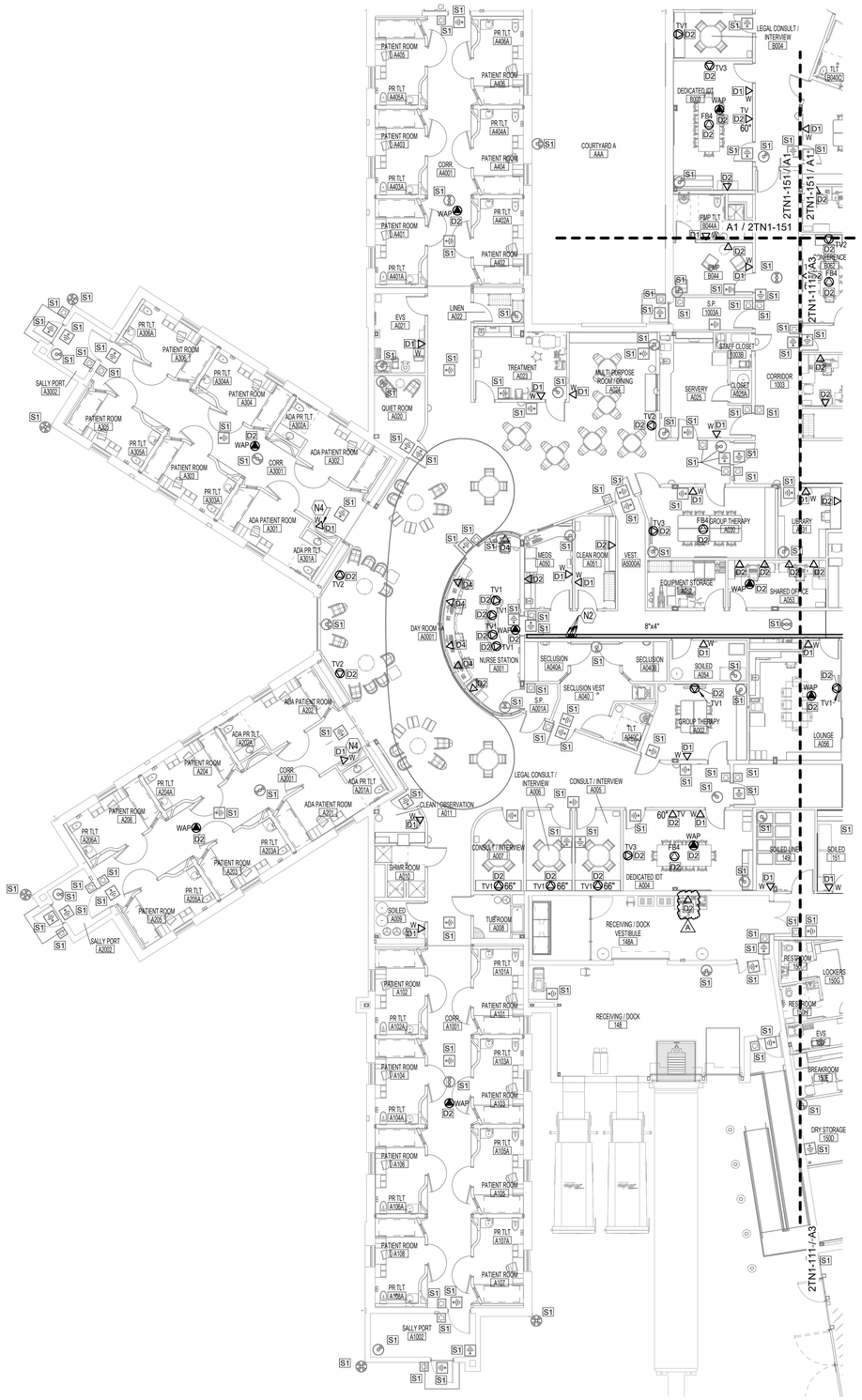
2TC6-100
COMMUNICATIONS SCHEDULES

3" = 1' - 0" 0" 3" 6" 1'
1 1/2" = 1' - 0" 0" 3" 6" 1' 2'
3/4" = 1' - 0" 0" 6" 1' 2' 4'
1/4" = 1' - 0" 0" 1' 2' 4' 8' 16'
1/8" = 1' - 0" 0" 2' 4' 8' 16' 32'
1/16" = 1' - 0" 0" 4' 8' 16' 32' 64'

ADDENDUM-01
2024.11.01

HORIZONTAL CABLE SCHEDULE

SYSTEM	CABLE		JACK	REMARKS
	TYPE	COLOR	COLOR	
DATA	CAT-6	BLUE	BLUE	
SECURITY	CAT-6	YELLOW	YELLOW	



A3 LEVEL 1 - DATA NETWORK PLAN - AREA F
3/32" = 1'-0"

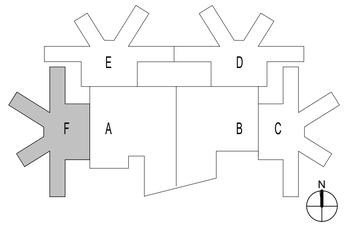
COMMUNICATIONS GENERAL NOTES

1. REFER TO THE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR LOCATIONS OF FIRE RATED WALLS AND CEILINGS AND THE ASSOCIATED U.L. ASSEMBLY NUMBERS.
2. FOR ALL PENETRATIONS IN FIRE RATED WALLS AND CEILINGS, PROVIDE AN ASTM E814 COMPLIANT, U.L. LISTED THROUGH PENETRATION FIRE STOPPING SYSTEM THAT IS SPECIFIC TO THE WALL OR CEILING CONSTRUCTION ASSEMBLY. INSTALL SYSTEM IN STRICT COMPLIANCE WITH THE U.L. ASSEMBLY INDICATED IN THE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.
3. ALL PIPING, CONDUIT, AND OUTLET BOXES (ELECTRIC, TELEPHONE, COMPUTER, ETC.) IN FIRE RATED WALLS OR CEILINGS SHALL BE CONSTRUCTED OF NON-COMBUSTIBLE MATERIAL.
4. OUTLET BOXES (ELECTRIC, TELEPHONE, COMPUTER, ETC.) ON OPPOSITE SIDES OF FIRE RATED WALLS SHALL BE SEPARATED BY A HORIZONTAL DISTANCE OF 24 INCHES OR PROTECTED BY OTHER MEANS ALLOWED BY THE SPECIFIC U.L. ASSEMBLY.
5. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATIONS OF STC RATED WALLS. OUTLET BOXES (ELECTRIC, TELEPHONE, COMPUTER, ETC.) ON OPPOSITE SIDES OF STC RATED WALLS SHALL BE LIMITED TO TWO OUTLET BOXES PER STUD SPACE AND COVERED WITH "PUTTY PAD" TYPE MOLDABLE FIRE BARRIER.
6. SUBMIT SHOP DRAWINGS AND INSTALL INTERIOR TELECOMMUNICATIONS INFRASTRUCTURE TO MEET THE NEEDS OF THE ACTIVITY AND SUPPORTING FACILITIES IN ACCORDANCE WITH ANSI/TIA-569-D, BICSI STANDARDS, AND THE SPECIFICATIONS.

KEYNOTES

#	
N2	4"C. WITH PULL ROPE AND INSULATED BONDING BUSHINGS TO FLOOR ABOVE. OFFSET CONDUIT AS REQUIRED TO COORDINATE WITH STRUCTURE, DUCTWORK, PIPING, AND LIGHT FIXTURES.
N4	PROVIDE GIA-TRONICS PHONE MODEL #276-002BH FLUSH MOUNTED WALL PHONES IN THIS AREA

KEY PLAN



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2TN1-161
LEVEL 1 - DATA NETWORK PLAN - AREA F

3" = 1' - 0" (0" 3" 6" 1')
1 1/2" = 1' - 0" (0" 3" 6" 1' 2')
3/4" = 1' - 0" (0" 6" 1' 2' 4')
1/4" = 1' - 0" (0" 1' 2' 4' 8' 16')
1/8" = 1' - 0" (0" 2' 4' 8' 16' 32')
1/16" = 1' - 0" (0" 4' 8' 16' 32' 64')

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