CSP 25-005KB (BP017) – ADDENDUM No.01
Triplex Center Renovations

FOR

Fort Bend Independent School District
2023 Bond Program

To access the complete Addendum:

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Reviewed By: DocuSigned by: Amanda Janek C5C38D2180664C4... 11/15/2024 | 8:29:16 CST
PROJECT MANAGER

Reviewed By: DocuSigned by: Ryan J. Kiefer 1F973D1CC91A41D... 11/15/2024 | 8:56:56 CST
DESIGN MANAGER

Reviewed By: DocuSigned by: Ashley Dixon 6F7254EFC4E6406... 11/15/2024 | 9:06:53 CST
CONSTRUCTION MANAGER

Approved By: Signed by: Daniel Bankhead AABFCACAF7E9453... 11/15/2024 | 12:53:17 PST
DESIGN AND CONSTRUCTION EXECUTIVE DIRECTOR

Approved By: Signed by: Doris Emeka-Onyenwe DF25ADA7E416421... 11/18/2024 | 5:05:35 PST
DIRECTOR MATERIALS MANAGEMENT

Addendum 01

BP017
Triplex Center Renovation
Fort Bend Independent School District
CSP#25-005KB

3815 Montrose Blvd
Suite123

Houston, Texas 77006
713.526.cre8 (2738)

14 November 2024

cre8 ARCHITECTS

This addendum modifies the original Proposal Documents dated October 24, 2024 and forms a part of the Contract Documents. Acknowledge receipt of this Addendum in the space provided on the Proposal Form. Failure to do so may subject Proposer to disqualification.

This Addendum consists of 6 pages and the following attachments:

- CSP 25-005KB BP017 Triplex Renovations, Pre-Proposal Meeting Attendance List, Date and Time: 11/7/2024, 2:00 PM
- CSP 25-005KB BP017 Triplex Renovations, Pre-Bid Walk Attendance List, Date and Time: 11/8/2024, 2:00 PM
- Drawings
  - A0.04 - ROOM SIGNAGE
  - E2.03 - LEVEL 01 POWER PLAN – BUILDING 3N
  - E3.02 – LEVEL 01 LIGHTING PLAN – BUILDING 2S
  - E4.02 – ENLARGED PLANS
  - E7.01 – LIGHTING SCHEDULES
  - E7.02 – PANEL SCHEDULES
  - E7.03 – PANEL SCHEDULES
- Specifications
  - Section 04 01 10 – Masonry Cleaning
  - Section 09 24 00 – Portland Cement Plastering
  - Section 25 00 00 – Energy Management and Control Systems
- Existing Roof Assembly Warranty ANM1180331460.

The time and date to receive Proposals are unchanged by this Addendum

GENERAL: Building 3 will not be occupied during the construction activities. Refer to Construction Sequencing Plan – Sheet A2.00.1 for additional information

1.0 QUESTIONS and RESPONSES

1. On Page C1.03 the legend calls for 2 dashed lines- 1 indicating items to be removed & the other indicating locations of saw cuts. There are several dashed lines on the page that appear to match the saw cut lines however it does not really seem to make sense where they are

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shown & the remaining civil pages give no indication as to what the point of the sawcuts would be.
Also- I'm not seeing any dashed lines indicating "exist. items to be removed" unless they are mixed in the potential saw cut lines. This page is very confusing.
Reply: The bold dashed lines with the pattern indicating pavement removal are sawcut lines. The other light and thin dashed lines on the plans are easements and are labeled accordingly. Items to be removed are indicated within the hatched areas and include curbs, ramps, sidewalks, etc.

2. I am taking a look at the signage designs on sheet A0.04. Please confirm that the "Accessible Signage" will be used for restrooms. Also, will the Plaque type "Z" be installed above every entrance, or just the Main entrance location?
   Reply: Yes, the accessible signage will be utilized at restrooms. Plaque type Z will be installed only at the main entrance location – Door 300.
3. The sign types on page A0.04 does not correspond to the door schedules since they are not identified on the page A0.04 as shown above. Can you confirm the sign types in the image above from that page?
   And also the sign types from the door schedules
   Sign Type D
   Sign Type E
   Sign Type P
   Sign Type NQ
   Sign Type CS
   Sign Type QN
   Reply: Refer to signage clarifications included as a part of this Addendum.
4. Will a specification/Sequence be issued for DDC Controls?
   Reply: Refer to Specification 25 00 00 Energy Management and Controls issued as a part of this Addendum.
5. Does this site have an existing DDC controls System?
   Reply: Yes – the existing system manufacturer is Unify.
6. Do the bidders need to use the installer of the current roof for any alterations to the existing roof and to maintain any roof warranties?
   Reply: The existing roof warranty must be maintained. Refer to information included as a part of this Addendum for additional information.
7. Assuming you want us to tie into the existing fire alarm system; what is the existing fire alarm system manufacturer and model?
   Reply: Yes – refer to Specification Section 28 31 11 for manufacturer information. The existing fire alarm system is Honeywell Silent Knight #682DEVS.
8. Assuming you want us to tie into the existing building automation system, what is the existing system manufacturer and model?
   Reply: Yes – the existing manufacturer is Unify.
9. I've had a request from some trade partners for a site visit. Is that still possible?
   Reply: No, additional site visits will not be scheduled.
10. Is there an asbestos report for this facility?
    Reply: Yes. Please refer to Project Manual, Section 00 31 26 Existing Hazardous Materials Information.

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11. Please provide the name of the contractor who currently holds the roof warranty?
    Reply: The roof warranty is provided by the roofing manufacturer – Johns Manville – Warranty #ANM1180331460. A copy is issued with this addendum.
12. Please provide the Fire Alarm Company for this building.
    Reply: Refer to Question 7.
13. Who is the BAS contractor for the building?
    Reply: Refer to Question 8.
14. Are there any additional subcontractors required for this project, other than those already identified?
    Reply: Subcontractors are selected by the General Contractor as required for the project.
15. Will a dumpster be allowed in the parking lot?
    Reply: Yes
16. Will temp. toilets be required?
    Reply: Yes
17. Please confirm the working hours for this project.
    Reply: Normal business hours
18. On sheet S-4.01 detail no. 10 please clarify the location and quantity of the new beam as shown in the detail.
    Reply: Refer to Existing Roof Framing Plan – Sheet S2.01. New beams (W16x31) are indicated at RTU locations where indicated.
19. Please confirm if the millwork will require AWI certification as shown on the spec section 06 41 16 - 1.
    Reply: Casework shall comply with the "Architectural Woodwork Standards" of AWI. Certification is not required. See revisions for Section 06 41 16 in this addendum.

2.0 CHANGES TO PROCUREMENT AND CONTRACTING DOCUMENTS:

01 Request For Competitive Sealed Proposals, Pre-Proposal Conference: A copy of the Pre-Proposal Meeting Attendance List is issued to this addendum

02 Request For Competitive Sealed Proposals, Walk Schedule: A copy of the Pre-Bid Walk Attendance List is issued to this addendum

3.0 CHANGES TO SPECIFICATIONS:

01 Section 01 10 00 – Summary of Work
   A. Paragraph 3.2.A, add the following: Building 3 will not be occupied by the Owner during the construction phase.
   B. Paragraph 3.2.D, add the following: The Owner will remove all existing furniture, moveable equipment, etc. currently stored within the areas of construction prior to the start of construction.

02 Section 04 10 00 – Masonry Cleaning: Add this Section 04 10 00 as issued with this Addendum.

03 Section 06 41 16 – Plastic-Laminate-Faced Architectural Cabinets
   A. Delete Paragraph 1.03.C.
   B. Paragraph 1.04.B, delete last sentence of this paragraph.
   C. Paragraph 2.03.A.1, delete this paragraph.

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04 Section 07 65 16 – Roof Flashing and Trim
- A. Paragraph 1.08 A, Revise Subparagraph 2 as follows:
  - 2. *Warranty: ANM1180331460.* ***Copy issued with this addendum.***
- B. Paragraph 1.08.B, Revise Subparagraph 1 as follows:
  1. *Perform work for new roof penetrations, curbs and flashing by installer* ***approved by existing roof manufacturer****, by methods and with materials so as not to void existing roofing system warranty issued by the manufacturer of the existing roof membrane system.*

05 Section 09 05 61.13 – Moisture Vapor Emission Control
- A. Paragraph 2.02.A add Paragraph 3:
  - *3. Mapei Planiseal VS Moisture Reduction Barrier.*
- B. Paragraph 2.03.C add Paragraph 2:
  - *2. Mapei Ultraplan 1 Plus Underlayment.*

06 Section 09 24 00 – Portland Cement Plastering: Add this Section 09 24 00 as issued with this Addendum.

07 Section 10 14 00 – Signage, add Paragraph 2.05.F:
- *F. Vinyl Film Characters: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.*

08 Section 25 00 00 – Energy Management and Control Systems: Add this Section 25 00 00 as issued with this Addendum.

2.0 CHANGES TO DRAWINGS:

01 A0.04 – ROOM SIGNAGE
- A. Refer to drawing revisions this sheet. Text added identifying the room location for each signage type.

02 A2.00D – OVERALL DEMOLITION FLOOR PLAN – LEVEL 01
- A. Remove broken glazing panel @ south exterior glazing – second window panel from southwest corner of building.

03 A2.04 SCH – LEVEL 01 FINISH SCHEDULE, DOOR SCHEDULE & NOTES
- A. Door Schedule - Add note for Door 273 – "Paint Existing HM Door & Frame"

04 A2.06 SCH – LEVEL 01 FINISH SCHEDULE, DOOR SCHEDULE & NOTES
- A. Door Schedule - Add note for Door 373 – "Paint Existing HM Door & Frame"

05 A2.06.1 – LEVEL 01 FLOOR PLAN – BUILDING 3S
- A. Replace broken glazing panel with glass to match existing@ south exterior wall of Conference 362. Glass panel is 4' – 2" w x 6' – 10" h. Field verify dimensions at site.

06 A5.01 – EXTERIOR ELEVATIONS
- A. Add Keyed Note/Description:
  - 04.0.11 Powerwash entire building exterior surfaces including masonry, metal coping at roof, aluminum frames & glazing, metal wall panels and plaster

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soffit (at breezeways)

07 A5.02 – EXTERIOR ELEVATIONS
- A. Add Keyed Note/Description:
  - 04.0.11 Powerwash entire building exterior surfaces including masonry, metal coping at roof, aluminum frames & glazing, metal wall panels and plaster soffit (at breezeways)

08 E1.01 – ELECTRICAL DEMOLITION PLAN – BUILDING 2N (Narrative Only)
- A. Tagged note E9 modified to clarify removal of above ceiling cabling.
  - i. E9: EXISTING LIGHTING IN THIS ROOM SHALL BE DEMOLISHED. ALL EXISTING ABOVE CEILING CABLING SHALL BE REMOVED.

09 E1.02 – ELECTRICAL DEMOLITION PLAN – BUILDING 2S (Narrative Only)
- A. Tagged note E9 modified to clarify removal of above ceiling cabling.
  - i. E9: EXISTING LIGHTING IN THIS ROOM SHALL BE DEMOLISHED. ALL EXISTING ABOVE CEILING CABLING SHALL BE REMOVED.

10 E1.03 – ELECTRICAL DEMOLITION PLAN – BUILDING 3S (Narrative Only)
- A. Note on plan modified to clarify removal of above ceiling cabling.
  - i. ALL EXISTING ELECTRICAL DEVICES AND EQUIPMENT IN BUILDING THREE SHALL BE REMOVED, INCLUDING REMOVAL OF ALL ABOVE CEILING CABLING.

11 E1.04 – ELECTRICAL DEMOLITION PLAN – BUILDING 3S (Narrative Only)
- A. Note on plan modified to clarify removal of above ceiling cabling.
  - i. ALL EXISTING ELECTRICAL DEVICES AND EQUIPMENT IN BUILDING THREE SHALL BE REMOVED, INCLUDING REMOVAL OF ALL ABOVE CEILING CABLING.

12 E2.03 - LEVEL 01 POWER PLAN – BUILDING 3N: Replace this drawing with revised drawing issued with this Addendum.
- A. Tagged note E55 added to drinking fountains.

13 E3.02 – LEVEL 01 LIGHTING PLAN – BUILDING 2S: Replace this drawing with revised drawing issued with this Addendum.
- A. One (1) AV40 fixture revised to AV40G to clarify drywall frame kit.

14 E4.02 – ENLARGED PLANS: Replace this drawing with revised drawing issued with this Addendum.
- A. Electrical 317
  - i. Quadraplex added in electrical room 317 for security riser and circuited to panel LEC. Associated tagged note E40 added.
  - ii. Power location added for BAS panel and circuited to panel LEC with associated tagged note E56. Provide power and data for BAS panel.
- B. Mech/Elec 245
  - iii. Power location added for BAS panel and circuited to panel LEB with associated tagged note E56. Provide power and data for BAS panel.
- C. IDF 333

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iv. Power for VF-A2 in IDF room 333 modified to be on separate circuit.

15 E7.01 – LIGHTING SCHEDULES: Replace this drawing with revised drawing issued with this Addendum.
   A. Fixture type AV40G added to light fixture schedule.

16 E7.02 – PANEL SCHEDULES: Replace this drawing with revised drawing issued with this Addendum.
   A. (E)LEB
      i. One (1) 120V/20A spare utilized for BAS panel power.

17 E7.03 – PANEL SCHEDULES: Replace this drawing with revised drawing issued with this Addendum.
   A. LEC
      i. One (1) 120V/20A spare utilized for VF-A1 in IDF room.
      ii. One (1) 120V/30A circuit added for security riser in electrical room 317.
      iii. One (1) space revised to 120V/20A breaker for BAS panel p.
      iv. Breaker for CU-01 revised from 208V/2P/20A to 208V/2P/30A.

END OF ADDENDUM 01

FBISD
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BUSINESS & FINANCE

CSP 25-005KB BP017 Triplex Renovations
Pre-Proposal Meeting Attendance List
Date and Time: 11/7/2024, 2:00 PM

SIGN IN SHEET

	Name	Company Name	Email
1	Raul Caldera	Nash Industries	rcaldera@nashindustriesinc.com
2	Prime Contractors	Prime Contractors	estimating@primecontractorsinc.com
3	John Hornsby	Indi Construction	jhornsby@indiconstruction.com
4	Jerry Bevel	Cre8 Architects	Jerry.Bevel@cre8houston.com
5	Vince Diaz	Dunhill Construction	vince@dunhillconstruction.com
6	Rizwan Ali	Temporary Wall Systems West Houston	rizwan.ali@tempwallsystems.com
7	Ala'a Rayyan	CMTA	ARayyan@cmta.com
8	Tyeasha Johnson	CMC Development & Construction	bids@cmccorp.us
9	Michael Aquino	Rogers-O'Brien Construction	Maquino@r-o.com
10	Miguel Garcia	Rogers-O'Brien Construction	miguelgarcia@r-o.com
11	Kathleen Booker	FBISD	

12	Antoinette Lewis	FBISD	
13	Amanda Janek	FBISD	
14	Jeanette Boleware	FBISD	
15	Cory Branham	FBISD	

FORT BEND INDEPENDENT SCHOOL DISTRICT BOND 2023

FORT BEND INDEPENDENT SCHOOL DISTRICT
MEETING PURPOSE: Pre-Bid Walk - CSP 25-005KB BP017 Triplex Renovation

MEETING SIGN-IN SHEET
DATE/TIME: 11/08/2024
LOCATION: 550 Julie Rivers Dr, Sugar Land, Texas 77478

Name	Title	Organization	Telephone	E-mail
Chris Kouimanis	Asst. PM	Bass Construction	281-342-2022	Bids@Bassconstruction.com
Phillip Cano	Estimator	Prime Contractors	281 999 0875	estimating@primecontractorsinc.com
Brandon Reed	Estimator	MtechElectric	713-377-2375	Brandonr@Mtechelectric.com
Jose Reyna	PM/Estimator	Compass Services	[redacted] 832 230 8871	J.reyna@compass-sucs.com
Antoinette Lewis	Sr. Buyer	FBISD Tur.	—	Antoinette.lewis@fortbendisd.gov
Vince Diaz	Director of Estimating	Dunhill Construction	713-208-6228	Vince@dunhillconstvuction.com
John Horns67	Estimator	INDI construction	346-456-9227	Jhorns67@indiconstruction.com
Valeria Barboza	Estimator	Dunhill Construction	7132086910	valeria@dunhillconstruction.com
Miguel Garcia	Estimator	Rogers-O'Brien	832-473-4700	miguelgarcia@r-o.com
Mike Ellisor	Designer/Estimator	NCS	281-299-9221	mellisor@ncs-tx.com
Tyeasha Johnson	Preconstruction Coord.	CMC Construction	713.588.9011	bids@cmccorp.us
Cory Branham	Assistant PM	FBISD B+C	832-985-1371	cn_cory.branham@fortbendisd.gov
Jerry Bevel	Principal	cre8 Architects	713-521-7505	jerry.bevel@cre8houston.com
DANIEL FERNANDEZ	DESIGNER	CRE8 ARCHITECTS	404-933-9615	DANIEL.FERNANDEZ@CRE8HOUSTON.COM
MICHAEL AQUINO	CLIENT DIRECTOR	ROGERS-O'BRIEN	832 723 5337	MAQUINO@R-O.COM
Amanda Janek	Sr. PM	FBISD-D+C	8322874788	amanda.janek@fortbendisd.gov

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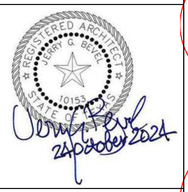
BP-017 Triplex Center Renovations

550 Julie Rivers Drive, Sugar Land, TX 77478

FORT BEND INDEPENDENT SCHOOL DISTRICT



Revision Schedule

NO.	ISSUE	DATE
1	ADDENDUM 01	11.14.2024

Sheet Information	
Date	24 October 2024
Job Number	23-006
Drawn	ALM
Checked	DB
Approved	JGB

Title

ROOM SIGNAGE

Sheet

A0.04

ISSUE FOR BID

PLAQUE TYPE GENERAL NOTES:

1) FOR DETAILED INFORMATION ON EACH PLAQUE TYPE, REFER TO PLAQUE TYPE ENLARGED DETAILS.

2) REFER TO ROOM PLAQUE SCHEDULE FOR PLAQUE LOCATIONS.

3) PROVIDE MATCHING BACK PLATE FOR PLAQUES INDICATED ON SCHEDULES WITH A "2", EX. "F2"; PLAQUES WILL BE INSTALLED ON GLAZING

5) REFER TO FINISH LEGEND (BELOW) FOR PLAQUE FINISHES.

6) REFER TO RESTROOM PICTOGRAMS LEGEND (BELOW) FOR PLAQUE TYPE 'D' PICTOGRAMS.

PLAQUE FINISH LEGEND:

Plastic Laminate: COLOR #1 = PL-2
COLOR #2 = PL-1

Braille Finish: CLEAR

Routed Band: BLACK

Edges: BLACK

RESTROOM PICTOGRAMS:

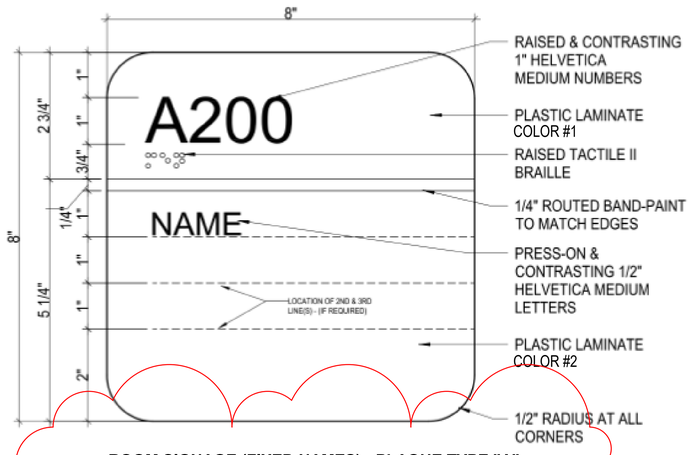
PLAQUE INSTALLATION DETAILS:

EXTERIOR DOOR - VINYL #

Mark	Exterior Vinyl #
200	01
207	02
273	03
302D	05
302E	04
320	08
345	09
356	06
363A	07

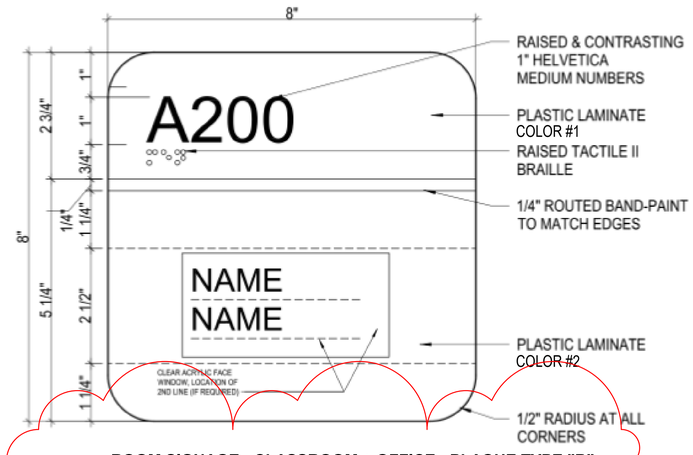
SEE A5.01 AND A5.02 EXTERIOR ELEVATIONS FOR PLACEMENT INFORMATION. FINAL DOOR NUMBERS TO BE CONFIRMED WITH ARCHITECT OWNER PRIOR TO INSTALLATION

PLAQUE TYPE ENLARGED DETAILS:



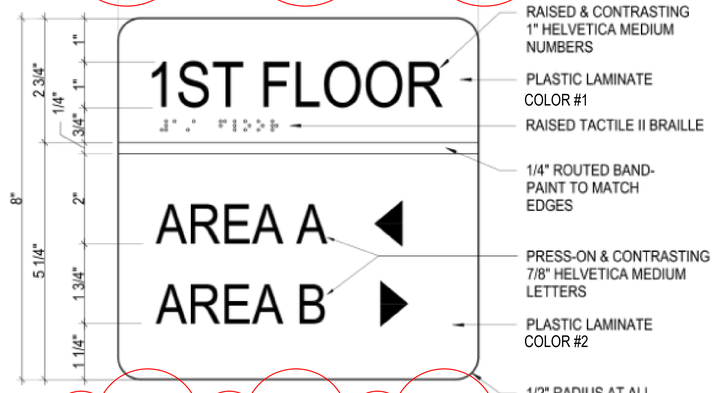
ROOM SIGNAGE (FIXED NAMES) - PLAQUE TYPE "A"

LOCATIONS:
BUILDING 2N: 200, 201, 203, 205, 205A
BUILDING 2S: 202, 202E, 206, 207, 208, 208A, 208B, 208C, 208D, 208E, 208F, 208G, 208H, 208J, 210, 211, 211A, 212, 213, 273
BUILDING 3N: 300, 301, 303, 303B, 307, 308, 309, 311, 311A, 314, 314A, 315, 317, 318, 318A, 319, 320, 321A, 323, 331, 333, 335, 339, 341, 343, 345
BUILDING 3S: 302, 302A, 302B, 302C, 302D, 302E, 312, 312A, 351, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 363A, 364, 373



ROOM SIGNAGE - CLASSROOM + OFFICE - PLAQUE TYPE "B"

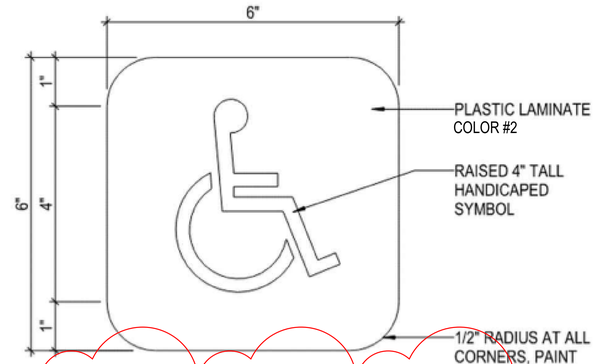
Locations:
BUILDING 2S: 202B, 202C, 202D, 204, 210A
BUILDING 3N: 304, 305, 306, 334, 336, 338, 340, 342



* SEE PLAN FOR LOCATION
NOTE: VERIFY ROOM NUMBERS W/ ARCHITECT & OWNER

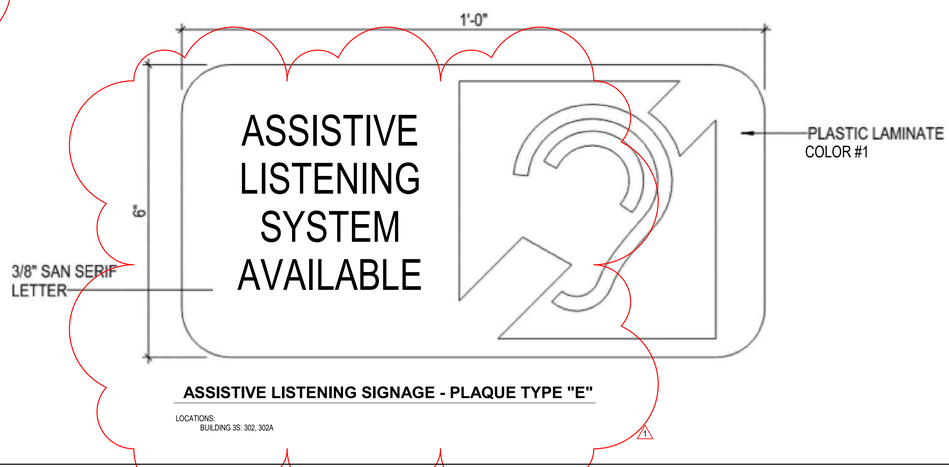
DIRECTIONAL SIGNAGE - PLAQUE TYPE "C"

LOCATIONS:
BUILDING 2: 2 FOR CORRIDORS
BUILDING 3: 4 FOR CORRIDORS



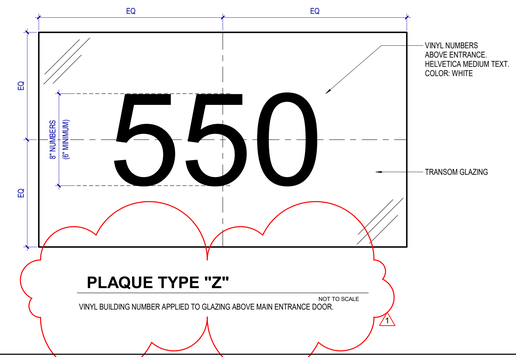
ACCESSIBLE SIGNAGE - PLAQUE TYPE "D"

LOCATIONS:
BUILDING 3N: 311 WITH APPLICABLE PICTOGRAMS
BUILDING 3S: 312 WITH APPLICABLE PICTOGRAMS



ASSISTIVE LISTENING SIGNAGE - PLAQUE TYPE "E"

LOCATIONS:
BUILDING 3S: 302, 302A



PLAQUE TYPE "Z"

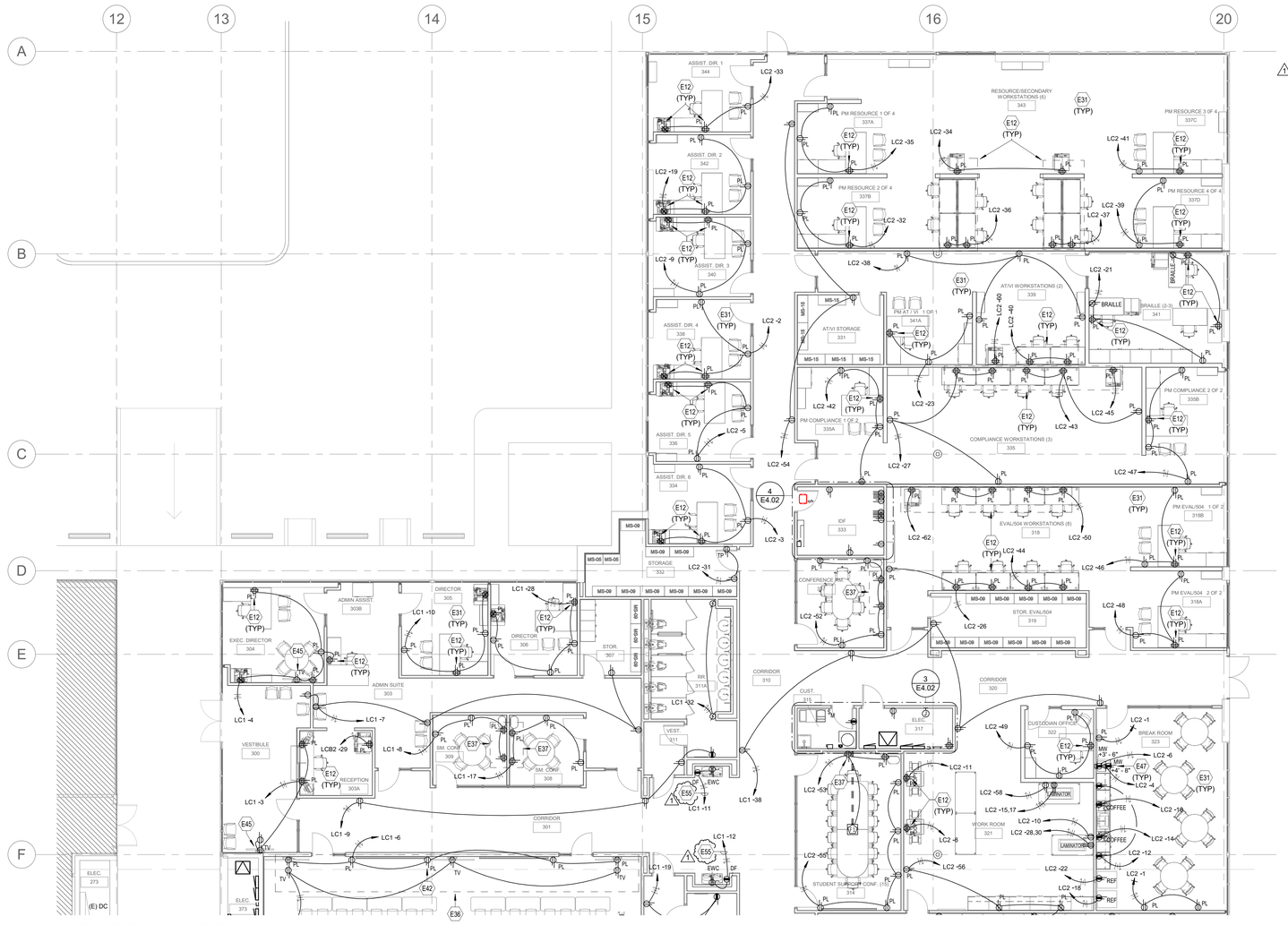
NOT TO SCALE

VINYL BUILDING NUMBER APPLIED TO GLAZING ABOVE MAIN ENTRANCE DOOR.

BINDING EDGE

BINDING EDGE

BINDING EDGE



1 LEVEL 01 POWER PLAN - BUILDING 3N
1/8" = 1'-0"

GENERAL NOTES (POWER):

A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.

B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING.

C. IF ADDITIONAL CONDUCTORS ARE RUN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C.

D. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.

E. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING ON OUTSIDE OF COVER PLATE. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.

F. RECEPTACLES THAT ARE CONTROLLED BY AN AUTOMATIC MEANS SUCH AS OCCUPANCY SENSOR OR ENERGY MANAGEMENT SYSTEM SHALL BE MARKED IN ACCORDANCE WITH NEC 406.3(E).

G. LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC. NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER EQUIPMENT NAMEPLATES OR ACCESS PANELS OR THROUGH ACCESS/MAINTENANCE CLEARANCES OF EQUIPMENT BY OTHER TRADES.

TAGGED NOTES

E12	POWER LOCATIONS AT DESKS AND PRINTER/COPIERS SHALL BE LOCATED NEXT TO ASSOCIATED DATA OUTLET(S) IN CADDY BRACKET CONFIGURATION. REFER TO TYPICAL OUTLET CONFIGURATIONS ON SHEETS 'T400' AND 'T401' FOR MORE INFORMATION. TYPICAL FOR ALL DESK AND PRINTER/COPIER LOCATIONS.
E31	AT LEAST 50% OF ALL RECEPTACLES IN ENCLOSED OFFICES, CONFERENCE ROOMS, AND BREAKROOMS SHALL BE PLUG-LOAD CONTROLLED CONTROLLED BY ROOM CONTROLLER WITHIN ASSOCIATED ROOM. U.O.N. PLUG-LOAD CONTROLLED RECEPTACLES ARE DENOTED WITH 'PL'.
E36	PROVIDE POWER FOR FLAT PANEL DISPLAYS AND ASSOCIATED POWER RELATIVE TO DISPLAYS IN TRAINING ROOM. COORDINATE EXACT MOUNTING HEIGHT AND POWER LOCATION WITH TECHNOLOGY DRAWINGS. REFER TO ELEVATION '1' ON SHEET 'TA301' AND TYPICAL WALL-MOUNTED FLAT PANEL DISPLAY DETAILS ON SHEET 'TA400' FOR MORE INFORMATION.
E37	POWER FOR INTERACTIVE FLAT PANEL WITH ASSOCIATED QUAD RELATIVE TO DISPLAY. COORDINATE EXACT MOUNTING HEIGHT AND POWER LOCATION WITH TECHNOLOGY DRAWINGS. REFER TO SHEET TA300 ELEVATION '2' FOR MORE INFORMATION.
E42	PROVIDE POWER NEAR CONTROL PANEL. COORDINATE EXACT POWER LOCATION WITH AV DRAWINGS.
E45	PROVIDE POWER FOR FLAT PANEL DISPLAYS. COORDINATE EXACT MOUNTING HEIGHT AND POWER LOCATIONS WITH TECHNOLOGY DRAWINGS. REFER TO TYPICAL WALL-MOUNTED FLAT PANEL DISPLAY DETAILS ON SHEET 'TA400' FOR MORE INFORMATION.
E47	DUPLEX RECEPTACLE FOR MICROWAVE SHALL BE RECESSED. TYPICAL FOR ALL MICROWAVE LOCATIONS.
E55	ROUTE CIRCUIT THROUGH CONTACTOR FOR BAS CONTROL OF DRINKING FOUNTAIN.

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550 Julie Rivers Drive, Sugar Land, TX 77478
FORT BEND INDEPENDENT SCHOOL DISTRICT

CMTA F-8627
10/24/2024

Revision Schedule

NO.	ISSUE	DATE
1	Addendum 01	11/11/2024

Sheet Information	
Date	24 October 2024
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Drawn	AAR
Checked	AMB
Approved	GJG

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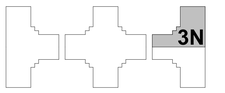
LEVEL 01 POWER PLAN - BUILDING 3N



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E2.03

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GENERAL NOTES (LIGHTING):

A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.

B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING.

C. IF ADDITIONAL CONDUCTORS ARE RUN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER N.E.C. #310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER N.E.C. #300.17 AND ANNEX C.

D. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN N.E.C #100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.

E. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING ON OUTSIDE OF COVER PLATE. ALSO, MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.

F. LOCATE CHAIN-HUNG INDUSTRIAL FIXTURES IN MECHANICAL ROOMS TO AVOID DUCTWORK AND PIPING, TO MAXIMIZE AVAILABLE LIGHT. SPACE AROUND EQUIPMENT, AIR HANDLERS, ETC. TO PROVIDE ADEQUATE LIGHTING TO ALL AREAS OF ROOM. PROVIDE ADDITIONAL FIXTURES OF SAME TYPE AS NEEDED TO FULFILL THIS REQUIREMENT.

G. LOCATE EXIT SIGNS FOR MAXIMUM VIEWING AREA TO IDENTIFY EGRESS PATHS AS INDICATED ON PLANS. COORDINATE LOCATIONS SUCH THAT ARCHITECTURAL FEATURES OR EQUIPMENT FROM OTHER TRADES DO NOT OBSTRUCT VIEW.

H. PROVIDE UNSWITCHED CONDUCTOR FOR ALL LIGHTING CIRCUITS SERVING EMERGENCY LIGHTING, WHETHER OR NOT INDICATED BY TICK MARKS. WHERE EXIT SIGNS, EMERGENCY BATTERY PACKS, OR EMERGENCY CONTROL RELAYS ARE PROVIDED, CONNECT TO UNSWITCHED LINE(S) PER MANUFACTURER INSTRUCTIONS.

I. ALL LIGHTING FIXTURE OPTICS SHALL BE HANDLED WITH COTTON GLOVES DURING INSTALLATION AND LAMPING TO AVOID FINGERPRINTS OR DIRT DEPOSITS. IT IS PREFERRED THAT FIXTURES BE SHIPPED AND INSTALLED WITH CLEAR PLASTIC BAGS TO PROTECT OPTICS. AT CLOSE OF PROJECT, AND AFTER CONSTRUCTION AIR FILTERS ARE CHANGED, REMOVE BAGS. ANY OPTICS SHOWING DIRT OR FINGER PRINTS SHALL BE CLEANED WITH SOLVENT RECOMMENDED BY THE MANUFACTURER, OR REPLACED AS NECESSARY IN ORDER TO TURN OVER TO THE OWNER NEW FIXTURES AT OCCUPANCY.

J. RECESSED LUMINAIRES SHALL BE SECURED SUCH THAT THE FORCE REQUIRED INSERTING LAMPS, TRIMS, LENSES, LOUVERS, OR DOOR FRAMES DOES NOT SHIFT HOUSING. ALL TRIMS SHALL BE COMPLETELY FLUSH WITH FINISHED CEILINGS AT COMPLETION OF CONSTRUCTION.

TAGGED NOTES

E27	A 277V/20A SPARE FROM EXISTING PANEL SHALL BE UTILIZED FOR NEW LIGHTING CIRCUIT AND CONNECTED TO EXISTING LIGHTING INVERTER (E)INVB.
E34	A 277V/20A SPARE FROM EXISTING PANEL SHALL BE UTILIZED FOR NEW LIGHTING CIRCUIT.

1 LEVEL 01 LIGHTING PLAN - BUILDING 2S
1/8" = 1'-0"

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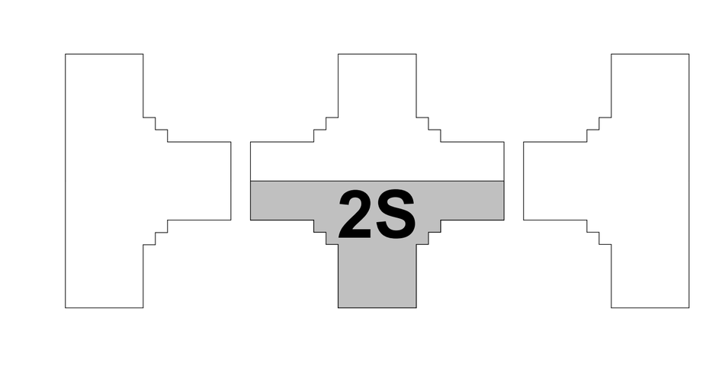
LEVEL 01 LIGHTING PLAN - BUILDING 2S



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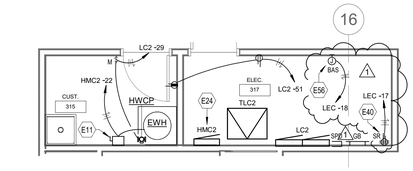
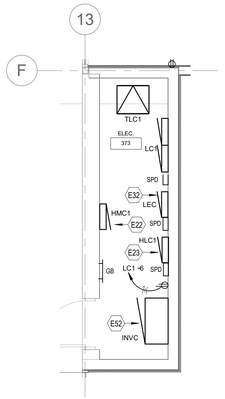


3 ENLARGED PLAN - ELEC 317/CUST 315
1/4" = 1'-0"



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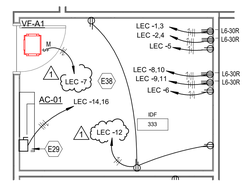

4 ENLARGED PLAN - IDF 333
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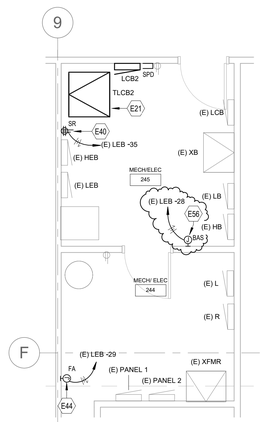

1 ENLARGED PLAN - BUILDING 2 ELEC
1/4" = 1'-0"

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GENERAL NOTES (ENLARGED AND TYPICAL):

A. ALL ROOM LAYOUTS ARE TYPICAL AND MAY VARY OR MIRROR OTHER ASSOCIATED ROOMS. CONTRACTOR SHALL REFER TO ARCHITECTURAL ELEVATIONS AND COORDINATE EACH ROOM PRIOR TO ROUGH-IN.

TAGGED NOTES

E11	PROVIDE 30A/1P HEAVY DUTY DISCONNECT SWITCH FUSED AT NAMEPLATE RATING OF EQUIPMENT FOR WATER HEATER. PROVIDE DISCONNECT WITH NEMA 3R ENCLOSURE. FIELD COORDINATE EXACT LOCATION WITH LOCATION OF WATER HEATER AND OTHER UTILITIES.
E21	NEW TRANSFORMER 'TLCB2' SHALL BE CONNECTED TO EXISTING DISTRIBUTION PANEL 'DB'. REFER TO ELECTRICAL ONE-LINE DIAGRAM ON SHEET E5.02 FOR MORE INFORMATION.
E22	NEW PANEL 'HMC1' SHALL BE CONNECTED TO EXISTING DISTRIBUTION PANEL 'DC' AND EXISTING 400A BREAKER PREVIOUSLY USED FOR EXISTING PANEL 'H4' SHALL BE UTILIZED. REFER TO ELECTRICAL ONE-LINE DIAGRAM ON SHEET E5.02 FOR MORE INFORMATION.
E23	NEW PANEL 'HLC1' SHALL BE CONNECTED TO EXISTING DISTRIBUTION PANEL 'DC' AND EXISTING 100A/3P BREAKER SHALL REUSED. REFER TO ELECTRICAL ONE-LINE DIAGRAM ON SHEET E5.02 FOR MORE INFORMATION.
E24	NEW PANEL 'HMC2' SHALL BE CONNECTED TO EXISTING DISTRIBUTION PANEL 'DC' AND EXISTING 200A/3P BREAKER SHALL BE REMOVED AND REPLACED WITH NEW 400A/3P BREAKER. REFER TO ELECTRICAL ONE-LINE DIAGRAM ON SHEET E5.02 FOR MORE INFORMATION.
E29	PROVIDE 30A/250V/2P/NF NEMA 1R RATED DISCONNECT SWITCH TO SERVE INDOOR SPLIT SYSTEM UNIT.
E32	NEW PANEL 'LEC' SHALL BE CONNECTED TO EXISTING PANEL 'LE' LOCATED IN BUILDING 1. A NEW 100A/3P BREAKER SHALL BE ADDED IN EXISTING PANEL 'LE'. REFER TO ONE-LINE DIAGRAM FOR MORE INFORMATION.
E38	COORDINATE EXACT MOUNTING HEIGHTS AND POWER LOCATIONS WITH 'TECHNOLOGY ENLARGED PLAN ON SHEET 'T300'.
E40	PROVIDE POWER FOR SECURITY RISER. COORIDATE EXACT MOUNTING HEIGHT AND POWER LOCATION WITH SECURITY DRAWINGS, SHEET 'TS204'.
E44	EXISTING FIRE ALARM PANEL SHALL BE REFED FROM EXISTING PANEL 'LEB'. AN EXISTING 120V/20A SPARE SHALL BE UTILIZED FOR NEW CIRCUIT. EXISTING CIRCUIT ON PANEL 'R' SHALL BE CHANGED BE LABELED AS 'SPARE'.
E52	PROVIDE 5KW INVERTER. REFER TO ONE-LINE DIAGRAM ON SHEET 'E5.02' FOR MORE INFORMATION.
E56	VERIFY EXACT LOCATION OF BAS PANEL WITH CONTROLS CONTRACTOR PRIOR TO INSTALLATION AND PROVIDE POWER AND DATA AT LOCATION.

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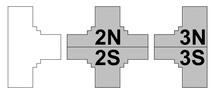

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ENLARGED PLANS

Sheet

E4.02

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LIGHTING CONTROL SCHEDULES - ROOM CONTROLLERS

TYPE	DESCRIPTION	SEQUENCE OF OPERATION	CONTROLLER	SENSOR	SWITCH	REMARKS
1ROC1	SINGLE ZONE ROOM CONTROLLER WITH CEILING-MOUNTED OCCUPANCY SENSING AND MANUAL DIMMING.	1. LOW-VOLTAGE MOMENTARY SWITCH WILL TURN LIGHTS "ON/OFF" 2. OCCUPANCY SENSOR - AUTO "ON" AT 50% 3. MANUAL 0-10V DIMMING FROM 10%-100% 4. OCCUPANCY SENSOR - AUTO "OFF" AFTER 20 MINUTE DELAY (ADJ.)	ROOM CONTROLLER: 1. Lutron #PP-DV 2. Greengate #RC3D-PL 3. nLight #nPP16-D-EFP-PA	SENSOR (QUANTITY AS REQUIRED BY MANUFACTURER): 1. Lutron #LOS-CDT-2000-WH 2. Greengate #OAC-DT-1000-R 3. nLight #nCM-PDT-10	LOW-VOLTAGE DIM SWITCH (QUANTITY AS SHOWN): 1. Lutron #NTSTV-WH 2. Greengate #RC-3TLB 3. nLight #NPODMA-DX-XX	
1ROC3	SINGLE ZONE ROOM CONTROLLER WITH CEILING-MOUNTED OCCUPANCY SENSING AND MANUAL DIMMING. PLUG LOAD CONTROL.	1. LOW-VOLTAGE MOMENTARY SWITCH WILL TURN LIGHTS "ON/OFF" 2. OCCUPANCY SENSOR - AUTO "ON" AT 50% 3. PLUG LOADS SHALL BE "ON" WITH LIGHTING 4. MANUAL 0-10V DIMMING FROM 10%-100% 5. OCCUPANCY SENSOR - AUTO "OFF" AFTER 20 MINUTE DELAY (ADJ.), PLUG LOAD	ROOM CONTROLLER: 1. Lutron #PP-DV (2) 2. Greengate #RC3D-PL 3. nLight #nPP16-D-EFP-PA (2)	SENSOR (QUANTITY AS REQUIRED BY MANUFACTURER): 1. Lutron #LOS-CDT-2000-WH 2. Greengate #OAC-DT-1000-R 3. nLight #nCM-PDT-10	LOW-VOLTAGE DIM SWITCH (QUANTITY AS SHOWN): 1. Lutron #NTSTV-WH 2. Greengate #RC-3TLB 3. nLight #NPODMA-DX-XX	SHEET E6.02/DETAIL 6. REFER TO POWER PLANS FOR TEH NUMBER OF RECEPTACLES/CIRCUITS TO BE CONTROLLED.

LIGHTING CONTROL SCHEDULES - POWER PACKS

TYPE	DESCRIPTION	SEQUENCE OF OPERATION	CONTROLLER	SENSOR	SWITCH	REMARKS
POC1	SINGLE ZONE POWER PACK WITH CEILING-MOUNTED OCCUPANCY SENSING	1. LOW-VOLTAGE MOMENTARY SWITCH WILL TURN LIGHTS "ON/OFF" (WHERE INDICATED ON DRAWINGS) 2. OCCUPANCY SENSOR - AUTO "ON" AT 100% 3. OCCUPANCY SENSOR - AUTO "OFF" AFTER 20 MINUTE DELAY (ADJ.)	POWER PACK: 1. Lutron #PP-DV 2. Greengate #SP20-RD4 3. nLight #nPP16-EFP	SENSOR (QUANTITY AS REQUIRED BY MANUFACTURER): 1. Lutron #LOS-CDT-2000-WH 2. Greengate #OAC-DT-1000-R 3. nLight #nCM-PDT-10	LOW-VOLTAGE MOMENTARY SWITCH (QUANTITY AS SHOWN): 1. Lutron #NTR-CS-1 2. Greengate #GMDS 3. nLight #nPODM-XX	
POC2	SINGLE ZONE POWER PACK WITH CEILING-MOUNTED OCCUPANCY SENSING WITH HOLD "ON" FUNCTION	1. LOW-VOLTAGE MOMENTARY SWITCH WILL TURN LIGHTS "ON/OFF" (WHERE INDICATED ON DRAWINGS) 2. OCCUPANCY SENSOR - AUTO "ON" AT 100% 3. OCCUPANCY SENSOR - AUTO "OFF" AFTER 20 MINUTE DELAY (ADJ.) 4. ON SIGNAL FROM ATS-LS WHILE OPERATING ON GENERATOR, SENSORS WILL BE BYPASSED AND LIGHTS HELD "ON" AT 100%	POWER PACK: 1. Greengate #SP20-RD4 WITH CEPC-2 2. nLight #nPP16-ER-EFP	SENSOR (QUANTITY AS REQUIRED BY MANUFACTURER): 1. Greengate #OAC-DT-1000-R 2. nLight #nCM-PDT-10	LOW-VOLTAGE MOMENTARY SWITCH (QUANTITY AS SHOWN): 1. Greengate #GMDS 2. nLight #nPODM-XX	
PVC1	SINGLE ZONE POWER PACK WITH CEILING-MOUNTED VACANCY SENSING	1. LOW-VOLTAGE MOMENTARY SWITCH WILL TURN LIGHTS "ON/OFF" 2. VACANCY SENSOR - MANUAL "ON" AT 100% 3. VACANCY SENSOR - AUTO "OFF" AFTER 20 MINUTE DELAY (ADJ.)	POWER PACK: 1. Lutron #PP-DV-M 2. Greengate #SP20-RD4 3. nLight #nPP16-EFP-SA	SENSOR (QUANTITY AS REQUIRED BY MANUFACTURER): 1. Lutron #LOS-CDT-2000-WH 2. Greengate #OAC-DT-1000-R 3. nLight #nCM-PDT-10	LOW-VOLTAGE MOMENTARY SWITCH (QUANTITY AS SHOWN): 1. Lutron #NTR-CS-1 2. Greengate #GMDS 3. nLight #nPODM-XX	

LIGHTING CONTROL SCHEDULES - LINE VOLTAGE SWITCHES

TYPE	DESCRIPTION	SEQUENCE OF OPERATION	SWITCH	REMARKS
V	LINE VOLTAGE, WALL MOUNT, DUAL TECHNOLOGY VACANCY SENSOR	1. MANUAL "ON" AT 100% 2. AUTO "OFF" AFTER 20 MINUTE DELAY (ADJ.)	SWITCH: 1. Lutron #MS-B102-V-WH 2. Greengate #VNW-D-1001-MV 3. nLight #nWSX-PDT-LV 4. Sensor Switch #WSXA-PDT-XX	

LIGHTING CONTROL SCHEDULES - WIRELESS CONTROLS INTEGRATED IN FIXTURE

TYPE	DESCRIPTION	SEQUENCE OF OPERATION	SENSOR	SWITCH	REMARKS
2IWO	INTEGRATED WIRELESS LIGHT FIXTURE CONTROLS WITH TWO LIGHTING ZONES AND PLUG LOAD CONTROL, AND LINE VOLTAGE WALL STATION.	OPEN OFFICE CONTROLS: 1. LOW-VOLTAGE MOMENTARY SWITCH WILL TURN LIGHTS "ON/OFF" 2. ACTIVE LIGHTING ZONE SHALL BE AUTO "ON" TO 100%. 3. ALL OTHER ZONES SHALL BE AUTO "ON" TO 20% 4. PLUG LOADS SHALL BE "ON" WITH LIGHTING 5. MANUAL 0-10V DIMMING FROM 10%-100% 6. NON-ACTIVE ZONES SHALL BE REDUCE TO 20% AFTER 20 MINUTES. 7. LIGHTING AND PLUG LOADS SHALL BE AUTO "OFF" AFTER 20 MINUTE DELAY (ADJ.) IF ALL ZONES ARE NOT ACTIVE.	SENSOR INTEGRATED INTO FIXTURE.	LINE-VOLTAGE DIM WALL STATION (QUANTITY AS SHOWN): 1. Lutron #PX-3BRL-GXX-IO1 2. WaveLinx #W2L-RL-X 3. nLight #RPODLA-DX-MVOLT-XX-G2	REFER TO POWER PLANS FOR THE NUMBER OF RECEPTACLES/CIRCUITS TO BE CONTROLLED.
3IWO	INTEGRATED WIRELESS LIGHT FIXTURE CONTROLS WITH THREE LIGHTING ZONES AND PLUG LOAD CONTROL, AND LINE VOLTAGE WALL STATION.	OPEN OFFICE CONTROLS: 1. LOW-VOLTAGE MOMENTARY SWITCH WILL TURN LIGHTS "ON/OFF" 2. ACTIVE LIGHTING ZONE SHALL BE AUTO "ON" TO 100%. 3. ALL OTHER ZONES SHALL BE AUTO "ON" TO 20% 4. PLUG LOADS SHALL BE "ON" WITH LIGHTING 5. MANUAL 0-10V DIMMING FROM 10%-100% 6. NON-ACTIVE ZONES SHALL BE REDUCE TO 20% AFTER 20 MINUTES. 7. LIGHTING AND PLUG LOADS SHALL BE AUTO "OFF" AFTER 20 MINUTE DELAY (ADJ.) IF ALL ZONES ARE NOT ACTIVE.	SENSOR INTEGRATED INTO FIXTURE.	LINE-VOLTAGE DIM WALL STATION (QUANTITY AS SHOWN): 1. Lutron #PX-3BRL-GXX-IO1 2. WaveLinx #W2L-RL-X 3. nLight #RPODLA-DX-MVOLT-XX-G2	REFER TO POWER PLANS FOR THE NUMBER OF RECEPTACLES/CIRCUITS TO BE CONTROLLED.
4IWO	INTEGRATED WIRELESS LIGHT FIXTURE CONTROLS WITH FOUR LIGHTING ZONES AND PLUG LOAD CONTROL, AND LINE VOLTAGE WALL STATION.	OPEN OFFICE CONTROLS: 1. LOW-VOLTAGE MOMENTARY SWITCH WILL TURN LIGHTS "ON/OFF" 2. ACTIVE LIGHTING ZONE SHALL BE AUTO "ON" TO 100%. 3. ALL OTHER ZONES SHALL BE AUTO "ON" TO 20% 4. PLUG LOADS SHALL BE "ON" WITH LIGHTING 5. MANUAL 0-10V DIMMING FROM 10%-100% 6. PRIMARY AND SECONDARY DAYLIGHTING ZONE SHALL BE PER CODE 7. NON-ACTIVE ZONES SHALL BE REDUCE TO 20% AFTER 20 MINUTES. 8. LIGHTING AND PLUG LOADS SHALL BE AUTO "OFF" AFTER 20 MINUTE DELAY (ADJ.) IF ALL ZONES ARE NOT ACTIVE.	SENSOR INTEGRATED INTO FIXTURE.	LINE-VOLTAGE DIM WALL STATION (QUANTITY AS SHOWN): 1. Lutron #PX-3BRL-GXX-IO1 2. WaveLinx #W2L-RL-X 3. nLight #RPODLA-DX-MVOLT-XX-G2	REFER TO POWER PLANS FOR THE NUMBER OF RECEPTACLES/CIRCUITS TO BE CONTROLLED.

LIGHT FIXTURE SCHEDULE - INTERIOR

TYPE	DESCRIPTION	BASIS OF DESIGN	EQUAL MANFACTURERS	MOUNTING	LAMPS / CCT	MINIMUM LUMENS	MAXIMUM WATTAGE	MINIMUM LUMEN/WATT	VOLTAGE	REMARKS
AF38	2'X4' FLAT PANEL, LOWER LUMENS.	METALUX #24FPX-38-L840-HE	DAY-BRITE #2FPZ38L840-4-DS-UNV-DIM LITHONIA #CPX-2X4-4000LM-80CRI-40K-SWL-MIN10-ZT-MVOLT	RECESSED	LED 4000K	3800	29	130	277	DLC LISTING REQUIRED.
AV40	2'X4' VOLUMETRIC TROFFER WITH RIBBED FROSTED ACRYLIC ROUND LENS, LOWER LUMENS.	METALUX #24CZ-LD5-40-UNV-L840-CD-1	DAY-BRITE #2FGXG43L840-4-F-UNV LITHONIA #2BLT4-40L-ADP-GZ10-LP840	RECESSED	LED 4000K	4000	36	122	277	DLC LISTING REQUIRED.
AV40G	2'X4' VOLUMETRIC TROFFER WITH RIBBED FROSTED ACRYLIC ROUND LENS AND DRYWALL FRAME KIT, LOWER LUMENS.	METALUX #24CZ-LD5-40-UNV-L840-CD-1-DF-24W-U	DAY-BRITE #2FGXG43L840-4-F-UNV-FMA24 LITHONIA #2BLT4-40L-ADP-GZ10-LP840-DGA24	RECESSED	LED 4000K	4000	36	122	277	DLC LISTING REQUIRED.
AV50	2'X4' VOLUMETRIC TROFFER WITH RIBBED FROSTED ACRYLIC ROUND LENS, MEDIUM LUMENS.	METALUX #24CZ-LD5-50-UNV-L840-CD-1	DAY-BRITE #2FGXG54L840-4-F-UNV LITHONIA #2BLT4-48L-ADP-GZ10-LP840	RECESSED	LED 4000K	5000	41	129	277	DLC LISTING REQUIRED.
AV60	2'X4' VOLUMETRIC TROFFER WITH RIBBED FROSTED ACRYLIC ROUND LENS, HIGH LUMENS.	METALUX #24CZ-LD5-60-UNV-L840-CD-1	DAY-BRITE #2FGXG74L840-4-F-UNV LITHONIA #2BLT4-60L-ADP-GZ10-LP840	RECESSED	LED 4000K	6000	56	135	277	DLC LISTING REQUIRED.
AVI40	2'X4' VOLUMETRIC TROFFER WITH RIBBED FROSTED ACRYLIC ROUND LENS, LOWER LUMENS. FIXTURE SHALL BE PROVIDED WITH INTEGRATED WIRELESS SENSOR.	METALUX #24CZ-LD5-40-UNV-L840-W2A-WAA	DAY-BRITE #2FGXG43L840-4-F-UNV-SWZCS-IRT9015 LITHONIA #2BLT4-40L-ADP-GZ10-LP840-NLTAIR2-RES7	RECESSED	LED 4000K	4000	36	130	277	DLC LISTING REQUIRED.
AVI50	2'X4' VOLUMETRIC TROFFER WITH RIBBED FROSTED ACRYLIC ROUND LENS, LOWER LUMENS. FIXTURE SHALL BE PROVIDED WITH INTEGRATED WIRELESS CONTROLS.	METALUX #24CZ-LD5-50-UNV-L840-W2A-WAA	DAY-BRITE #2FGXG54L840-4-F-UNV-SWZCS-IRT9015 LITHONIA #2BLT4-48L-ADP-GZ10-LP840-NLTAIR2-RES7	RECESSED	LED 4000K	5000	41	130	277	DLC LISTING REQUIRED.
AVI65	2'X4' VOLUMETRIC TROFFER WITH RIBBED FROSTED ACRYLIC ROUND LENS, LOWER LUMENS. FIXTURE SHALL BE PROVIDED WITH INTEGRATED WIRELESS CONTROLS.	METALUX #24CZ-LD5-65-UNV-L840-W2A-WAA	DAY-BRITE #2FGXG74L840-4-F-UNV-SWZCS-IRT9015 LITHONIA #2BLT4-72L-ADP-GZ10-LP840-NLTAIR2-RES7	RECESSED	LED 4000K	6500	59	123	277	DLC LISTING REQUIRED.
BF32	2'X2' FLAT PANEL, LOWER LUMENS.	METALUX #22FPX32-L840	DAY-BRITE #2FPZ38L840-2-DS-UNV-DIM LITHONIA #CPX-2X2-3200LM-80CRI-40K-SWL-MIN10-ZT-MVOLT	RECESSED	LED 4000K	3200	31	114	277	DLC LISTING REQUIRED.
BV34	2'X2' VOLUMETRIC TROFFER WITH RIBBED FROSTED ACRYLIC ROUND LENS, LOWER LUMENS.	METALUX #22CZ-LD5-34-UNV-L840-CD-1	DAY-BRITE #2FGXG38L840-2-F-UNV LITHONIA #2BLT2-33L-ADP-GZ10-LP840	RECESSED	LED 4000K	3400	24	137	277	DLC LISTING REQUIRED.
BV44	2'X2' VOLUMETRIC TROFFER WITH RIBBED FROSTED ACRYLIC ROUND LENS, MEDIUM LUMENS.	METALUX #22CZ-LD5-44-UNV-L840-CD-1	DAY-BRITE #2FGXG45L840-2-F-UNV LITHONIA #2BLT2-48L-ADP-GZ10-LP840	RECESSED	LED 4000K	4300	43	135	277	DLC LISTING REQUIRED.
BVI34	2'X2' VOLUMETRIC TROFFER WITH RIBBED FROSTED ACRYLIC ROUND LENS, MID LUMENS. FIXTURE SHALL BE PROVIDED WITH INTEGRATED WIRELESS CONTROLS.	METALUX #22CZ-LD5-34-UNV-L840-W2A-1-WAA	DAY-BRITE #2FGXG38L840-2-F-UNV-SWZCS-IRT9015 LITHONIA #2BLT2-33L-ADP-GZ10-LP840-NLTAIR2-RES7	RECESSED	LED 4000K	3400	23	137	277	DLC LISTING REQUIRED.
D610	6" ROUND DOWNLIGHT WITH WIDE DISTRIBUTION AND SEMI-SPECULAR LENS.	PORTFOLIO #LD6C109040D010-W0L1	LIGHTOLIER #6RN-C6L10940WZ10U-C6RDLCD GOTHAM #EV06-40/10-AR-LSS-WD-MVOLT-GZ10	RECESSED	LED 4000K	900	11	90	277	ENERGY STAR CERTIFICATION REQUIRED.
F440	4' STRIP WITH SEMI-FROSTED LENS AND NARROW DISTRIBUTION. PROVIDE FIXTURE WITH CHAIN HANGER KIT.	METALUX #4SNLED-LD5-41SL-LN-UNV-L840-CD-1-AYC-CHAIN/SET	DAY-BRITE #FSS440L840-UNV-DIM-FKR-126 LITHONIA LIGHTING #ZL1D-L48-3000LM-FST-MVOLT-40K-80CRI-HC36 M12	SUSPENDED	LED 4000K	4000	32	135	277	DLC LISTING REQUIRED.
LR6	6" WIDE LINEAR RECESSED FIXTURE. REFER TO LIGHTING PLANS FOR REQUIRED LINEAR LENGTH.	NEORAY #S125DR-S610840-ETG-4F0-1-UDD-F	AXIS LIGHTING #B6RLED-600-80-40-FS-X'-UNV-DP-1-TB PRUDENTIAL #BPRO5-REC-FLSH-LED4-MO-X'-SAL-SC-UNV-X1-DM10	RECESSED	LED 4000K	600LM/FT	<varies>	126	277	ENERGY STAR CERTIFICATION REQUIRED.
LR6H	6" WIDE LINEAR RECESSED FIXTURE. REFER TO LIGHTING PLANS FOR REQUIRED LINEAR LENGTH.	NEORAY #S125DR-S850840-ETG-4F0-1-UDD-F	AXIS LIGHTING #B6RLED-800-80-40-FS-X'-UNV-DP-1-TB PRUDENTIAL #BPRO5-REC-FLSH-LED4-SO-X'-SAL-SC-UNV-X1-DM10	RECESSED	LED 4000K	800LM/FT	<varies>	124	277	
X1	UNIVERSAL MOUNT THERMOPLASTIC EXIT SIGN.	SURE-LITES #APX6R	CHLORIDE #CLXARW LITHONIA #LQM-S-W-3-R-MVOLT				2		277	

PROVIDE A 10 YEAR WARRANTY. REFER TO ARCHITECT FOR FINISH. REFER TO SPECIFICATIONS FOR MORE INFORMATION. FIXTURE TYPE NAMES WITH 'I' REFER TO FIXTURES WITH INTEGRATED WIRELESS CONTROLS.

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FORT BEND INDEPENDENT SCHOOL DISTRICT

CMTA F-8627
10/24/2024

Revision Schedule

NO.	ISSUE	DATE
1	Addendum 01	11/11/2024

Sheet Information

Date	24 October 2024
Job Number	23-006
Drawn	AAR
Checked	AMB
Approved	GJG

Title

LIGHTING SCHEDULES

Sheet

E7.01

ISSUE FOR BID

BINDING EDGE

BINDING EDGE

BINDING EDGE

PANELBOARD AND WIRING SCHEDULE

PANEL: (E) LEB
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 225 A
MAINS TYPE:
SPD:
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT:
PANEL INTERRUPTING RATING: 22 KAIC
LOCATION: MECH/ELEC 245
SUPPLY FROM: (E)LE

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
(E)LOAD	--	--	--	20	1	1	0.0	0.0					2	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	30	2	3			0.0	0.0			4	1	20	--	--	--	(E)LOAD
						5					0.0	0.0	6	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	30	2	7	0.0	0.0					8	1	20	--	--	--	(E)LOAD
						9			0.0	0.0			10	2	30	--	--	--	(E)LOAD
(E)LOAD	--	--	--	30	2	11					0.0	0.0	12						
						13	0.0	0.0					14	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	20	1	15			0.0	0.0			16	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	20	1	17					0.0	0.0	18	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	20	1	19	0.0	0.0					20	2	25	--	--	--	(E)LOAD
(E)LOAD	--	--	--	20	2	21			0.0	0.0			22						
						23					0.0	0.0	24	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	20	1	25	0.0	0.0					26	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	20	1	27			0.0	0.5			28	1	20				245 BAS PANEL
FA PANEL				20	1	29					0.5	0.0	30	1	20	--	--	--	(E)SPARE
(E)SPARE	--	--	--	20	1	31	0.0	0.0					32	1	20	--	--	--	(E)SPARE
(E)SPARE	--	--	--	20	1	33			0.0	0.0			34	1	20	--	--	--	(E)SPARE
245 SEC RISER	10	10		30	1	35					1.0	--	36	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	37	--	--					38	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	39			--	--			40	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	41					--	--	42	1	--	--	--	--	SPACE
TOTAL LOAD (kVA):							0.0 kVA		0.5 kVA		1.5 kVA								
TOTAL CURRENT (A):							0 A		5 A		13 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	500 VA	100.00%	500 VA	**TOTAL CONNECTED LOAD:**	2000 VA
REC	1500 VA	100.00%	1500 VA	**TOTAL ESTIMATED DEMAND:**	2000 VA
				TOTAL CONNECTED CURRENT:	6 A
				TOTAL ESTIMATED DEMAND CURRENT:	6 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: (E) HEB
VOLTAGE: 480Y/277V,3P,4W
AMPERES: 225 A
MAINS TYPE: MLO
SPD: No
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT: 10 kA
PANEL INTERRUPTING RATING: 14 KAIC
LOCATION: MECH/ELEC 245
SUPPLY FROM: (E)HE

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
(E)LTG LOAD	--	--	--	20	1	1	0.3	2.0					2	1	20	--	--	--	(E) INVB
B2 SOUTH & WEST OFFICE EM...				20	1	3			0.7	0.0			4	1	20	--	--	--	(E)SPARE
B2 SOUTH & WEST CORR LTG EM				20	1	5					0.4	0.0	6	1	20	--	--	--	(E)SPARE
(E)SPARE	--	--	--	20	1	7	0.0	0.0					8	1	20	--	--	--	(E)SPARE
(E)SPARE	--	--	--	20	1	9			0.0	0.0			10	1	20	--	--	--	(E)SPARE
(E)SPACE	--	--	--	--	1	11					--	--	12	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	13	--	--					14	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	15			--	--			16	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	17					--	--	18	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	19	--	--					20	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	21			--	--			22	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	23					--	--	24	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	25	--	--					26	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	27			--	--			28	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	29					--	--	30	1	--	--	--	--	(E)SPACE
TOTAL LOAD (kVA):							2.3 kVA		0.7 kVA		0.4 kVA								
TOTAL CURRENT (A):							9 A		3 A		1 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
LTNG	1044 VA	125.00%	1305 VA	**TOTAL CONNECTED LOAD:**	3371 VA
Spare	2327 VA	100.00%	2327 VA	**TOTAL ESTIMATED DEMAND:**	3632 VA
				TOTAL CONNECTED CURRENT:	4 A
				TOTAL ESTIMATED DEMAND CURRENT:	4 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: (E) HB
VOLTAGE: 480Y/277V,3P,4W
AMPERES: 100 A
MAINS TYPE: MLO
SPD: No
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT: 13.6 kA
PANEL INTERRUPTING RATING: 14 KAIC
LOCATION: MECH/ELEC 245
SUPPLY FROM: (E) DB

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
(E)LTG CORR &RM 235,236	--	--	--	20	1	1	0.0	1.2					2	1	20				B2 WEST OFFICE/STOR LTG
(E)LTG RM 223,256,257,261 MAIN...	--	--	--	20	1	3			0.0	0.0			4	1	20	--	--	--	(E)LTG LOAD
(E) EXT RECESSED CAN LTG B2	--	--	--	20	1	5					0.0	0.0	6	1	20	--	--	--	(E) EXT FLOOD LTG B2
(E) CONTROL B3 LTG	--	--	--	20	1	7	0.0	0.0					8	1	20	--	--	--	(E)SPARE
B2 SOUTH OFFICE LTG				20	1	9			1.4	0.0			10	1	20	--	--	--	(E)SPARE
B2 SOUTH & WEST CORR LTG				20	1	11					0.4	0.0	12	1	20	--	--	--	(E)SPARE
(E)SPARE	--	--	--	20	1	13	0.0	0.0					14	1	20	--	--	--	(E)SPARE
(E)SPARE	--	--	--	20	1	15			0.0	0.0			16	1	20	--	--	--	(E)SPARE
(E)SPACE	--	--	--	--	1	17					--	0.0	18	3	15	--	--	--	(E)LOAD
(E)SPACE	--	--	--	--	1	19	--	0.0					20						
(E)SPACE	--	--	--	--	1	21			--	0.0			22						
(E)SPACE	--	--	--	--	1	23					--	--	24	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	25	--	--					26	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	27			--	--			28	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	29					--	--	30	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	31	--	--					32	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	33			--	--			34	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	35					--	--	36	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	37	--	--					38	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	39			--	--			40	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	41					--	--	42	1	--	--	--	--	(E)SPACE
TOTAL LOAD (kVA):							1.2 kVA		1.4 kVA		0.4 kVA								
TOTAL CURRENT (A):							5 A		5 A		2 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
LTNG	2989 VA	125.00%	3737 VA	**TOTAL CONNECTED LOAD:**	2989 VA
				TOTAL ESTIMATED DEMAND:	3737 VA
				TOTAL CONNECTED CURRENT:	4 A
				TOTAL ESTIMATED DEMAND CURRENT:	4 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: (E) L
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 225 A
MAINS TYPE: 225A MCB
SPD: No
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT:
PANEL INTERRUPTING RATING: 22 KAIC
LOCATION: MECH/ ELEC 244
SUPPLY FROM: (E) XFMR

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
(E) WATER PUMP	--	--	--	20	1	1	0.0	0.0					2	1	20	--	--	--	(E)LOAD
(E) BUG EYES	--	--	--	20	1	3			0.0	0.0			4	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	20	1	5					0.0	0.0	6	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	100	2	7	0.0	0.0					8	1	20	--	--	--	(E) 101 WEST WALL
						9			0.0	0.0			10	1	20	--	--	--	(E)LOAD
(E)AV RM	--	--	--	20	1	11					0.0	0.0	12	1	20	--	--	--	(E) 101 COMPUTER POLE
(E)LOAD	--	--	--	20	1	13	0.0	0.0					14	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	20	1	15			0.0	0.0			16	1	20	--	--	--	(E)LOAD
(E) RM 404 COMPUTERS	--	--	--	20	1	17					0.0	0.0	18	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	30	3	19	0.0	0.0					20	1	20	--	--	--	(E)LOAD
						21			0.0	0.0			22	1	20	--	--	--	(E) 101 SOUTH WALL COMPUTER
						23					0.0	0.0	24	1	20	--	--	--	(E)LOAD
203 AAC WRKST				20	1	25	1.0	0.0					26	1	20	--	--	--	(E)LOAD
STUDENT CONF REC				20	1	27			0.7	0.0			28	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	20	1	29					0.0	0.0	30	1	20	--	--	--	(E) TABLE PLUGS 201
(E) 404 COMPUTER	--	--	--	20	1	31	0.0	0.0					32	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	20	1	33			0.0	0.0			34	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	20	1	35					0.0	0.0	36	1	20	--	--	--	(E) NURSING COMPUTER
(E)LOAD	--	--	--	20	1	37	0.0	0.0					38	1	20	--	--	--	(E)LOAD
(E)LOAD	--	--	--	20	1	39			0.0	0.7			40	1	20				EF-01
ROOF REC				20	1	41					0.4	0.0	42	1	20	--	--	--	(E) WATER COOLER
TOTAL LOAD (kVA):							1.0 kVA		1.4 kVA		0.4 kVA								
TOTAL CURRENT (A):							10 A		13 A		3 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
Motor	696 VA	100.00%	696 VA	**TOTAL CONNECTED LOAD:**	2816 VA
REC	2120 VA	100.00%	2120 VA	**TOTAL ESTIMATED DEMAND:**	2816 VA
				TOTAL CONNECTED CURRENT:	8 A
				TOTAL ESTIMATED DEMAND CURRENT:	8 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: (E)LE
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 400 A
MAINS TYPE: 400A MCB
SPD: Yes
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT:
PANEL INTERRUPTING RATING: 22 KAIC
LOCATION: ELEC. 172
SUPPLY FROM: (E)XE

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
(E)LEA				225	3	1	0.0	4.5					2	3	100	SEE ONE-LINE			LEC*
						3			0.0	5.2			4						
						5					0.0	3.2	6						
(E) LEB				100	3	7	0.0	--					8	1	--	--	--	--	(E)SPACE
						9			0.5	--			10	1	--	--	--	--	(E)SPACE
						11					1.5	--	12	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	13	--	--					14	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	15			--	--			16	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	17					--	--	18	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	19	--	--					20	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	21			--	--			22	1	--	--	--	--	(E)SPACE
(E)SPACE	--	--	--	--	1	23					--	--	24	1	--	--	--	--	(E)SPACE
SPD	--	--	--	30	3	25	0.0	--					26	1	--	--	--	--	(E)SPACE
						27			0.0	--			28	1	--	--	--	--	(E)SPACE
						29					0.0	--	30	1	--	--	--	--	(E)SPACE
TOTAL LOAD (kVA):							4.5 kVA		5.7 kVA		4.7 kVA								
TOTAL CURRENT (A):							37 A		47 A		39 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	500 VA	100.00%	500 VA	**TOTAL CONNECTED LOAD:**	14770 VA
Motor	4370 VA	100.00%	4370 VA	**TOTAL ESTIMATED DEMAND:**	14770 VA
REC	9900 VA	100.00%	9900 VA	**TOTAL CONNECTED CURRENT:**	41 A
				TOTAL ESTIMATED DEMAND CURRENT:	41 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.
*NEW 208V/100A/3P BREAKER SHALL BE ADDED FOR NEW PANEL LEC. REFER TO ONE-LINE DIAGRAM FOR MORE INFORMATION.

PANELBOARD AND WIRING SCHEDULE

PANEL: (E) R
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 225 A
MAINS TYPE: 225A MCB
SPD: No
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT:
PANEL INTERRUPTING RATING: 22 KAIC
LOCATION: MECH/ ELEC 244
SUPPLY FROM: (E) XFMR

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
(E)LOAD	--	--	--	20	1	1	0.0	1.1					2	1	20				AAC ASSIT DIRECTOR
(E)RM 104 WATER HEATER	--	--	--	20	1	3			0.0	1.3			4	1	20				AAC BUDGET REC
(E)LOAD	--	--	--	20	1	5					0.0	0.9	6	1	20				202B AAC DIRECT REC
FUME HOOD OUTLETS	--	--	--	20	1	7	0.0	0.9					8	1	20				202C AAC ASSIST DIRECT REC
(E)LOAD	--	--	--	20	1	9			0.0	0.0			10	1	20	--	--	--	(E)RM 103 PLUGS
(E)LOAD	--	--	--	20	1	11					0.0	1.8	12	1	20				204 COFFEE
SPARE	--	--	--	20	1	13	0.0	0.0					14	1	20	--	--	--	(E)AVI PLUGS
202H AAC COORD				20	1	15			1.1	0.0			16	1	20	--	--	--	(E)POLES RM 203
202J ADMIN/204 BREAK RM				20	1	17					1.1	0.0	18	1	20	--	--	--	(E)POLES RM 203
204 COUNTER REC				20	1	19	1.8	0.0					20	1	20	--	--	--	(E)PLUGS RM 402
204 MW				20	1	21			1.0	0.0			22	1	20	--	--	--	(E)PLUGS RM 402
204 REFRIG				20	1	23					0.8	0.0	24	1	20	--	--	--	(E)PLUGS RM 402
(E)PLUGS RM 402	--	--	--	20	1	25	0.0	0.0					26	1	20	--	--	--	(E)RM 201 AUTO CLAVE
(E)PLUGS RM 402	--	--	--	20	1	27			0.0	0.0			28	1	20	--	--	--	(E)RM 201 AUTO CLAVE
(E)PLUGS RM 402	--	--	--	20	1	29					0.0	0.0	30	1	20	--	--	--	(E)RM 201 AUTO CLAVE
(E)LOAD	--	--	--	20	1	31	0.0	0.0					32	1	20	--	--	--	(E)RM 202 PLUGS
(E)LOAD	--	--	--	20	1	33			0.0	0.0			34	1	20	--	--	--	(E)RM 202 PLUGS
(E)REFRIGERATOR	--	--	--	20	1	35					0.0	0.0	36	1	20	--	--	--	(E)LOAD
(E)DOOR OPENER	--	--	--	20	1	37	0.0	0.0					38	1	20	--	--	--	(E)WATER HEATER
(E)SPACE	--	--	--	--	1	39			--	0.0			40	1	20	--	--	--	(E)WATER HEATER
(E)SPACE	--	--	--	--	1	41					--	0.5	42	1	20				ROOF REC
TOTAL LOAD (kVA):							3.8 kVA		3.3 kVA		5.1 kVA								
TOTAL CURRENT (A):							32 A		28 A		43 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
REC	12280 VA	90.72%	11140 VA	**TOTAL CONNECTED LOAD:**	12280 VA
				TOTAL ESTIMATED DEMAND:	11140 VA
				TOTAL CONNECTED CURRENT:	34 A
				TOTAL ESTIMATED DEMAND CURRENT:	31 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: (E) PANEL 2
VOLTAGE: 480Y/277V,3P,4W
AMPERES: 400 A
MAINS TYPE: MLO
SPD: No
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT: 13.1 kA
PANEL INTERRUPTING RATING: 14 KAIC
LOCATION: MECH/ ELEC 244
SUPPLY FROM: (E) DB

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
(E)RTU-26	--	--	--	15	3	1	0.0	0.0					2	3	30	--	--	--	SPARE*
						3			0.0	0.0			4						
						5					0.0	0.0	6						
(E)RTU-28	--	--	--	30	3	7	0.0	0.0					8	3	30	--	--	--	SPARE*
						9			0.0	0.0			10						
						11					0.0	0.0	12						
(E)RTU-27	--	--	--	15	3	13	0.0	7.8					14	3	30		10	10	RTU-24-06
						15			0.0	7.8			16						
						17					0.0	7.8	18						
(E)RTU-30	--	--	--	30	3	19	0.0	0.0					20	3	30	--	--	--	SPARE*
						21			0.0	0.0			22						
						23					0.0	0.0	24						
(E)RTU-31	--	--	--	25	3	25	0.0	7.4					26	3	30		10	10	RTU-24-10
						27			0.0	7.4			28						
						29					0.0	7.4	30						
(E)RTU-29	--	--	--	35	3	31	0.0	0.0					32	3	30	--	--	--	SPARE*
						33			0.0	0.0			34						
						35					0.0	0.0	36						
(E)XMFR	--	--	--	125	3	37	0.0	0.0					38	3	30	--	--	--	SPARE*
						39			0.0	0.0			40						
						41					0.0	0.0	42						
TOTAL LOAD (kVA):							15.3 kVA		15.3 kVA		15.3 kVA								
TOTAL CURRENT (A):							55 A		55 A		55 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
Motor	15796 VA	100.00%	15796 VA	**TOTAL CONNECTED LOAD:**	45796 VA
HEAT	30000 VA	100.00%	30000 VA	**TOTAL ESTIMATED DEMAND:**	45796 VA
				TOTAL CONNECTED CURRENT:	55 A
				TOTAL ESTIMATED DEMAND CURRENT:	55 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.
*EXISTING BREAKER SHALL BE RE-LABELED AS SPARE.

PANELBOARD AND WIRING SCHEDULE

PANEL: (E) PANEL 1
VOLTAGE: 480Y/277V,3P,4W
AMPERES: 225 A
MAINS TYPE: MLO
SPD: No
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT: 13.4 kA
PANEL INTERRUPTING RATING: 14 KAIC
LOCATION: MECH/ ELEC 244
SUPPLY FROM: (E) DB

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
(E)RTU-33	--	--	--	25	3	1	0.0	7.8					2	3	30		10	10	RTU-24-01
						3			0.0	7.8			4						
						5					0.0	7.8	6						
(E)RTU-34	--	--	--	30	3	7	0.0	7.4					8	3	30		10	10	RTU-24-05
						9			0.0	7.4			10						
						11					0.0	7.4	12						
(E)RTU-35	--	--	--	25	3	13	0.0	0.0					14	3	30	--	--	--	SPARE*
						15			0.0	0.0			16						
						17					0.0	0.0	18						
(E)RTU-32	--	--	--	25	3	19	0.0	0.0					20	3	30	--	--	--	(E)HOT WATER HEATER
						21			0.0	0.0			22						
						23					0.0	0.0	24						
(E)LOAD	--	--	--	20	1	25	0.0	0.0					26	1	20	--	--	--	(E)EAST HALL LTG
(E)SOUTH LOOP E/L	--	--	--	20	1	27			0.0	0.0			28	1	20	--	--	--	(E)LOAD
(E)SOUTH HALL E/L	--	--	--	20	1	29					0.0	0.0	30	1	20	--	--	--	(E)EAST HALL E/L
(E)SOUTH HALL LTG	--	--	--	20	1	31	0.0	0.0					32	1	20	--	--	--	(E)SPARE
(E)LOAD	--	--	--	20	1	33			0.0	0.0			34	1	20	--	--	--	(E)LOAD
(E)LOOP LTG	--	--	--	20	1	35					0.0	0.0	36	1	20	--	--	--	(E)E/L 403
(E)LTG LOAD	--	--	--	20	1	37	0.0	0.0					38	1	20	--	--	--	(E)IDF
(E)W/S E/L	--	--	--	20	1	39			0.0	0.0			40	1	20	--	--	--	(E)WALL PACK LTG
(E)R/R	--	--	--	20	1	41					0.0	0.0	42	1	20	--	--	--	(E) MECH RM
(E)SPACE	--	--	--	--	1	43	--	--					44	1	--	--	--	--	(E)SPACE
TOTAL LOAD (kVA):							15.3 kVA		15.3 kVA		15.3 kVA								
TOTAL CURRENT (A):							55 A		55 A		55 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
Motor	15796 VA	100.00%	15796 VA	**TOTAL CONNECTED LOAD:**	45796 VA
HEAT	30000 VA	100.00%	30000 VA	**TOTAL ESTIMATED DEMAND:**	45796 VA
				TOTAL CONNECTED CURRENT:	55 A
				TOTAL ESTIMATED DEMAND CURRENT:	55 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.
*EXISTING BREAKER SHALL BE RE-LABELED AS SPARE.

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GREGORY JAMES GEHRT
90965
CMTA F-8627
10/24/2024

Revision Schedule

NO.	ISSUE	DATE
1	Addendum 01	11/11/2024

Sheet Information	
Date	24 October 2024
Job Number	23-006
Drawn	AAR
Checked	AMB
Approved	GJG

Title

PANEL SCHEDULES

Sheet

E7.02

ISSUE FOR BID

11/11/2024 2:30:06 PM

BINDING EDGE

BINDING EDGE

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PANELBOARD AND WIRING SCHEDULE

PANEL: HMC2
VOLTAGE: 480Y/277V,3P,4W
AMPERES: 250 A
MAINS TYPE: MLO
SPD: No
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT: 19.8 kA
PANEL INTERRUPTING RATING: 22 kA
LOCATION: ELEC. 317
SUPPLY FROM: (E) DC

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
TLC2	*	*	*	125	3	1	18.7	8.0					2	3	30		10	10	RTU-24-15
						3			15.6	8.0			4						
						5					18.1	8.0	6						
(E)RTU-50	10	10		30	3	7	4.7	7.4					8	3	30		10	10	RTU-24-16
						9			4.7	7.4			10						
						11					4.7	7.4	12						
(E)RTU-44	10	10		30	3	13	3.6	7.8					14	3	30		10	10	RTU-24-12
						15			3.6	7.8			16						
						17					3.6	7.8	18						
RTU-24-19	10	10		30	3	19	7.8	--					20	1	--	--	--	--	SPACE
						21			7.8	4.0			22	1	20				EWH
						23					7.8	--	24	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	25	--	--					26	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	27			--	--			28	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	29					--	--	30	1	--	--	--	--	SPACE
TOTAL LOAD (kVA):							58.0 kVA		58.9 kVA		57.4 kVA								
TOTAL CURRENT (A):							210 A		213 A		207 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	528 VA	100.00%	528 VA	TOTAL CONNECTED LOAD:	174382 VA
Motor	61834 VA	100.00%	61834 VA	TOTAL ESTIMATED DEMAND:	160372 VA
REC	38020 VA	63.15%	24010 VA	TOTAL CONNECTED CURRENT:	210 A
HEAT	74000 VA	100.00%	74000 VA	TOTAL ESTIMATED DEMAND CURRENT:	193 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.
*REFER TO ONE-LINE DIAGRAM ON SHEET E5.02.

PANELBOARD AND WIRING SCHEDULE

PANEL: LEC
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 100 A
MAINS TYPE: MLO
SPD: Yes
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT: 5.0 kA
PANEL INTERRUPTING RATING: 10 KAIC
LOCATION: ELEC. 373
SUPPLY FROM: (E)LE

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
IDF L6-30R	10	10		30	2	1	0.8	0.8					2	2	30		10	10	IDF L6-30R
						3			0.8	0.8			4						
IDF DUPLEX				20	1	5					0.2	0.2	6	1	20				IDF DUPLEX
VF-A1				20	1	7	0.0	0.8					8	2	30		10	10	IDF L6-30R
IDF L6-30R	10	10		30	2	9			0.8	0.8			10						
						11					0.8	0.5	12	1	20				IDF REC
CU-01	10	10		25	2	13	2.0	0.2					14	2	15				AC-01
						15			2.0	0.2			16						
317 SEC RISER	10	10		30	1	17					1.0	0.5	18	1	20				BAS PANEL
SPACE	--	--	--	--	1	19	--	--					20	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	21			--	--			22	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	23					--	--	24	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	25	--	0.0					26	3	30	1	8	8	SPD
SPACE	--	--	--	--	1	27			--	0.0			28						
SPACE	--	--	--	--	1	29					--	0.0	30						
TOTAL LOAD (kVA):							4.5 kVA		5.2 kVA		3.2 kVA								
TOTAL CURRENT (A):							39 A		45 A		26 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	0 VA	0.00%	0 VA	TOTAL CONNECTED LOAD:	12770 VA
Motor	4370 VA	100.00%	4370 VA	TOTAL ESTIMATED DEMAND:	12770 VA
REC	8400 VA	100.00%	8400 VA	TOTAL CONNECTED CURRENT:	35 A
				TOTAL ESTIMATED DEMAND CURRENT:	35 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: LC2
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 400 A
MAINS TYPE: 250A MCB
SPD: Yes
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT: 4.7 kA
PANEL INTERRUPTING RATING: 10 KAIC
LOCATION: ELEC. 317
SUPPLY FROM: TLC2

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
323 BREAK ROOM				20	1	1	0.5	0.9					2	1	20				338 ASSIST DIRECT
334 ASSIST DIRECT				20	1	3			0.9	1.0			4	1	20				323 MICROWAVE
336 ASSIST DIRECT				20	1	5					0.9	1.0	6	1	20				323 MICROWAVE
318 DESK QUAD				20	1	7	0.4	0.2					8	1	20				321 COPIER
340 ASSIST DIRECT				20	1	9			0.9	1.0			10	1	20				321 WRK RM LARGE COPIER
31 COPIER				20	1	11					0.2	0.4	12	1	20				323 COUNTER
EF-02				20	1	13	0.5	1.5					14	1	20				323 COFFEE 2
321 WRK RM LARGE COPIER	10	10		30	2	15			1.0	1.5			16	1	20				323 COFFEE 1
						17					1.0	0.8	18	1	20				323 REF 2
342 ASSIST DIRECT				20	1	19	0.9	0.2					20	1	20				ROOF REC
341 BRAILLE ROOM				20	1	21			0.6	0.8			22	1	20				323 REF 1
341A OFFICE				20	1	23					0.5	0.6	24	1	20				341 NORTH BRAILLE/OFFICE
EF-03				20	1	25	0.5	0.5					26	1	20				318/319 SOUTH WALL/STORAGE
335 STATIONS/NORTH WALL				20	1	27			0.7	1.0			28	2	30		10	10	321 WRK RM LARGE COPIER
HWCP				20	1	29					0.5	1.0	30						
332 TRAP PRIMER/STOR				20	1	31	0.2	0.5					32	1	20				337B OFFICE
344 ASSIST DIRECT				20	1	33			0.7	0.4			34	1	20				343 COPIERS
337A OFFICE				20	1	35					0.5	0.4	36	1	20				343 DESK GROUP
343 DESK GROUP				20	1	37	0.4	0.7					38	1	20				339 PRINTER/REC
337D OFFICE				20	1	39			0.5	0.4			40	1	20				339 DESK QUADS
337C OFFICE				20	1	41					0.4	0.7	42	1	20				335A OFFICE
335 DESK QUADS				20	1	43	0.5	0.4					44	1	20				318 DESK QUADS
355 PRINTER				20	1	45			0.5	0.5			46	1	20				318B OFFICE
335B OFFICE				20	1	47					0.7	0.5	48	1	20				318A OFFICE
322 OFFICE				20	1	49	0.7	0.4					50	1	20				318 DESK QUADS
315/317 CUST/ELEC				20	1	51			0.4	1.1			52	1	20				333 CONFERENCE
314 CONF FLOORBOX/TV				20	1	53					0.5	0.5	54	1	20				310/331 NORTH CORRIDOR/STOR
314 CONFERENCE				20	1	55	0.9	0.9					56	1	20				321 COUNTER REC
ROOF REC				20	1	57			0.7	1.0			58	1	20				321 WRK RM LARGE COPIER
RTU-24-20	6	10	1	50	2	59					6.4	0.5	60	1	20				339 PRINTER
						61	6.4	0.5					62	1	20				318 PRINTER
SPARE	--	--	--	20	1	63			0.0	0.0			64	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	65					0.0	0.0	66	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	67	0.0	--					68	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	69			--	--			70	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	71					--	--	72	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	73	--	--					74	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	75			--	--			76	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	77					--	--	78	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	79	--	0.0					80	3	30	1	8	8	SPD
SPACE	--	--	--	--	1	81			--	0.0			82						
SPACE	--	--	--	--	1	83					--	0.0	84						
TOTAL LOAD (kVA):							18.7 kVA		15.6 kVA		18.1 kVA								
TOTAL CURRENT (A):							159 A		130 A		154 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	528 VA	100.00%	528 VA	TOTAL CONNECTED LOAD:	52342 VA
Motor	3794 VA	100.00%	3794 VA	TOTAL ESTIMATED DEMAND:	38332 VA
REC	38020 VA	63.15%	24010 VA	TOTAL CONNECTED CURRENT:	145 A
HEAT	10000 VA	100.00%	10000 VA	TOTAL ESTIMATED DEMAND CURRENT:	106 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: LC1
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 400 A
MAINS TYPE: 250 MCB
SPD: Yes
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT: 5.1 kA
PANEL INTERRUPTING RATING: 10 KAIC
LOCATION: ELEC. 373
SUPPLY FROM: TLC1

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
302 TRAINING TVS				20	1	1	0.5	0.7					2	1	20				302 TRAINING EAST
303A RECEPTION				20	1	3			0.7	1.4			4	1	20				304/300 EXEC DIRECT...
302C CONTROL				20	1	5					1.0	1.1	6	1	20				302 TRAINING NORTH
303 ADMIN SUITE PLUGS				20	1	7	0.9	0.7					8	1	20				SMALL CONF
301/307/311 CORRIDOR/STOR/RR				20	1	9			0.7	0.9			10	1	20				305 DIRECTOR OFFICE
310 WATER NORTH				20	1	11					0.5	0.5	12	1	20				310 WATER SOUTH
350/359/364...				20	1	13	0.7	0.5					14	1	20				351 OFFICE
358 ITINERANT				20	1	15			0.5	0.5			16	1	20				362 CONF FLOORBOX/TV
308 SM CONF				20	1	17					0.7	0.5	18	1	20				362 CONFERENCE
312/302 RR/STOR				20	1	19	0.5	0.5					20	1	20				354 CONF FLOORBOX/TV
351 OFFICE				20	1	21			0.5	0.9			22	1	20				354 CONFERENCE
312A HAND DRYER				20	1	23					1.8	0.5	24	1	20				351 OFFICE
351 OFFICE				20	1	25	0.5	0.7					26	1	20				357 OFFICE
353/355 STOR/CORRIDOR				20	1	27			0.5	1.1			28	1	20				306 DIRECTOR OFFICE
351 OFFICE				20	1	29					0.5	0.5	30	1	20				351 OFFICE
351 PRINTER				20	1	31	0.5	1.8					32	1	20				311A HAND DRYER
355A OFFICE				20	1	33			0.5	0.5			34	1	20				355B OFFICE
355 PRINTER				20	1	35					0.5	0.7	36	1	20				355 DESK QUADS
355 DESK QUADS				20	1	37	0.5	0.9					38	1	20				310/320 OPEN OUTLETS
355 DESK QUADS				20	1	39			0.5	0.5			40	1	20				355D OFFICE
355 DESK QUADS				20	1	41					0.5	0.7	42	1	20				355C OFFICE
357 DESK QUADS				20	1	43	0.9	0.7					44	1	20				361 DESK QUADS
357 PRINTER				20	1	45			0.5	0.5			46	1	20				361 OFFICE
357 OFFICE				20	1	47					0.9	0.7	48	1	20				363 OFFICES
363 COPIERS				20	1	49	0.2	0.5					50	1	20				363 DESK QUADS
363 DESK QUADS				20	1	51			0.5	0.5			52	1	20				363 DESK QUADS
363 DESK QUADS				20	1	53					0.5	1.2	54	1	20				302 PROJECTOR/CONTROL PANEL
363 WALL NORTH				20	1	55	0.5	0.4					56	1	20				363 DESK QUADS
363 DESK QUADS				20	1	57			0.4	0.5			58	1	20				361 PRINTER
358 DESK QUAD				20	1	59					0.5	0.0	60	1	20	--	--	--	SPARE
ROOF REC				20	1	61	0.4	0.0					62	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	63			0.0	0.0			64	1	20	--	--	--	SPARE
SPARE	--	--	--	20	1	65					0.0	--	66	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	67	--	--					68	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	69			--	--			70	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	71					--	--	72	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	73	--	--					74	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	75			--	--			76	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	77					--	--	78	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	79	--	0.0					80	3	30	1	8	8	SPD
SPACE	--	--	--	--	1	81			--	0.0			82						
SPACE	--	--	--	--	1	83					--	0.0	84						
TOTAL LOAD (kVA):							13.8 kVA		13.0 kVA		14.1 kVA								
TOTAL CURRENT (A):							116 A		109 A		119 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	1500 VA	100.00%	1500 VA	TOTAL CONNECTED LOAD:	40980 VA
Motor	500 VA	100.00%	500 VA	TOTAL ESTIMATED DEMAND:	28290 VA
REC	35380 VA	64.13%	22690 VA	TOTAL CONNECTED CURRENT:	114 A
HEAT	3600 VA	100.00%	3600 VA	TOTAL ESTIMATED DEMAND CURRENT:	79 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: HLC1
VOLTAGE: 480Y/277V,3P,4W
AMPERES: 100 A
MAINS TYPE: MLO
SPD: Yes
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT: 26.6 kA
PANEL INTERRUPTING RATING: 35 KAIC
LOCATION: ELEC. 373
SUPPLY FROM: (E) DC

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
TRAINING/OFFICE LTNG				20	1	1	3.8	0.0					2	1	20				LTNG PM BRT 1 OF 2 363A
CORR LTG				20	1	3			0.8	1.4			4	3	20				INVC
NORTH OFFICE LTG				20	1	5					3.0	0.7	6						
SPARE	--	--	--	20	1	7	0.0	0.6					8						
SPACE	--	--	--	--	1	9			--	--			10	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	11					--	--	12	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	13	--	0.0					14	3	30	1	8	8	SPD
SPACE	--	--	--	--	1	15			--	0.0			16						
SPACE	--	--	--	--	1	17					--	0.0	18						
TOTAL LOAD (kVA):							4.4 kVA		2.2 kVA		3.7 kVA								
TOTAL CURRENT (A):							17 A		8 A		14 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	0 VA	0.00%	0 VA	TOTAL CONNECTED LOAD:	10344 VA
LTNG	10344 VA	125.00%	12930 VA	TOTAL ESTIMATED DEMAND:	12930 VA
				TOTAL CONNECTED CURRENT:	12 A
				TOTAL ESTIMATED DEMAND CURRENT:	16 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: HMC1
VOLTAGE: 480Y/277V,3P,4W
AMPERES: 250 A
MAINS TYPE: MLO
SPD: No
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT: 30.7 kA
PANEL INTERRUPTING RATING: 35 KAIC
LOCATION: ELEC. 373
SUPPLY FROM: (E) DC

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
TLC1	.*	.*	.*	125	3	1	13.8	8.3					2	3	30		10	10	RTU-24-24
						3			13.0	8.3			4						
						5					14.1	8.3	6						
(E)RTU-46	8	10		40	3	7	6.4	3.6					8	3	30		10	10	(E)RTU-41
						9			6.4	3.6			10						
						11					6.4	3.6	12						
(E)RTU-42	10	10		30	3	13	3.6	8.0					14	3	30		10	10	RTU-24-26
						15			3.6	8.0			16						
						17					3.6	8.0	18						
SPACE	--	--	--	--	1	19	--	--					20	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	21			--	--			22	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	23					--	--	24	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	25	--	--					26	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	27			--	--			28	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	29					--	--	30	1	--	--	--	--	SPACE
TOTAL LOAD (kVA):							43.8 kVA		42.9 kVA		44.0 kVA								
TOTAL CURRENT (A):							158 A		155 A		159 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	1500 VA	100.00%	1500 VA	TOTAL CONNECTED LOAD:	130755 VA
Motor	60275 VA	100.00%	60275 VA	TOTAL ESTIMATED DEMAND:	118065 VA
REC	35380 VA	64.13%	22690 VA	TOTAL CONNECTED CURRENT:	157 A
HEAT	33600 VA	100.00%	33600 VA	TOTAL ESTIMATED DEMAND CURRENT:	142 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.
*REFER TO ONE-LINE DIAGRAM ON SHEET E5.02.

PANELBOARD AND WIRING SCHEDULE

PANEL: LCB2
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 400 A
MAINS TYPE: 400A MCB
SPD: Yes
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT: 5.3 kA
PANEL INTERRUPTING RATING: 10 KAIC
LOCATION: MECH/ELEC 245
SUPPLY FROM: TLCB2

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
202G COPIER				20	1	1	0.4	1.1					2	1	20				202F WRKSTNS/STOR
202D AAC ASSIST DIRECT REC				20	1	3			1.3	1.1			4	1	20				208G INTAKE TEAM 4
208F INTAKE TEAM 3				20	1	5					1.3	0.2	6	1	20				206 CUST REF
208A INTAKE TEAM 1				20	1	7	0.9	0.9					8	1	20				210 RDSPD WRKST
208B INTAKE TEAM 2				20	1	9			1.3	0.9			10	1	20				207 VEST/208J INTAKE SPECIALIST
211 STUDENT CONF				20	1	11					1.4	1.8	12	1	20				208C INTAKE MEET/208D STOR
210 WRKST				20	1	13	1.1	1.3					14	1	20				208E INTAKE TEAM 5
210A RDSPD ASST				20	1	15			1.1	1.4			16	1	20				210 WRKST/212 STOR
RTU-24-02	6	10	1	50	2	17					6.7	6.7	18	2	50	1	10	6	RTU-24-08
						19	6.7	6.7					20						
RTU-24-04	6	10	1	50	2	21			6.7	5.1			22	2	40		10	8	RTU-24-11
						23					6.7	5.1	24						
RTU-24-07	6	10	1	50	2	25	6.7	1.0					26	1	20				206 MW
						27			6.7	0.5			28	1	20				208D STOR COPIER
303 COPIER				20	1	29					0.2	0.5	30	1	20				206 CUST BKRM/KRONOS
212 CHARGING CAB				20	1	31	1.0	0.0					32	1	20	--	--	--	SPARE
212 CHARGING CAB				20	1	33			1.0	0.0			34	1	20	--	--	--	SPARE
212 CHARGING CAB				20	1	35					1.0	0.0	36	1	20	--	--	--	SPARE
SPACE	--	--	--	--	1	37	--	0.0					38	3	30	1	8	8	SPD
SPACE	--	--	--	--	1	39			--	0.0			40						
SPACE	--	--	--	--	1	41					--	0.0	42						
TOTAL LOAD (kVA):							27.7 kVA		27.1 kVA		31.6 kVA								
TOTAL CURRENT (A):							231 A		226 A		264 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	0 VA	0.00%	0 VA	TOTAL CONNECTED LOAD:	86325 VA
Motor	16245 VA	100.00%	16245 VA	TOTAL ESTIMATED DEMAND:	80035 VA
REC	22580 VA	72.14%	16290 VA	TOTAL CONNECTED CURRENT:	240 A
HEAT	47500 VA	100.00%	47500 VA	TOTAL ESTIMATED DEMAND CURRENT:	222 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: INVC
VOLTAGE: 480Y/277V,3P,4W
AMPERES: 225 A
MAINS TYPE: MLO
SPD: Yes
MOUNTING: SURFACE
AVAILABLE FAULT CURRENT: 14.2 kA
PANEL INTERRUPTING RATING: 22 KAIC
LOCATION: ELEC. 373
SUPPLY FROM: HLC1

CIRCUIT DESCRIPTION	WIRE	GND	C	OCP	P	CKT	A		B		C		CKT	P	OCP	C	GND	WIRE	CIRCUIT DESCRIPTION
LTNG TRAINING (100) 302				20	1	1	0.4	--					2	1	--	--	--	--	SPACE
OPEN OFFICE LTG EM				20	1	3			0.7	--			4	1	--	--	--	--	SPACE
CORR LTG EM				20	1	5					0.6	--	6	1	--	--	--	--	SPACE
OFFICE/RR LTG EM				20	1	7	1.0	--					8	1	--	--	--	--	SPACE
SPARE	--	--	--	20	1	9			0.0	--			10	1	--	--	--	--	SPACE
SPACE	--	--	--	--	1	11					--	--	12	1	--	--	--	--	SPACE
TOTAL LOAD (kVA):							1.4 kVA		0.7 kVA		0.6 kVA								
TOTAL CURRENT (A):							5 A		3 A		2 A								

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
LTNG	2671 VA	125.00%	3339 VA	TOTAL CONNECTED LOAD:	2671 VA
				TOTAL ESTIMATED DEMAND:	3339 VA
				TOTAL CONNECTED CURRENT:	3 A
				TOTAL ESTIMATED DEMAND CURRENT:	4 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

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GREGORY JAMES GEHRT
90965
CMTA F-8627
10/24/2024

Revision Schedule

NO.	ISSUE	DATE
1	Addendum 01	11/11/2024

Sheet Information

Date	24 October 2024
Job Number	23-006
Drawn	AAR
Checked	AMB
Approved	GJG

Title

PANEL SCHEDULES

Sheet

E7.03

ISSUE FOR BID

SECTION 04 01 10 - MASONRY CLEANING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes cleaning the following:

1. Exterior wall surfaces including masonry, metal wall panels, metal fascia, coping, soffits and glazed openings.

1.02 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

B. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

C. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.05 QUALITY ASSURANCE

A. Mockups: Prepare mockups of cleaning on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Cleaning: Clean an area approximately 25 sq. ft. for each type of masonry and surface condition.

a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not test cleaners and methods known to have deleterious effect.

b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.

PART 2 - PRODUCTS

2.01 CLEANING MATERIALS

A. Water: Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

C. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.

D. Mold, Mildew, and Algae Remover, Job Mixed: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 5 quarts of 5 percent sodium hypochlorite (bleach), and 15 quarts of hot water for every 5 gal. of solution required.

PART 3 - EXECUTION

3.01 PROTECTION

A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent paint removers and chemical cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist paint removers and chemical cleaners used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents according to manufacturer's written instructions. Do not apply liquid strippable masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.

3.02 CLEANING MASONRY, GENERAL

A. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

B. Proceed with cleaning in an orderly manner; work from [**bottom to top**] [**top to bottom**] of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.

C. Use only those cleaning methods indicated for each masonry material and location.

1. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage surfaces, including joints.

a. Equip units with pressure gages.

b. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.

c. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.

D. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.
E. Perform additional general cleaning, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed according to the "Cleaning Appearance Standard" Paragraph, so that cleaned surfaces blend smoothly into surrounding areas.
F. Water-Spray Application Method: Unless otherwise indicated, hold spray nozzle at least 6 inches from masonry surface and apply water in horizontal back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.

3.03 PRELIMINARY CLEANING

A. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to planned cleaning methods. Extraneous substances include paint, calking, asphalt, and tar.
    1. Carefully remove heavy accumulations of rigid materials from masonry surface with sharp chisel. Do not scratch or chip masonry surface.
    2. Remove paint and calking with alkaline paint remover.
        a. Comply with requirements in "Paint Removal" Article.
        b. Repeat application up to two times if needed.

3.04 CLEANING MASONRY

A. Detergent Cleaning:
    1. Wet surface with cold or hot water applied by low-pressure spray.
    2. Scrub surface with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.
    3. Rinse with cold water applied by low or medium-pressure spray to remove detergent solution and soil.
    4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.
B. Mold, Mildew, and Algae Removal:
    1. Wet surface with cold or hot water applied by low-pressure spray.
    2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
    3. Scrub surface with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that surface remains wet.
    4. Rinse with cold water applied by low or medium-pressure spray to remove mold, mildew, and algae remover and soil.
    5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

END OF SECTION 04 01 10

SECTION 09 24 00 - PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
   1. Nonstructural steel framing and furring.
   2. Exterior portland cement plasterwork (stucco) soffits on metal lath plaster bases for repairing existing plaster soffits removed or damaged during the course of renovations..

B. Related Sections include the following:
   1. Division 07 Section "Joint Sealants" for sealants installed with exterior portland cement plaster (stucco).

1.02 SUBMITTALS

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

B. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.04 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Exterior Plasterwork:
   1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
   2. Apply plaster when ambient temperature is greater than 40 deg F.
   3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

C. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Products: Subject to compliance with requirements, provide one of the products specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 NONSTRUCTURAL STEEL FRAMING MEMBERS, GENERAL

A. Components, General: Comply with ASTM C 1063. For steel sheet components not included in ASTM C 1063, comply with ASTM C 645 requirements for metal, unless otherwise indicated.

B. Cold-Rolled Channels: Base metal thickness of 0.0538 inch with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating. Steel Runners and Hangers to be 1-1/2” 16 gauge minimum.

C. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter, unless otherwise indicated.

2.03 STEEL FRAMING FOR CEILINGS

A. Suspended Furring:
   1. Main Runners (Carrying Channels): Cold-rolled channels, 1-1/2 inches deep.
   2. Cross Furring: Cold-rolled channels, 3/4 inch (19.1 mm) deep.

B. Direct Furring: Cold-rolled channels, 3/4 inch deep.

C. Tie Wire:
   1. For tying main runners directly to beams or joists (where wire hangers are used between beams or joists), use double loop of 0.1205-inch- diameter wire.
   2. For tying furring directly to steel structure without main runners, use double loop of 0.0625-inch- diameter wire, or quadruple loop of 0.0475-inch- diameter wire.
   3. For saddle tying cross furring to main runners use 0.0625-inch- diameter wire, or double strand of 0.0475-inch-diameter wire.

D. Wire Hangers: 0.162-inch-diameter wire.

2.04 METAL LATH

A. Expanded-Metal Lath: ASTM C 847 with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
   1. Diamond-Mesh Lath: Flat and Self-furring.
      a. Weight: 3.4 lb/sq. yd..
      b. Flat mesh lath for suspended soffits without Solid Substrate.
      c. Self- furring mesh lath for vertical surfaces over solid substrate.

2.05 ACCESSORIES

A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Zinc and Zinc-Coated (Galvanized) Accessories:

1. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating
2. Cornerbeads: Fabricated from zinc.
   a. Smallnose cornerbead with expanded flanges; use unless otherwise indicated.
3. Casing Beads: No. 60 and No. 66 - Fabricated from zinc or zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
4. Control Joints: No. 15 - Fabricated from zinc; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
5. Expansion Joints: Fabricated from zincl; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
6. Drip Screed (Plain): - Extruded aluminum for intersection of soffit with fascia and walls, similar to No. FPM-75-75 by Fry Reglet Corporation
7. Drip Screed (Vented) – Extruded aluminum for intersection of soffit with fascia or walls, similar to No. FPM-75-V-75 by Fry Reglet Corporation.
8. Drip Screed (Vented) – Extruded aluminum for locations other than soffit to fascia or soffit to walls, similar to No. PCS-75-V-75 by Fry Reglet Corporation.
9. Wind Uplift Bracing at Suspended Soffits: Hot-dipped galvanized channels as indicated in drawings.
10. Channel Screed: 1-inch wide for plaster reveals in vertical walls.

2.06 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Bonding Compounds: ASTM C 631

C. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in portland cement plaster.

D. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of not fewer than three exposed threads.

E. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.

2.07 PLASTER MATERIALS

A. Portland Cement: ASTM C 150, Type I.
   1. Color for Finish Coats: White.

B. Masonry Cement: ASTM C 91, Type N.
   1. Color for Finish Coats: White.

C. Plastic Cement: ASTM C 1328.

D. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.

E. Sand Aggregate: ASTM C 897.

F. Waterproofing Admixture: Hydrocel Powder 219-1517.

G. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates; for use over portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.

2.08 PLASTER MIXES

A. General: Comply with ASTM C 926 for applications indicated.
   1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. ft. of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.

B. Base-Coat Mixes for Use over Metal Lath: Scratch, brown and finish coats for three-coat plasterwork as follows:
   1. Mix Proportions: In accordance with ASTM C 926
      a. Scratch Coat:
         1 Part Portland Cement
         2 Parts Masonry Cement
         2-1/2 to 4 Parts sharp torpedo Sand
         1-1/2 Lbs. of ½" Alkaline resistant fiberglass strands
      b. Brown Coat:
         1 Part Portland Cement

2 Parts Masonry Cement
3 to 5 Parts sharp torpedo Sand
1-1/2 Lbs. of ½" alkaline resistant fiberglass strands
Texture

c. Finish Coat: Ceilings, soffits and vertical surfaces
1 part White Portland Cement
¾ to 1-½ Parts lime
3 parts XO marble sand

C. Factory-Prepared Finish-Coat Mixes: For acrylic-based finish coatings, comply with manufacturer's written instructions.
1. Finish (integral color): Provide at plaster surfaces; Color and texture shall match existing plaster surfaces as approved by the Architect. See color schedule on the Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, for compliance with requirements and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
B. Prepare solid-plaster bases that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.03 INSTALLING NONSTRUCTURAL STEEL FRAMING, GENERAL

A. General: Comply with requirements in ASTM C 1063 for applications indicated.
1. Comply with ASTM C 754 for installation of items not addressed in ASTM C 1063.
B. Install supplementary framing, blocking, and bracing at terminations in plaster assemblies to support fixtures, equipment services, heavy trim, or similar construction.
C. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement.
D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.04 INSTALLING STEEL FRAMING FOR SOFFITS

A. Suspend soffit hangers from building structure as follows:
1. Install hangers plumb and free of contact with insulation or other objects within plenum that are not part of supporting structural or suspension system. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of construction within plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers. Size supplemental suspension members and hangers to limit deflection to 1/360 of span while supporting soffit loads.
3. Wire Hangers: Secure by looping and tying, either directly to structure or directly to fasteners that are secure and appropriate for substrate, in a manner that will not cause them to deteriorate or otherwise fail.
4. Install wind up-lift bracing as detailed on the drawings. Bracing to run from furring channels to structure above at 4'-0" o.c. unless indicated otherwise. Provide rigid welded connections.
5. Do not attach hangers to steel roof deck. Attach hangers to structural members.
6. Do not connect steel framing to or suspend it from pipes or conduit.
B. Installation Tolerances: Install steel framing components for soffits so members are level to within 1/4 inch in 10 feet measured lengthwise on each member and transversely between parallel members.
C. Install steel framing components for soffits in sizes and spacings indicated but not less than that required by the referenced steel framing and installation standards.
1. Hanger Spacing: 48 inches o. c.
2. Main Runner (Carrying Channel) Spacing: For suspended soffits, 36 inches o.c. and not more than 36 inches from parallel wall.
3. Cross-Furring Spacing: For suspended soffits as required by lath, but not to exceed 16 inches o.c..
4. Provide framing to receive recessed light fixtures, as required.

3.05 INSTALLING METAL LATH

A. Expanded-Metal Lath: Install according to ASTM C 1063.
1. Vertical Framing and Furring: Install expanded metal lath.
2. Flat-Soffits and Horizontal Framing: Install flat expanded metal lath.

3.06 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.

B. Reinforcement for External Corners:

1. Install lath-type external-corner reinforcement at exterior locations.
2. Install cornerbead at exterior locations.

C. Control Joints: Install control joints at locations as indicated on the drawings, but not to exceed the following parameters:

1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
   a. Vertical Surfaces: 144 sq. ft..
   b. Horizontal and other Non-vertical Surfaces: 100 sq. ft..
2. At distances between control joints of not greater than 18 feet o.c.
3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
4. Where control joints occur in surface of construction directly behind plaster.
5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

D. Install screeds at locations as indicated on the drawings, secure and ready to receive plaster work.

3.07 PLASTER APPLICATION

A. General: Comply with ASTM C 926.

1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.
2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Bonding Compound: Apply on plaster bases as required and recommended by manufacturer.

C. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer's written instructions.

D. Leveling Coat: Apply to existing ribbed textured concrete wall surface to provide a flush, smooth wall surface to receive carpet applied finish.

3.08 CUTTING AND PATCHING

A. Cut, patch, replace, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.09 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 24 00

SECTION 250000 – ENERGY MANAGEMENT AND CONTROL SYSTEMS

PART 1 - PRODUCTS

1.01 GENERAL

A. The Energy Management and Control System (EMCS) shall be comprised of a Local Area Network (LAN) infrastructure, Operator Workstations (OWS), Engineering Workstations (EWS), a Primary Network Server (PNS), Network Area Controllers (NAC), Application Specific Controllers (ASC), Unitary System Controllers (USC), and Field Devices installed within the facility.

B. The Workstations, Primary Network Server, and Network Area Controllers shall be connected by an EMCS Contractor supplied and installed Local Area Network. The LAN shall comply with all IEEE Standards as outlined in: IEEE STD 802-1990: IEEE Standards for Local and Metropolitan Networks, Overview and Architecture.

C. If the EMCS contractor wishes connect to the Owner's Wide Area/Local Area Network as part of the control system network, the EMCS contractor shall acquire permission in writing and include the letter in the submittal. Any system that requires connection to the owner's network for communication between NAC, ASC, USC and/or filed devices that is submitted without the written permission from the owner shall be rejected. The EMCS Contractor shall coordinate with the Owner and supply all required information.

D. Access to the system, either locally in the building, or remotely from a central site or sites, shall be accomplished through standard web browsers, via the Internet and/or a local area network. System shall be compatible across various devices including iPhone, Android and Windows phones and various tablets running these operating systems.

E. All EMCS controllers and workstations shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135-2010, latest revision. Management level TCP/IP Ethernet network speeds shall be 1 Gbps minimum and the Automation Level MS/TP network speeds shall be 76.8 Kbps minimum.

F. The Server shall gather data from the system and generate HTML5 pages accessible through a conventional web browser from all personal computers (PCs) connected to the network. System shall include any and all software and hardware to support unlimited users. The EMCS shall be compatible with all common web browsers.

G. Facility Operators shall be able to view and configure systems through the standard web browser and all graphical/data representations shall appear identical, whether the user is on site or viewing via the Internet at a remote location. Standard operator functions such as control point manipulation, configuration and viewing of trends, schedules and alarms shall be performed through the standard browser. Each mechanical system and building floor plan shall be depicted on the operator workstation by point-and-click graphics.

H. The EMCS shall directly control HVAC equipment as specified in the Sequence of Operations. Furnish Energy Conservation features such as Optimal Start/Stop, Night Setback, Setpoint Reset logic, and Demand Control Ventilation.

I. The EMCS vendor shall provide the following additional services as part of this specification: warranty and service during the warranty period; submittals, samples and record documentation; comprehensive startup and testing of the EMCS with documentation; training services for the owner and facility operators; coordination with other contractors and suppliers; operator and technician training program, and shall cooperate fully with the Project Commissioning Agent.

J. Products furnished under this specification but installed by other.

1. Mechanical devices installed under Division 23 by the mechanical contractor or other suppliers: temperature sensing thermowells; automatic control valves; pipe taps for flowmeters; water pressure sensors and switches; automatic control dampers not installed in air handling unit mixing boxes or louver schedules; damper actuators for variable air volume (VAV) terminal units; mounting cost of controller and actuator for VAV terminal units.
2. Electrical devices installed under Division 26 by the electrical contractor:
   a. 120 VAC power to controllers and control panels at locations indicated on the drawings. Review and verify that these locations are adequate for the proposed EMCS.
   b. Interlock wiring to duct mounted smoke detector or fire alarm shutdown relays to HVAC equipment motor starters, variable frequency drives (VFD) and etc.

K. Provide and install all interconnecting cables between all operator's terminals and peripheral devices (such as printers, etc.) supplied under this section.

L. DDC system to be tied in to emergency button/switch to initiate shut down of all HVAC equipment when activated.

M. System shall be fully compatible and interface with School Dude FS Direct. Owner shall be able to use Maintenance Direct for Actions on individual Areas as needed and requested by owner. Contractor responsible for all hardware, software and coordination involved.

N. It is contractor responsibility to discover and integrate all devices and points into system as necessary. This includes, but not limited to, HVAC, electrical, plumbing and lighting devices.

O. It is the intent of this specification to describe the basic architecture and performance requirements of the Energy Management Control System (EMCS). The turn-key EMCS shall include all work station software including operator software, cables, programming tools, graphics editor, all other available software programs, modules, handhelds, or plug-ins

offered by the DDC manufacturers, hardware, Control Units, Distributed Controllers, Unitary Controllers, Local Area Networks (LANs), sensors, modems, wiring, connectors, control devices, actuators, installation and calibration, supervision, adjustments and fine tuning necessary for a complete and fully operational system.

P. Systems shall be furnished and installed complete in all respects, including any and all equipment, controls, wiring, instrumentation, enclosures, labor, engineering, training, commissioning, programming, supervision, calibration, coordination with other trades, etc. No information given in (or omitted from) these specifications shall relieve the contractor of this absolute requirement. Include all associated electrical work except as noted. Work includes furnishing of all labor, superintendence, materials, tools, equipment and sources necessary for the complete installation or modification of the following systems as herein specified. It is the intent of these specifications that the Contractor shall furnish and install the systems complete in every respect and ready to operate. All equipment, miscellaneous items and accessories required for such installation and for the correct and convenient operation of the entire installation whether or not each such item or accessory is shown on the plans or mentioned in these specifications shall be furnished and installed.

Q. All systems shall be complete true stand-alone systems. Program database, data acquisition, and all control sequence logic shall reside in each DDC Device.

R. The Building Level Communication Network (BLCN) shall not be dependent upon connection to a Server or Master Controller for the performance of the Sequence of Control as outlined in this specification. Each Device shall, to the greatest possible extent, perform its programmed sequence without reliance on the BLCN.

S. All devices installed shall be native BACnet. Lonworks or proprietary protocols are not allowed. Devices that are not BACnet tested, compliant, certified, clearly stamped and listed by the BACnet Testing Laboratories (BTL) shall not be acceptable under this specification and are strictly prohibited.

T. System shall be provided with a complete Web-enabled operator interface. The application shall operate on industry standard PC hardware. Proprietary server hardware or “Black Boxes” will not be acceptable. Third party Web-enabled applications are acceptable if they are configured to be indistinguishable from the OWS applications.

U. Programming of software shall be written in BASIC STRUCTURED logic that client is familiar with and not written within CORE spec engineering.

V. No Gateways, Communication Bridges, Protocol Translators or any other device that translates any proprietary or other communication protocol to the BACnet communication the protocol shall be permitted as a part of the BAS installation under this specification section. Gateways may only be used as required for communication to existing systems or systems installed under other specification sections.

W. All BAS DDC Devices shall be capable of updating firmware using software via the internet without replacing any hardware, microprocessors or chips.

X. Installed system must have full access to logic and functional blocks. User shall have full ability to modify programming.

Y. Outside air temperature shall be supplied by the National Weather Service with a local backup at every site.

Z. Point naming/labeling shall be consistent throughout buildings.

AA. Where drawings are provided as part of or supplement to these specifications, such drawings are inherently schematic only and not intended to convey all controls, wiring, installation, details, etc. It shall be the responsibility of the EMCS contractor to verify that control approaches presented are appropriate for the HVAC systems involved, and that bids include all work described, specified, or otherwise necessary for a complete and functioning system.

BB. System shall have the ability to program schedules locally if needed during network outages.

1.02 RELATED DOCUMENTS & REFERENCES

A. Drawings and general provisions of the contract documents, apply to this section including:

1. Division 01 for General Conditions and Supplementary Conditions.
2. Division 21 for fire protection equipment.
3. Division 22 for plumbing equipment and domestic water systems.
4. Division 23 for mechanical equipment, ductwork, and piping systems.
5. Division 26 for electrical equipment, lighting control, and fire alarm systems.

B. The latest edition of the following standards and codes in effect as approved by the authority having jurisdiction and amended as of supplier's proposal date, and any applicable subsections thereof, shall govern design and selection of equipment and material supplied:

1. ANSI MC85.1 - Terminology for Automatic Control.
2. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
3. ANSI/ASHRAE Standard 135-2010, BACnet.
4. BTL Mark by the BACnet Testing Laboratories.
5. Uniform Building Code (UBC), including local amendments.
6. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.
7. National Electrical Code (NEC).
8. FCC Part 15, Subpart J, Class A.
9. National Institute of Standards and Technology (NIST).

10. IEEE STD 802-1990: IEEE Standards for Local and Metropolitan Networks, Overview and Architecture.

1.03 RELATED WORK IN OTHER SECTIONS

A. Refer to Division 00 and Division 01 for allowances and related contractual requirements.

B. Refer to Division 21 for General Fire Protection Provisions and fire suppression pump.
   1. The EMCS contractor shall provide communications integration via BACnet/IP interface to each installed system listed above. BACnet MS/TP or Modbus acceptable if IP interface is not available from equipment manufacturer.
   2. The EMCS contractor shall coordinate with all vendors providing above systems to obtain communications requirements and points lists. Map all available points to EMCS.

C. Refer to Division 22 for General Plumbing Provisions, domestic water heating systems, domestic water pumping systems, and domestic water metering.
   1. The EMCS contractor shall provide communications integration via BACnet/IP interface to each installed system listed above. BACnet MS/TP or Modbus acceptable if IP interface is not available from equipment manufacturer.
   2. The EMCS contractor shall coordinate with all vendors providing above systems to obtain communications requirements and points lists. Map all available points to EMCS.

D. Refer to Division 23 for General Mechanical Provisions for equipment such as chillers, cooling towers, boilers, pumps, air-handling units, terminal units, ventilation fans, variable frequency drives, unitary AC units, etc.
   1. The EMCS contractor shall provide communications integration via BACnet/IP interface to each installed system listed above. BACnet MS/TP or Modbus acceptable if IP interface is not available from equipment manufacturer.
   2. The EMCS contractor shall coordinate with all vendors providing above systems to obtain communications requirements and points lists. Map all available points to EMCS.

E. Refer to Section 26 for General Electrical Provisions for equipment such as electrical switchgear control, electrical power monitoring, emergency generators, lighting control system, etc.
   1. The EMCS contractor shall provide communications integration via BACnet/IP interface to each installed system listed above. BACnet MS/TP or Modbus acceptable if IP interface is not available from equipment manufacturer.
   2. The EMCS contractor shall coordinate with all vendors providing above systems to obtain communications requirements and points lists. Map all available points to EMCS.
   3. System shall be configured so that lighting control modules on physical wired modules controlled by web interface control schedule.

1.04 ELECTRICAL POWER PROVISIONS

A. Primary power will be provided under Division 26 by the electrical contractor to the panel locations indicated on the mechanical & electrical drawings. Provide step down transformers within panel enclosures. Provide all necessary fuses and circuit protection devices

B. Power will be provided to the controllers serving fan powered terminal units with electric heat via the control transformer provided with the unit.

C. All components of the EMCS shall be powered from the sources above. Provide final terminations from the locations indicated on the Division 23 Drawings.

D. The EMCS Contractor shall provide any additional control power that is required as part of this contract and not indicated by other. This shall include all conduit, cabling, circuit breakers, etc.

1.05 CONTRACTOR QUALIFICATIONS

A. Acceptable manufacturers shall match the existing building 1 and 2 controls system and shall tie into this front-end.

B. The EMCS Contractor shall:
   1. Have a local office within 100 miles of jobsite before bid date and at a minimum until the completion of the warranty period.
   2. Have a local staff of trained personnel capable of giving instructions and providing routine and emergency maintenance on the EMCS, all components and software/firmware and all other elements of the EMCS.
   3. Have a proven record of experience in the supply and installation of equivalent EMCS/BACnet systems over a minimum period of five years. Provide documentation of at least three equal and complexity, if so requested by the Owner's Representative.
   4. Be a factory certified representative of the native BACnet EMCS manufacturer for design, installation, and service of the proposed system.
   5. Have comprehensive local service, training and support facilities for the total EMCS as provided. Maintain local, supplies of essential expendable parts.
   6. Have a local 24/7 phone support service.

1.06 SUBMITTALS

A. ALL DOCUMENTS SUBMITTED SHALL BE IN NATIVE PDF FORMAT. NO SCANS.

B. Shop Drawings:
   1. The following information shall be included on the cover page for each shop drawing and equipment documentation submittal:

a. Project name with date. Refer to the applicable specifications by name and number.
b. Provide submittal number and re-submittal number and date as applicable.
c. Provided name and address of Consulting Engineer, Mechanical Contractor, General Contractor

2. Shop drawings shall be CAD generated, plot size of 8-1/2" x 11" or 11" x 17". Drawings shall include diagrams, mounting instructions, installation procedures, equipment details and software descriptions for all aspects of the system to be installed.
3. Provide schematic of systems indicating instrumentation locations, all interconnecting cables between supplied cabinets on a mechanical floor plan.
4. Software specifications and descriptions including operating sequences.
5. Provide a bill of material that indicates specific manufacturer, part number, part description and quantity of each device for all system components.
6. Provide a list of the wire labels to be installed on each end of the control wiring, at the device and the control panel terminal. Labels shall be machine generated, typed and legible with a maximum of 17 characters. The label description "AHU-1 SAT" shall indicate the supply air temperature of AHU-1.
7. Equipment Schematic: Provide an electronic equipment schematic for each piece of mechanical equipment. The schematic shall display all mechanical equipment
8. characteristics including fans, dampers, valves, sensors and other applicable control devices. The schematic shall show wiring terminations to each control device as shown in the submittal and as-build documentation. Control devices shall be labeled by a symbol that can easily be identified in a bill of material that is shown on this graphic. The bill of material shall show the device symbol, description, manufacture and part number.
9. Sequence of Operations: The control sequences shall be viewable for each piece of mechanical equipment and be in a text format as shown in the as built documentation. The sequence of operations shall be selectable at the applicable location for the control program.
10. Provide detail points list on every piece of equipment.
11. Provide technical cut sheets showing all relevant devices and/or information highlighted to distinguish what was installed.

C. Control component submittals:
1. Component technical data sheets with mounting and installation details.
2. The documentation shall include comprehensive and complete details of the BACnet Interoperability Building Blocks (BIBB) and automation level documentation including address, associated controller type, etc. as required and for the interface to the EMCS.
3. Details of networks/communications equipment, cabling and protocols proposed. Provide schedule of cabling including details of proposed cable types.
4. Module Drawing: Provide an electronic wiring diagram of each control module (as shown in submittal documentation). Diagram shall display wiring schematic and terminations to end devices. Diagram shall display each input and output terminals and label those that are used for the control application. Diagram shall display module type/name and network address.
5. Field sensor and instrumentation specification sheets. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.
6. Schedule and specification sheets for dampers, valves and actuators.
7. Design and provide layout of all components of panel mounted control devices, terminal strips and power supplies.

D. Colorgraphics: Provide sample layout of color graphic representations of the systems for review. The submittal shall indicate the quality of the graphic to be provided with the system with a sample of the specific control points to be included. Control points shall as a minimum include points indicated in the input/output summary, control schematic and primary controlling points defined in the sequences of operation. Provide a sample of a floor plan layout, typical AHU, terminal unit, outside air pretreatment unit, variable frequency drive, exhaust/supply fan, chiller plant and hot water plant. For control points to be provided by equipment BACnet integration provide sample of the control points.

E. Verification Reports. The submittal shall include a sample of the verification reports to be utilized during the verification section of this specification. Sample reports shall be approved as submitted or be modified by the engineer or owner's representative. The verification reports shall be included in the final Operation & Maintenance Manuals. Reports shall be provided in electronic PDF format.
1. Project Systems Verification Form for each controller.
a. General information for each form shall include: project name; associated equipment with mark number; control panel number and location; controller number and model number; controller device instance number (address); MS/TP LAN segment number; verifying technician and date.
b. Each connected control point and device shall contain the following columns with a separate line for each connected physical point: point description (same as device label); input/output number for each connected control device (AI-XX, AO-XX, DI-XX, or DO-XX).

c. Check boxes confirming that the verification tasks have been completed: device location, proper termination at device; proper termination at control panel; sequence is verified; point trend is enabled.
d. Data entry boxes indicating measured/confirmed values: preliminary control point value on the graphic; observed control point value; calibration or adjustment value to correct offset; final displayed point value on the color-graphic; date of verification; engineer or owner's representative verification.

2. Control Panel Verification Form for each control panel.
   a. General information: panel location and identification number; panel dimensions and NEMA rating; panel properly installed; Class 1 and Class 2 wiring are properly separated; correct voltage to the panel; no shorts or grounds in panel; no induce voltages in panel wiring; point to point termination match submittal; devices are mounted in the correct location; controller software revision number; address of controllers; panel device checkout is complete; panel startup is complete.
3. Sequence of Operation Verification Form per piece of equipment (AHU, VAV, chiller, boiler, etc.).
   a. General information: project name; system identifier; building area served; control panel and controller numbers; controller model number and instance number (address); MS/TP LAN segment number; name of verifying technician and date.
   b. Each step of the sequence of operation for each piece of equipment shall be documented shall include a "description of test", "input to trigger test" and "expected outcome". A pass/fail checkbox shall indicate each of these actions. Provide space for technician approval with associated date.

F. Operating and Maintenance (O&M) manuals: Provide O&M manual with full information to allow the owner to operate, maintain and repair installed products. Include trade names with model numbers, color, dimensions and other physical characteristics.
1. Format: Produce on 8-1/2 x 11-inch pages, and bind in 3-ring/binders with durable plastic covers. Label binder covers with printed title "OPERATION AND MAINTENANCE MANUAL", title of project, and subject matter and "Number _ of_" of binder. Provide substantial dividers tabbed and titled by section/component number.
2. Table of Contents for each volume:
   a. Part 1: Directory with name, address and telephone number of Designer, Contractor and Subcontractors and Suppliers for each Project Manual section.
   b. Part 2: Operation and maintenance instructions, arranged by Project Manual Section number where practical and where not, by system. Include:
3. Product design criteria, functions, normal operating characteristic and limiting conditions. Installation, alignment, adjustment, checking instructions and troubleshooting guide. Operating instructions for start-up, normal operation, regulation and control, normal shutdown and emergency shutdown. Test data and performance curves.
4. Spare parts list for operating products, prepared by manufacturers including detailed drawings giving location of each maintainable part, lists of spares recommended for user- service inventory and nearest source of in-stock spares.

G. Record Documentation:
1. Details of all alarm, diagnostic, error and other messages. Detail the Operator action to be taken for each instance.
2. Detail special programs provided and provide a complete programming instruction manual. Detail operation of all software applications.
3. Detailed list of the database for all installed devices.
4. Record drawings shall be CAD generated and shall include final locations and point ID for each monitored and controlled device.
5. In additional to the required hard-copies, provide electronic copies on a USB Drive with all of the record documentation in PDF format and a USB Drive containing backup copies of all installed software and graphics.
6. Provide an excel spreadsheet for tracking and maintenance by equipment type. Coordinate with owner for database and template requirement.
7. Online as-built documentation: provide digital replications of as-builts that shall be accessible from each equipment graphic controlled or monitored by the EMCS.

1.07 WARRANTY

A. Warranty work and the equipment provided under this contract shall be for a period of one year from the date of Substantial Completion. Warranty shall cover all components, system software, parts and assemblies supplied by this contractor and shall be guaranteed against defects in materials and workmanship for one (1) year from the date of Substantial Completion. If manufacturer warranty on a product is longer than (1) year, contractor is responsible for honoring and coordinating the warranty of that product up to the end of manufacturer warranty. Labor to troubleshoot, repair, reprogram or replace system components that have failed due to defects in materials and workmanship shall be provided by this contractor at no charge to the owner during the warranty period. All corrective software modifications made during warranty service periods shall be updated on all user documentation and on user and manufacturer archived software. All warranty work shall be performed by the EMCS contractor's local service group.

B. Warranty shall not include routine maintenance, e.g., equipment cleaning, mechanical parts lubrication, pilot lamp replacement, operational testing, etc. Warranty shall not cover repair or replacement of equipment damaged by under- or over-voltage, misuse, lack of proper maintenance, lightning, water damage from weather or piping failure.

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 EMCS contractor. The maximum acceptable response time to provide this service at the site shall be 24 hours, during normal working hours.

1.08 OPERATIONS PERSONNEL TRAINING

A. Provide a training session for the owner's operations personnel. Training session shall be performed by a qualified person who is knowledgeable in the subject system/equipment. Submit a training agenda two (2) weeks prior to the proposed training session for review and approval. Training session shall include at the minimum:

1. Purpose of equipment.
2. Principle of how the equipment works.
3. Important parts and assemblies.
4. How the equipment achieves its purpose and necessary operating conditions
5. Most likely failure modes, causes and corrections.
6. On site demonstration that includes hands-on demonstration of the manipulation of setpoints, schedules and other adjustable elements of the system.
7. The demonstration shall be on the actual, completed graphic interface pages for the specific project.

B. Provide a second training session 6 months after initial session for any follow-up or additional training requested by owner's personnel. Allow 3 hours for the second training session.

1.09 OPERATOR WORKSTATION (OWS)

A. The Operator Workstation shall be any personal computer, connected to the WAN/LAN, with appropriate web browser software installed.

1.10 ENGINEERING WORKSTATION (EWS)

A. The Engineering Workstation shall be any personal computer or virtual pc and/or server, connected to the WAN/LAN, with a registered copy of the EMCS contractor supplied engineering and/or programming software installed. The EMCS contractor shall provide at least one copy of all required software(s) and files, to enable the Owner complete editing/programming functions of all controllers, graphics, and control logic.

B. The EMCS shall provide one virtual pc and/or server which is compatible with the performance required by the EMCS Engineering Software. It shall be able to be reached locally and remotely as needed.

PART 2 - PRODUCTS

2.01 PRIMARY NETWORK SERVER (PNS)

A. The EMCS Contractor shall provide and install the Primary Network Server as part of this system if compatible PNS is not already in place. The PNS shall utilize the Internet and provide efficient integration of standard open protocols. The PNS shall maintain comprehensive database management, alarm management and messaging services, and graphical user interface as follows:

1. Support an unlimited number of users over the Internet/intranet with a standard web browser to access alarms, trend logs, graphics, schedules and configuration data. Access to the PNS shall be password protected utilizing authentication and encryption techniques. An audit trail of database changes indicating user, time stamp, and audit action shall be provided.
2. Enterprise level information exchange using an SQL database and HTML5 formats.
3. Synchronize controller databases, database storage scheduling, control and energy management routines
4. Alarm processing and routing shall include email, SMS text messages and paging as needed by the owner.
5. HTML5 based help system that includes comprehensive online system documentation.
6. Support of multiple Network Area Controllers (NAC) connected to a Local Area Network.
7. Aggregate data and provide visualization interface and dashboard that includes, but not limited to, graphs, gauges, charts of relevant trends and energy usage.

B. Server Functions

1. It shall be possible to access all Network Area Controllers (NAC) via a single connection to the server through the Ethernet LAN. In this configuration, each Network Area Controller can be accessed from a single user login.
2. The PNS shall provide the following functions, at a minimum:
   a. The server shall provide complete access to distributed global data. The server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.
   b. The server shall include a master clock service for its subsystems and provide time synchronization for all NACs.
   c. The server shall provide scheduling for all NACs and their underlying field control devices.

d. The server shall provide demand limiting control that operates across all NACs. The network server shall be capable of multiple demand limiting programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shed lists for effective demand control.

e. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to NACs. Each Network Area Controller supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.

f. The server shall provide central alarm management for all NACs supported by the server. Alarm management shall include: routing of alarms to a video display, a printer, an email and pager; view and acknowledge alarms; query alarm logs based on user-defined parameters

g. The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.

h. The server shall provide central management of logged data for all NACs supported by the server. Logged data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include: viewing and printing log data; exporting log data to other software applications; query log data based on user-defined parameters. A report log of manually overridden points shall be part of the management system.

i. Storage of the graphical screens shall be in the network web server, without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.

j. Modify common application objects, such as schedules, calendars, and set-points in a graphical manner. Schedule times will be adjusted using a graphical slider. Holidays shall be set by using a graphical calendar.

k. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

l. Server shall be able to save a minimum of thirty-six (36) months of Energy Demand and Consumption data from the four (4) energy meters being provided by Div 26 contractor.

3. The Primary Network Server shall be capable of supporting at the very minimum the following open system drivers;
   a. BACnet/IP
   b. Modbus TCP

C. Network Server Platform Requirements
1. Rack-Mounted Server Computer Hardware: DELL PowerEdge R230 or equal, Intel Xeon Quad E3-1225 V53.3 GHz or higher, 16GB RAM, 1TB harddrive, video card, 22" color monitor, and Ethernet adapter 1Gbps or higher.
2. Operating system software shall be Microsoft Windows 10 Professional or higher.

2.02 NETWORK AREA CONTROLLER (NAC)

A. Provide one or more Network Area Controllers (NAC) to meet the sequence of operations and the type and quantity of devices being integrated into the system. It is contractor responsibility to ensure that a single NAC is not overloaded beyond 85% in any manner. If threshold is meet, contractor shall install an additional NAC and redistribute the load. The NAC shall provide the interface between the local area network and the field controllers. The NAC shall provide global supervisory control functions over the associated controllers and shall be capable of executing application control programs to provide: calendar functions; scheduling; trending; alarm monitoring and routing; time synchronization; integration of controller data for each applicable protocol; network management functions for all network devices. The user may view real-time information via web-based data.

B. The Network Area Controller shall provide the following hardware features as a minimum: Ethernet Ports 100Mbps or higher, BACnet MS/TP ports, battery backup, DDR RAM memory, flash memory for long term data backup.

C. Provide an uninterruptible power source (UPS) per network controller to maintain operation for 1 hours.

D. The NAC shall be capable of operation over a temperature range of 32 to 122 °F and operation over a humidity range of 5 to 95% RH, non-condensing; storage temperatures of between 32 and 158 °F.

E. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.

F. The NAC shall be capable of supporting at the very minimum the following open system drivers;
1. BACnet/IP
2. BACnet MS/TP
3. Modbus TCP
4. Modbus RTU

G. If additional drivers or modules are needed, contractor must provide at no extra cost to owner.

H. Controls engineer to place all main equipment like chillers, cooling tower, boilers and domestic water systems on main module (or backbone) and subdivide building's wings and floors by using AAR sub-modules on communication network. Assist field technicians for easier troubleshooting and downtime.

I. Event Alarm Notification and actions: The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers. Alarm conditions shall be routed to any defined user location whether connected to a local or wide-area network.
   1. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to: alarm; return to normal; fault.
   2. Provide for the creation of a minimum of eight alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc. Allow timed routing of alarms by class, object, group, or node.
   3. Provide alarm generation from binary object "runtime" and/or event counts for equipment maintenance (i.e. filter status, fan run status). Authorized users shall be able to reset runtime or event count values with appropriate password control.
   4. Control equipment and network failures shall be treated as alarms and annunciated.
   5. Alarms shall be annunciated in any of the following manners as defined by the user: screen message text; e-mail of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on: day of the week, time of day and recipient.
   6. Color-graphic shall have flashing alarm object(s). Printed message may be routed directly to a dedicated alarm printer.
   7. The following shall be recorded by the NAC for each alarm (at a minimum): time and date; location (building, floor, zone, office number, etc.); associated equipment. Upon acknowledgement of the alarm the NAC shall document the time, date and authorized user. The number of alarm occurrences since the last acknowledgement shall be recorded.
   8. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user. Alarm actions may be initiated by user defined programmable objects created for that purpose.
   9. Alarm archiving: A log of all alarms shall be maintained by the NAC and/or a server and shall be available for review by the user. Provide a "query" feature to allow review of specific alarms by user defined parameters. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
   10. Provide ability for user to clear nuisance alarms.

J. Data Collection and Storage: The NAC shall have the ability to collect data for any property of any object and store this data for future use.
   1. The user shall designate the log as an interval log or deviation log. For an interval log, the object shall be configured for time of day, day of week and the sample collection interval. For deviation log, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
   2. All log data shall be stored in a relational database in the NAC and the data shall be accessed from the server or a standard web browser. All log data, when accessed from the server, shall be capable of being manipulated using standard SQL statements.
   3. All log data shall be available to the user in the following data formats: HTML, XML, plain text, comma separated values, as a minimum.
   4. The NAC shall have the ability to archive its log data either locally or remotely to the server or other NAC on the network.

K. Local Access: The NAC shall provide redundancy of system access to the local controllers at the remote building if the Primary Network Server should lose communication or be off-line. The NAC shall maintain setpoint and scheduling features, access to the color-graphic displays, maintain trend logs and reports. Upon restoration of communication with the PNS the archived information shall be transmitted to the server for archiving.

2.03 SOFTWARE FOR THE NAC

A. The distributed architecture of the operating system for the PNS and NACs shall provide the operator a comprehensive interface to allow the operator to configure and customize the EMCS to optimize the HVAC system to save energy, schedule and maintain equipment and provide occupant comfort. The provided graphical toolset shall allow the operator to create applications in a drag and drop environment.
   1. Input/output capability shall allow the operator to request the current value or status of the control point; command/override equipment to a specific state; add, change or delete control points, alarm limits and controllers; change descriptors to control points and equipment; modify parameters; create or modify DDC loops.

B. Operator System Access: Via software password with the ability to have different access levels at workstations and at each control unit.

C. Color graphic tools shall allow the user to create equipment and floor plan graphics from a standard library of symbols; allow custom generation of symbols; utilize over 64 or more colors; create real-time dynamic data for the graphics. Up to 60 control points may be displayed on each graphic.
   1. Provide a link between compatible graphics to minimize the paths to additional information. For example provide the link from the zone sensor to the VAV terminal to the air handling unit and to the central plant. Web pages shall be provided to allow the operator to zoom into specific areas of the facility and then link the space to the floor plan to the overall building and then to the facility site plan.
   2. Graphical tools shall allow the creation of bar graphs, pie graphs and other tools to visualize control information such as run time hours, energy consumed and occupant comfort.
   3. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, PDF, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.
   4. Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML5 or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.

D. Alarm processing tools shall allow the operator to create alarm messages that include as a minimum: time of alarm, point descriptor, alarm condition and remote annunciation. Critical alarms shall be displayed, archived to a storage device or printed on a alarm printer. Alarms shall be displayed in order of occurrence and have an optional audible alarm indicator.
   1. Print alarm messages, up to 60 characters in length, for each alarm point specified.
   2. Alarms may be routed to other devices including web-enabled cell phones, pagers, tablet PCs and designated personal computers on the network or Internet.
   3. Operator specifies when alarm requires acknowledgment. Continue to indicate unacknowledged alarms after return to normal. An alarm log shall be maintained to archive alarms for future reference with the above specified parameters as well as indicating the person acknowledging the alarm.
   4. The graphical display shall indicate the number of the current unacknowledged alarms by individual building site or by sum of all campus-wide facilities. The alarm console shall pop up every time user logs in. In addition, system shall have a map of the district with schools in critical alarm flashing in red.
   5. The operator may create and forward an e-mail message to another user directly from the graphical interface so that the message can be read when the second user logs on to the system.

E. Upon a power failure to equipment in the facility, the EMCS shall automatically stage and start equipment upon the restoration of power. Program a time delay between individual equipment restart on a schedule to minimize demand charges from the utility company.

F. Custom reports may be created by the operator with a requested time and date manually or automatically. All reports may be logged to a storage device for future reference. The data reports shall allow customization and scaling of the X-Y coordinates; plotting of tabular reports; provide multi-point graphical reports with not less than eight variables on the same report. Print reports on daily, weekly, monthly, yearly or scheduled basis as scheduled.

G. The network server current operating system, database, color-graphics, custom reports shall be backed up automatically to a remote server or storage device as directed by the owner's representative.

H. Maintenance Management capability shall allow the system to monitor and log the run- time for HVAC equipment; schedule maintenance reports that include recommended material and labor for the assigned task.

2.04 APPLICATION SPECIFIC CONTROLLERS (ASC)

A. All devices required for single loop control shall be terminated on a single controller. (for example, CHW loop pressure control. The differential pressure sensor and the pump VFD ramp signal.)

B. ASCs shall be capable of implementing control strategies for the system based on information from any or all connected inputs. The AC shall utilize factory pre-programmed global strategies that may be modified by field personnel on-site. Global control algorithms and automated control functions should execute via a 32-bit processor

C. Programming shall be object-oriented using control program blocks that will support a minimum of 500 Analog Values and 500 Binary Values. Analog and binary values shall support standard BACnet priority arrays. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing.

D. Controller shall have adequate data storage to ensure high performance and data reliability. Battery shall retain static RAM memory and real-time clock functions for a minimum of 1 year (cumulative). Battery shall be a field-replaceable (non-rechargeable) lithium type. The onboard, battery-backed real time clock must support schedule operations and trend logs.

E. The base unit of the ASC shall host various I/O combinations including universal inputs, binary outputs, and switch selectable analog outputs (0-10V or 0-20 mA). Inputs shall support thermistors, 0-5VDC, 0-10VDC, 4-20mA, dry contacts and pulse inputs directly.

F. All binary outputs shall have onboard Hand-Off-Auto switches and a status indicator light. HOA switch position shall be monitored. The position of each HOA switch shall be available system wide as a BACnet object.

G. Controller shall be capable of BACnet communication. BACnet Conformance:

1. Standard BACnet object types supported shall include as a minimum: Analog Input, Binary Input, Analog Output, Binary Output, Analog Value, Binary Value, Device, File, Group, Event Enrollment, Notification Class, Program and Schedule object types. All necessary tools shall be supplied for working with proprietary information.

H. Schedules: Each ASC shall support a minimum of 10 BACnet schedule objects.

I. Logging Capabilities: Each controller shall support a minimum of 100 trend logs. Sample time interval shall be adjustable at the operator's workstation. Controller shall periodically upload trended data to system server for long term archiving if desired. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

J. Alarm Generation: Alarms may be generated within the system for any object change of value or state either real or calculated. This includes things such as analog object value changes, binary object state changes, and various controller communication failures. Alarm logs shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site via remote communications. Controller must be able to handle up to 200 alarm setups stored as BACnet event enrollment objects – system destination and actions individually configurable.

2.05 UNITARY SYSTEM CONTROLLERS (USC)

A. All devices required for single loop control shall be terminated on a single controller. (for example, cooling coil control valve control. The temperature sensor and the valve control signal.) Distributed control of one singular piece of major mechanical equipment shall not be performed by multiple controllers.

B. The EMCS Contractor shall provide all Unitary System Controllers. USCs shall be fully programmable or applications specific controllers with pre-packaged operating sequences maintained in Flash RAM. Building scheduling shall be downloaded into flash memory in order to function during network outages.

C. The USC shall be a node on the automation network and shall control its own communications so that the failure of any one node, shall not inhibit communications on the network between the remaining nodes. USCs shall be totally independent of other network nodes for their monitoring and control functions.

D. Provide each USC with a battery back-up for the protection of volatile memory for a minimum of 72 hours. Batteries shall be rated for a seven year life.

E. All associated applications programs shall reside at the USC. The USC shall not require communication to any other panel for normal operating sequences other than time scheduled base commands.

F. Control shall be based on algorithms, i.e. proportional plus integral plus derivative (PID), proportional plus integral (PI), or proportional to comply with the sequences of operation PID algorithms shall maintain the system operation within +/- 2% of setpoint.

G. The USC shall be configured with sufficient input/output capacity to achieve the required control points to meet the sequence of operations.

2.06 VAV TERMINAL UNIT CONTROLLER (TUC)

A. All devices required for single loop control shall be terminated on a single controller. (for example, terminal unit air valve control. The flow sensor and the actuator control signal.)

B. The EMCS Contractor shall provide all controllers required for all variable air volume (VAV) terminal units. The number and location of terminal units and airflow rates shall be as indicated on the mechanical drawings.

C. The TUC shall be capable of monitoring and controlling the following parameters for VAV terminal units per the sequences of operation and input/output summary: space temperature; primary air flow rate; damper modulation; heating coil stage control, heating valve control, heating SCR control (as applicable); fan on/off control; supply air sensor; occupancy senor; carbon dioxide sensor or humidity sensor.

D. Furnish primary damper actuators, for factory mounting, meeting the following requirements: direct shaft mounting; adequate torque, to properly operate the damper from fully open to fully closed without binding; locking "V" groove or similar means to prevent slippage between actuator and shaft.

E. The EMCS Contractor shall field install the following components for each terminal unit: space temperature sensor; supply air temperature sensor; occupancy sensor, and carbon dioxide sensor as indicated on the Mechanical Drawings.

F. The EMCS Contractor shall furnish to the terminal unit manufacturer the following components for factory installation and wiring for each terminal unit: VAV controller with integral differential pressure transducer and damper actuator.

G. The terminal unit manufacturer may provide the following components for each terminal unit for interface and mounting of the TUC: primary air dampers; enclosure to house the TUC and associated components including suitable mounting brackets shall be NEMA 1 rating and located outside the terminal unit; multi-point averaging type flow sensor at the primary air inlet to the terminal unit; 24 VAC control transformer; 24 VAC fan control relay interface; 24 VAC heater control relay interface (up to two stages); 24 volt SCR heater input as scheduled (0-10 Vdc or 4-20 mA).

H. Any items required for proper operation but not provided by TU vendor, shall be provided under this section.

2.07 AIR HANDLING UNIT CONTROLLER

A. All devices required for single loop control shall be terminated on a single controller. (for example, AHU static pressure control. The differential pressure sensor and the VFD ramp signal.)

B. The EMCS Contractor shall provide controllers required for chilled/hot water and DX/electric heat air handling units and fan coil units. Provide an enclosure to house the controller and associated components including suitable mounting brackets shall be NEMA 1 rated and located outside the FCUs.

C. The controller shall be capable of monitoring and controlling the following parameters per the sequences of operation and input/output summary; space temperature; space relative humidity sensor ; cooling/heating stage control or modulating valve control; fan on/off control and status; supply air sensor; occupancy sensor; carbon dioxide sensor; VFD control and monitoring.

2.08 SOFTWARE OVERVIEW

A. Dynamic Colored Floor plans: Dynamic colored floor plans that compare actual space conditions to setpoints shall be provided on all floorplan graphics displayed on the front- end. Floorplan enlargements shall also use the thermographs to display space conditions. Zones within the set point range shall appear transparent white. As the space gets warmer the zone color shall gradually modulate from transparent white to transparent red to identify a hot zone. As the space conditions get cooler the zone color shall gradually modulate from transparent white to transparent blue to identify a cold zone. Each zone shall indicate the current actual zone temperature within the zone. The floor plans shall use a dynamic scheduling icon to indicate schedule occupancy for each zone and provide direct one-click access to that zones unique schedule. Provide a designated icon or symbol indicating that the zone is in the occupied/unoccupied condition. From the floorplan graphic, the operator shall be able to click on any zone and go directly to the graphic for the piece of equipment controlling that zone. All dynamic floor plans shall be visible via web interface as well as on the LAN. The authorized system operator shall be able to change the zone or system identifier (or name) on the graphic and that change shall be distributed to other associated graphics and to the equipment controller.

B. All unitary graphics must have interactive graphics with animations. All relevant points shall be shown on graphic pages.

C. Pop up Trends: Provide trend logs that automatically pop up when the operator mouse clicks on the point from the graphic. Provide pop up trends for all dampers, control valves, temperature sensors, carbon dioxide sensors, humidity sensors, airflows, static pressures, flow meters, VFD speeds, etc. The EMCS contractor shall set up all trends for the owner. The pop-up trend shall include a trend tool that allows the operator to modify the trend time scale and sample interval for up to 10 sample values. The trends shall be graphical on the computer screen but shall provide an output as an .xls, .csv, .pdf, HTML, r text file.

D. Interactive Maps: Implement such as Google Interactive maps depicting the facility location to indicate the site plan. This is not a static image and must be completely interactive.

E. Custom User HTML applications: The EMCS shall utilize HTML5 applications as an extra feature. At minimum, provide 7-day forecast, weather radar, traffic map and hurricane tracker. All of these features shall be imbedded into the EMCS system.

F. Provided a web-based EMCS platform; contractor shall provide an Open License software. Licenses that are not open are not acceptable. There shall be no per seat or per user licensing fee charged to the owner by the contractor.

G. System shall use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules. Schedules, setpoints, trends, and alarms shall be BACnet Objects.

H. User access shall include 50 assigned operators that shall include five levels of access within the web system. Each operator log-in shall have an expiration date to allow for temporary access to the system. The operator's access description shall include his e- mail address and cell/phone numbers. The operator access can be limited from 5 minutes to permanent access. The user shall be limited to eight bad login attempts before being locked out of the system.

I. Global modification: Provide the capability for global modification of user definable parameters of all points shall be provided. Global modification is defined as the mass adjustment of user definable parameters across a defined group, area, facility, campus, or network. Parameters shall include, but not be limited to temperature set point (VAV boxes, AHU Discharge, VAV AHU Static Pressure Setpoints etc.), equipment start/stop, equipment status, valve output signal, VFD speed control signal, and damper position signal. User shall be able to lock the definable parameter to a set value, or adjust a set point to an operator adjustable value. This function shall be accomplished through the standard graphical user interface/workstation and is to be selectively applicable by the user to all controllers on the network, all controllers in a specific facility or all controllers in a specific zone within a specific facility.

J. The system operator shall be able to override the output signal to the valves, dampers, variable frequency drives, etc. with the use of the PC mouse click on the device. The system override shall include a Hand-Off-Auto (HOA) capability. If the output is commanded to the hand position the operator shall designate an output value of 0-100% in 1% increments. The hand override position shall be permanent or expire after a designated time period and revert to the auto position. The color-graphic shall indicate the device that has been overridden by a color change of the output value.

K. For non-emergency in-warranty events the system operator may submit a Service Request directly from the floor plan or system graphic. The web interface shall include the EMCS suppliers contact information including phone numbers and e-mail address. The service request will be logged into the EMCS suppliers service department. A non- response by the assigned technician shall elevate the request to the next highest manager or supervisor until the system operator receives an response that their request has been received and is scheduled for a resolution. All requests for service shall be maintained in the customer's database for future reference. The service request capability may be extended after the expiration of the warranty as part of a service agreement.

L. The web-based system shall be accessible from Tablet PCs and provide the same functionality that is available from personal computers connected through the LAN or WAN to the system operator. The tablet PCs as a minimum shall include an Apple iPad and Google Android based tablet PC. Operation shall include touch screen capability and use of the tablet keyboard screen. The operator shall be able to view color-graphics, system trends, override setpoints, change time schedules, and override damper and valve positions.

2.09 ENERGY SAVING PROGRAMS

A. Demand Limiting: Monitor total power consumption for each power meter and shed associated loads automatically to reduce power consumption to an operator set maximum demand level.

B. Duty Cycling: Periodically stop and start loads, based on space temperature, and according to various on/off patterns.

C. Automatic Time Scheduling: Self-contained programs for automatic start/stop/scheduling of building loads. Support up to seven (7) normal day schedules, seven (7) "special day" schedules and two (2) temporary schedules.

D. Optimal Start/Stop: Perform optimized start/stop as function of outside conditions, inside conditions, or both. Optimization shall be adaptive and self-tuning, adjusting to changing conditions by modifying occupancy period based upon the desired temperature at beginning and end of the occupancy period. Base optimization on occupancy schedules, outside air temperature, seasonal requirements, and interior room temperature. Employ adaptive model prediction for how long building takes to warm up or cool down under different conditions.

E. Night-Setback Program: Reduce heating space temperature setpoint or raise cooling space temperature setpoint during unoccupied hours in conjunction with scheduled start/stop and optimum start/stop programs.

F. Setpoint Reset: Setpoints for control of variable load systems shall be reset based on load demand, as described in the Sequence of Operations.

G. Calculated Points: Define calculations and totals computed from monitored points (analog/digital points), constants, or other calculated points.

H. Event Initiated Programming: Any data point capable of initiating event, causing series of controls in a sequence.

I. Holiday Scheduling

J. Direct Digital Control: Furnish software so operator is capable of customizing control strategies and sequences of operation by defining appropriate control loop algorithms and choosing optimum loop parameters.

K. Trend logging shall be provided for all points per the input/output summary where there is a change in the analog or binary signal. Each controller shall be capable of storing trend values and then automatically transfer data to the NAC or the NS hard disk. Trend data shall be updated continuously per the operator assigned interval at intervals as low as one minute. Collect samples at intervals specified in minutes, hours, days, or month. Output trend logs as line-graphs or bar graphs. Binary points (input and output) shall only be logged upon a change of value (COV). Display trend samples on workstation in graphic format. Automatically scale trend graph with minimum 60 samples of data in plot of time versus data.

2.10 FIELD INSTRUMENTATION

A. Temperature Sensors: All temperature sensors shall be thermistor type, factory- calibrated to within 1 °F, interchangeable with housing appropriate for application. Sensors shall have a temperature curve rated for the application. Sensor wiring terminations shall be in a galvanized box.

1. Outside air temperature sensors shall be installed in weather proof enclosure with ventilated sun-shied
2. Duct mounted temperature sensors shall be averaging type for supply air, mixed air and low temperature applications for air handling units. Duct probe temperature sensor shall be acceptable for terminal units.
3. Space temperature sensors shall contain a backlit LCD digital display and user function keys along with temperature sensor, setpoint adjustment and after-hours override use. Override time may be set in one-hour increments.
4. Thermowell temperature sensors shall be stainless steel probe of length that is equivalent to a minimum of 50% of the pipe diameter. End-to-end accuracy shall be ± 1 deg. F. Connection box shall be moisture/water proof with conduit fitting. Furnish the stainless steel thermowell to the mechanical contractor for installation. A thermal conducting grease shall be installed in the thermowell to provide uniform temperature sensing.
5. Provide flat plate stainless steel space temperature sensors with no local setpoint adjustment as indicated on the drawings.

B. Carbon Dioxide Sensors: The sensor shall be capable of monitoring carbon dioxide concentration with an accuracy of +/- 50 parts per million (PPM). The sensor shall produce a linear 0-10 VDC or 4-20 mA signal over the range of 0 to 2000 PPM. The sensor shall measure using non-dispersed infrared (NDIR) technology to measure carbon dioxide gas and shall be;

1. The EMCS contractor shall utilize the required calibration devices to properly commission and calibrate the sensors per the manufacturer’s requirements.

C. Relative Humidity Sensors: relative humidity sensors shall be a two-wire type, 4-20 mA output proportional to the relative humidity range of 0-100%. The accuracy of the sensors shall be +2% over a range of 10-90% RH.

1. Outdoor relative humidity sensors: provide non-corroding outdoor shield to minimize wind effects and solar heating. Install wall-mount weather proof enclosure with conduit fitting.
2. Wall-mounted relative humidity sensor: sensor shall be installed in a wall- mounted enclosure with white cover.

3. Duct-mounted relative humidity sensor: sensor shall be provided with a moisture resistant enclosure with conduit fitting. The probe length shall be 8" minimum.

D. Pressure Transducers:
1. Air pressure sensor: The pressure sensors shall have an input range compatible with the medium being measured. The proportional output signal shall be 0-10 VDC or 4-20 mA.
2. Water pressure sensors: The pressure sensors shall have an input range compatible with the medium being measured. The proportional output signal shall be 0-10 VDC or 4-20 mA. Sensor shall be installed with a valved piping bypass and bleed off for each port.

E. Freezestat: Provide freezestats for all chilled water air handling systems that receive more than 10% untreated outside air. Freezestats shall provide vapor tension elements, which shall serpentine the inlet face on all coils. Provide additional sensors, wired in series, to provide one linear foot per square foot of coil surface area. Freezestat shall be manually reset at the switch. Interlock to the associated fan so that fan will shut down when HOA switch is in hand or auto position. Provide time delay relays with a 0-10 minute time delay relay duration to minimize nuisance freezestat trips. Time delay relay shall be adjustable at the associated control panel.

F. Air differential pressure switch: For fan shutdown, provide air differential pressure switches for all fans controlled by a variable frequency drive (VFD) to shut down the associated fan in the event of sensing high differential pressure. Air differential pressure switches shall have an adjustable setpoint with a range of 0-10 inches w.g. with manual reset at the switch. Provide ¼ inch copper tubing with compression fittings to mount to the side of the duct.

G. Momentary control relays: Provide momentary control relays as indicated. . Relays shall have coil ratings of 120 VAC, 50 mA or 10-30 VAC/VDC, 40 mA as suitable for the application. Contact ratings shall be 10 amp. Provide complete isolation between the control circuit and the digital output. Relays shall be located in the UC or other local enclosures and have pin-type terminals. Relays shall have LED indication of status.

H. Current sensing relay: Current sensing relays shall be rated for the applicable load. The output relay shall have an accessible trip adjustment over its complete operating range. Enclosure shall have an LED to indicate relay status.

I. Photocell: Ambient light level shall by a photocell in a non-corroding in a weatherproof housing with sun shield suitable for exterior installation. The control signal output shall be 4-20 ma or binary contact closure as specified in the sequences of operation. Mount the photocell on the north side of the building on the roof. The sensor reading shall be 0- 750 foot-candles.

J. Occupancy Sensors
1. The dual-technology occupancy ceiling mounted sensor shall be capable of detecting presence in the control area by via Doppler shifts in transmitted ultrasound and passive infrared (PIR) heat changes. Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic and PIR technologies. Detection verification of both technologies must occur in order to activate lighting systems. Sensor shall have a retrigger feature in which detection by either technology shall retrigger the lighting system on within 5 seconds of being switched off. The sensor shall operate at 24 VDC/VAC.
2. Sensors shall have a time delay that is adjustable with configuration software or shall have a fixed time delay of 5 to 30 minutes, set by a DIP switch. Sensors shall feature a walk-through mode, where lights turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds.
3. The sensor shall have an additional single-pole, double throw isolated relay with normally open, normally closed and common outputs. The isolated relay is for use with HVAC control, data logging, and other control options. The sensor shall have an LED indicator that remains active at all times in order to verify detection within the area to be controlled.

2.11 WHOLE BUILDING METERING

A. Buildings are to monitor electrical, water and gas usage. Any additional sub metering is to be provided by the contractor and determined by each specific project as called out on the drawings or specifications.

B. Inline nutating-disk type flow meters shall be provided for domestic water and cooling tower metering applications. The meter shall include a pulse output for monitoring by the EMCS. Provide meter to be installed by Division 23.

2.12 AIRFLOW MEASURING STATIONS (AFMS)

A. Duct mounted airflow measuring stations with combination airflow and air temperature measurement devices shall have the following features:
1. Multi-point sensors in one or more probe assemblies with a maximum of one to sixteen sensor nodes per location, and a single remotely mounted microprocessor-based transmitter for each measurement location. Each sensor node shall consist of two hermetically sealed bead-in-glass thermistors. Each sensing point shall independently determine the airflow rate and temperature at each node, which shall be equally weighted in calculations by the transmitter prior to output as the cross-sectional average. Each ducted sensor probe shall have an integral, U.L. Listed, plenum rated cable. Each independent temperature sensor shall have a calibrated accuracy of +/-0.14° F (0.08° C) over the entire operating temperature range of -20° F to 160° F (-28.9° C to 71° C).and be calibrated at 3 temperatures against standards that are traceable to NIST. Acceptable manufacturer shall be EBTRON, Inc. GTx116-PC.

2. Each transmitter shall have a display capable of simultaneously displaying both airflow and temperature. Airflow rate shall be field configurable to be displayed as velocity or volumetric rates, selectable as IP or SI units. Each transmitter shall operate on 24 VAC and be fused and protected from over voltage, over current and power surges.
3. Each independent airflow sensor shall have a laboratory accuracy of +/-2% of Reading over the entire calibrated airflow range of 0 to 5,000 fpm (25.4 m/s)., and be wind tunnel calibrated at 16 points against air velocity standards that are traceable to NIST.

2.13 DAMPER ACTUATORS:

A. Outside and exhaust air damper actuators shall be mechanical spring return. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the damper as required.
B. Outside and return air modulating actuators shall utilize analog (proportional) control 0-10 VDC. Actuators shall be driven in both the open and closed directions.
C. Electric damper actuators shall be direct shaft mounted and use a V-bolt and toothed V- clamp causing a cold weld effect for positive gripping. Single bolt or setscrew type fasteners are not acceptable.
D. Single section dampers shall have one electronic actuator direct shaft mounted.
E. Multi-section dampers with electric actuators shall be arranged so that each damper section operates individually. One electronic actuator shall be direct shaft mounted per damper section.
F. Damper actuators shall be BELIMO or equivalent.
A. Butterfly Valve Industrial Actuators
1. Enclosure shall be NEMA 4 (weatherproof) enclosure and will have an industrial quality coating.
2. Actuator shall have a motor rated for continuous duty. The motor shall be fractional horsepower; permanent split capacitor type designed to operate on a 120 VAC, 1 phase, 60 Hz supply. Two adjustable cam actuated end travel limit switches shall be provided to control direction of travel. A self-resetting thermal switch shall be imbedded in the motor for overload protection.
3. Reduction gearing shall be designed to withstand the actual motor stall torque. Gears shall be hardened alloy steel, permanently lubricated. A self-locking gear assembly or a brake shall be supplied.
4. Actuator shall have a 6 ft wiring harness provided for ease in field wiring (above 1500 in-lbs). Two adjustable SPDT cam-actuated auxiliary switches, rated at 250 VAC shall be provided for indication of open and closed position. Actuator shall have heater and thermostat to minimize condensation within the actuator housing.
5. Actuator shall be equipped with a hand wheel for manual override to permit operation of the valve in the event of electrical power failure or system malfunction. Hand wheel must be permanently attached to the actuator and when in manual operation electrical power to the actuator will be permanently interrupted. The hand wheel will not rotate while the actuator is electrically driven.
6. The actuator shall be analog, floating, or two position as called out in the control sequence of operation. All analog valves shall be positive positioning, and respond to a 2-10 VDC, 4-20 mA, or adjustable signal as required. Analog actuators shall have a digital control card allowing any voltage input for control and any DC voltage feedback signal for position indication.
7. Butterfly valve actuators shall be Belimo furnished with specified butterfly valves.

2.14 PANELS AND ENCLOSURES

A. Provide panels and enclosures for all components of the EMCS, which are susceptible to physical or environmental damage.
B. Interior panels and enclosures shall meet be NEMA 1 rated painted steel panels with locking door.
C. Exterior mounted panels and enclosures shall be NEMA 4 painted steel panels with locking door.
D. Panels for USCs shall be mounted on the outside of all unit ventilators and fan coil units with three feet of wall clearance in front of them and no higher than 7 feet to the bottom of the panel.

2.15 LABELING AND WARNING NOTICES

A. Provide labeling for all control panels and enclosures.
B. Provide labeling of all control wires and input/output points at the controller and at the control device; the label at each end of the wire shall be the same Labels shall be machine generated, typed and clearly legible with a maximum of 17 characters. Hand written labels or labels written on the control wire jacket will not be acceptable. Each label shall be unique to its function and shall reference the applicable system. For example “AHU-1 SAT” will indicate the supply air temperature sensor for AHU-1. Improper labeling shall be removed and shall require re-commissioning of the control device and controller to document correct functionality.
C. Provide high voltage warning notices at all equipment controlled by the EMCS and at all associated motor starters when used by equipment controller.
D. Provide high voltage warning notices at all equipment controlled by the EMCS and at all associated motor starters when used by equipment controller.

2.16 TUBING AND PIPING

A. Provide tubing and piping as required for the field instrumentation.

B. Tubing within equipment rooms, vertical risers, and penetrations to ductwork shall be either copper pipe or shall be plastic tubing within conduit. Tubing for all water-based instrumentation shall be copper pipe. Identify the type of tubing proposed in the shop drawing submittal.
C. Provide suitable bulk head fittings for duct and panel penetrations.
D. Tubing in plenum rated areas may be plastic tubing. Polyethylene tubing shall meet, at minimum, the following requirements: flame retardant; crack resistant; 300 psi burst pressure.

2.17 CONDUIT AND FITTINGS

A. Provide all conduits, raceways and fittings for the EMCS monitoring, communication and control cabling. All work shall meet all applicable codes.
B. Conduit, where required, shall meet, the requirements specified within Division 26.
C. EMCS monitoring and control cable shall not share conduit with cable carrying voltages in excess of 90 VAC.
D. Conduit and fittings must be rated for exterior/outdoor conditions.

2.18 CABLING

A. Provide all cables for the EMCS. Cable shall meet, at minimum, the following requirements:
   1. Minimum 98% conductivity stranded copper.
   2. Proper impedance for the application as recommended by the EMCS component manufacturer.
   3. Monitoring and control cable shall be #18 AWG or larger, dependent on the application. Analog input and output cabling shall be shielded.
   4. Management Level Network cable shall be CAT 6, 24 gauge unshielded.
   5. Automation Level Network cable shall be #24 AWG shielded.
   6. Shield shall be grounded at the CCP, UC, or control panel. Ground at one end only to avoid ground loops.
   7. Identification of each end at the termination point. Identification should be indicated on and correspond to the record drawings.
B. 120 VAC power wiring shall be of #12 AWG solid conductor or larger as required.

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION

A. The EMCS supplier shall provide a pre-construction coordination meeting with the affected trades to ensure a cooperative efficient process of installation. The invited trades shall include the general contractor, mechanical contractor, electrical contractor, test and balance contractor, owner's representative, consulting engineer and others with a direct interest in the coordination of the affected systems. The EMCS contractor shall provide an outline of the meeting agenda highlighting the construction schedule, coordination with mechanical and electrical trades. Provide a sign-in sheet and submit it through the attendees along with a summary of the meeting notes for future reference.

3.02 INSPECTION DURING INSTALLATION

A. Provide a technician to assist the Engineer or Owner's Representative, Test and Balance and Commissioning Agent with inspections made during the installation period that are required to review the progress and quality of ongoing work. The engineer/owner's representative shall generate field observation reports on the findings of the inspection. The engineer or owner's representative shall advise the EMCS contractor during the inspection of any concerns noted with respect to the installation and shall repeat the concerns in writing as soon as possible after the inspection is completed. The EMCS contractor shall take corrective action to meet the requirements of the specifications. Upon correction, the EMCS contractor shall submit written documentation through the contractors to the engineer.

3.03 INSTALLATION OF COMPONENTS

A. Provide all interlock and control wiring. All wiring shall be installed in a neat and professional manner in accordance with specification Division 26 and all national, state and local electrical codes.
B. Provide wire and wiring techniques recommended by equipment manufacturers. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the Owner's Representative prior to rough-in. Provide auxiliary pilot duty relays on motor starters as required for control function.
C. Electrical Contractor shall provide 120 or 277 volt power at a junction box within 48" of the controller. The BAS Contractor shall coordinate with the Electrical Contractor to identify locations of power requirements prior to the installation of the controls.
D. Conduit for control wiring shall be provided whenever one of the following conditions exists:
   1. Conduit is indicated on the drawings or specifically required by the specifications.
   2. Cabling runs through inaccessible areas such as within partitions/walls, above closed in ceilings, under floor; within trenches and underground; on the exterior of the building; exposed on the surface of the building; when encased in concrete or other material that makes the cable inaccessible or when located such that access to the cable is not readily obtained.
   3. Cable within mechanical, telecommunications and electrical equipment rooms and control rooms.

4. Conduit shall be installed, inside wall from sensor box to above the wall, for all wall mounted temperature, humidity and CO2 sensors.

E. Control wiring located above an accessible ceiling space may be plenum rated cable. Plenum rated wire shall be bundled and routed at right angles to the building lines and secured to the building structure every 15 feet.

F. When communication bus enters or exits a building, a surge suppressor shall be installed. The surge suppressor shall be installed according to the controls manufacturer's instructions.

G. Provide sleeves for all cable and conduit passing through walls, partitions, structural components, floors and roof

H. All sensor wiring shall be labeled to indicate the origination (at the device) and destination of data (at the control panel). The description shall indicate the type and location of the control device such as "AHU-1 SA temp" or "VAV 1-1 space temp".

I. Wall temp sensors at 48" above the finished floor to comply with ADA requirements and to match the height of the light switches. Mount humidity sensor at equal height to wall temperature sensor.

3.04 VERIFICATION REQUIREMENTS

A. Verification shall be provided by the EMCS contractor to demonstrate and confirm that the installed system complies with the specifications and the control sequences of operation herein specified. Upon completion of the verification process the EMCS contractor shall demonstrate to the engineer or owner's representative and Commissioning Agent the functionality of the control system devices are in compliance with the contract documents.

B. Technicians provided by the EMCS contractor shall be factory trained and qualified in the operation of the provided control system. The EMCS contractor shall provide, if requested, the factory training certificates of the individuals providing the verification services on this project.

C. Verification tools, applicable to the system provided, shall be utilized by the factory- trained technicians for proper verification of system operation and functionality. Temperature verification sensors shall be NIST certified within the last 12 months. Meters such as Fluke 52 series or better shall be utilized. Use of non-certified meters may require the system to be re-verified with certified meters at no cost to the owner.

D. Documentation of the verification process shall be provided per the project general conditions in electronic PDF format as required. Documentation shall include the following forms:

1. Project System Verification Forms for each controller provided on the project to verify the proper function of each controller, control device and system component provided.
2. Panel Verification Forms for each control panel to document the proper installation and function of each control panel provided.
3. Sequence of Operation Verification Forms for each piece of controlled equipment to confirm compliance of the control system with the specified sequences of operation.
4. Not providing proper documentation for each control devices, panel, or system, upon request by the engineer or owner's representative, may require the EMCS contractor to re-verify the applicable systems at no additional cost to the owner.

E. After completion of the verification, the EMCS contractor shall be able to demonstrate the sequence of operations for each system to the engineer and the owner's representative.

F. Equipment checkout sheets are to be produced by this contractor showing checkboxes and compliance with the following procedures for each piece of equipment and turned over to the owner and/or mechanical engineer.

3.05 COLORGRAPHICS

A. The colorgraphics shall be provided for the EMCS system prior to system acceptance and owner training. Ownder has final final approval and decision on all graphic templates.

B. The colorgraphics provided shall include the following as a template. Provide forward and backward links on the graphic.

1. Site plan with link to overall building plan including detached buildings. The site plan shall be referenced to an automatically updated aerial view or map view of the area such as Google Maps or Bing Maps. Provide link to proceed to the overall building floor plan.
2. The overall building plan shall indicate space temperature conditions referenced by the color of the zone. Specific details of the zone temperatures and equipment are not required. Provide a link to the floor plan wings, upper floors and remote buildings.
3. The floor plan colorgraphics shall indicate the space temperatures by color references. Additional information shall indicate the space temperature, the occupancy of the zone, air handling units, VAV terminals and ductwork with diffusers. A link at each terminal unit or AHU shall automatically connect the system operator to the equipment colorgraphic.
4. The colorgraphics for the equipment shall as a minimum be equal to the points from the input/output summary or control schematic. Primary control devices as required by the sequences of operation shall also be provided.
5. Control points from equipment that are integrated into the EMCS via BACnet shall be provided to convey the operating conditions of the attached equipment. Coordination of the integration points shall be accomplished during the submittal phase. The EMCS contractor shall provide a list of all integrated points on their submittal.

3.06 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Startup testing documentation: Prepare the checklist documenting startup testing of each input and output device, with technician's initials and date certifying each device has been tested and calibrated prior to acceptance testing. This document shall indicate proof that the following functions have been commissioned and shall be included in the as-built documentation: short to ground check, configuration of trends, confirmation that color- graphics are accurately representing actual systems, point to point checkout, all damper and valve actuators respond to input change, control modules are addressed and have functional descriptors, specified interlocks are functional, calibration report of all sensors, discrete outputs respond to time schedule or manual enable command.

B. Demonstration. Prior to acceptance, demonstrate the following performance tests to demonstrate system operation and compliance with specifications.
   1. Engineer, owner's representative and mechanical contractor shall be invited to observe and review system demonstration. Provide attendees at least 10 days notice.
   2. Demonstration shall follow process approved as part of the submittal and shall include complete checklists and forms for each system as part of system demonstration.
   3. Demonstrate actual field operation of each sequence of operation as specified. Demonstrate calibration and response of any input and output points requested by engineer or owner's representative.
   4. Demonstrate complete operation of operator interface including review of color- graphics, time schedules, trend logs, alarm notification, functionality of tablet PC operation.
      a. PID loop response. Supply graphical trend data output showing each PID loop's response to a set point change representing an actuator position change of at least 25% of full range. Trend sampling rate shall be selectable from 10 seconds to 3 minutes, depending on loop speed. Each sample's trend data shall show set point, actuator position, and controlled variable values.
      b. Demand limiting. Supply trend data output showing demand-limiting algorithm action. Trend data shall document action sampled each minute over at least a 30-minute period and shall show building kW, demand limiting setpoint, and status of set points and other affected equipment parameters.
      c. Trend logs for each system. Trend data shall indicate set points, operating points, valve positions, and other data as specified. Logs shall be accessible through system's operator interface and shall be retrievable for use in other software programs.
   5. Alarms and Interlocks. Check each alarm with an appropriate signal at a value that will trip the alarm. Trip interlocks using field contacts to check logic and to ensure that actuators fail in the proper direction. Alarm verification shall include temperatures exceeding alarm threshold (high and low), fan failure safety, duct high static pressure switch, freezestat, and smoke detector shutdown.
   6. Tests that fail to demonstrate proper system operation to the engineer shall be repeated after contractor makes necessary repairs or revisions to hardware or software to successfully complete each test.

C. Owner Acceptance.
   1. After tests described in this specification are performed to the satisfaction of both engineer and owner's representative and Commissioning Agent, the engineer shall accept the control system as meeting completion requirements. Engineer may exempt tests from completion requirements that cannot be performed due to circumstances beyond EMCS contractor's control. Engineer shall provide written statement of each exempted test. Exempted tests shall be performed as part of warranty.
   2. System shall not be accepted until completed demonstration forms and checklists are submitted and approved by the engineer, owner and commissioning agent.

3.07 DEMONSTRATION AND OWNER TRAINING

A. Furnish basic operator training for multiple persons on data display, alarm and status descriptors, requesting data, execution commands and log requests. Include a minimum of 16 hours: 8 hours instructor time for onsite training and 8 hours of hands on class environment training. Training sessions may be provided in 4-hour increments as approved by the owner's representative.
   1. Change/modify temperature setpoints.
   2. Change/modify time of day, holiday and override schedules.
   3. Display, create, and modify trends of system points.
   4. Update room numbers on the color-graphics.

B. Demonstrate complete and operating system to Owner. Provide written documentation listing the attendees of the specified training with sign-in sheet and training time and date.

PART 4 - SEQUENCE OF OPERATIONS

4.1 SEQUENCE OF OPERATIONS

A. The following are sequences of operations which will be accomplished by the EMCS. Coordinate with Owner in operating equipment to maximize comfort and economy. All points required to accomplish the sequences will be provided and connected to the EMCS.

B. Equipment interfaces are acceptable for providing information but each piece of equipment (including but not limited to chillers, VFD's, unitary equipment, etc.) shall have a hard wired point for start/stop and speed control.
C. All Points added by Engineer and/or Control Contractor needed for the sequences shall be identified in the Submittals and Project Record Documents.
D. All VFD's and actuators shall have feedback that reports to the EMCS.
E. All units to have economizer sequences and economizer fault detection and diagnosis capabilities.
F. Flow meters at air handlers shall be integrated into the EMCS.
G. Connection to flow meters provided by Division 22 Contractor
    1. Provide connection to water and gas meter provided by Division 22 contractor. Consumption for water and gas shall be stored for a minimum 36 month period.
H. Connections to energy meters provided by Division 26 contractor
    1. Division 26 contractor is providing a total of four (4) energy meters. Meters shall have 10/100BaseT Ethernet with Modbus TCP protocol capabilities to interface EMCS. EMCS contractor shall maintain and store 36 months of energy demand recorded on a 15-minute basis and consumption for each energy meter. These meters shall be installed at 1) Main Distribution Switchboard (MSB), 2) Panel LP1E, 3) Panel HK1A and 4) Panel LK1A.

DOMESTIC WATER HEATING CIRCULATION PUMP
- Start/stop – DO
- Return water temperature – AI
- Status

System On/Off – Pump and drinking fountains shall be controlled by BAS generated occupancy schedule.

DRINKING FOUNTIAN
- Status Electric drinking fountain
- Start/stop - DO
- Status

System On/Off – Pump and drinking fountains shall be controlled by BAS generated occupancy schedule.

PACKAGED DX ROOF TOP UNIT WITH HOT GAS REHEAT AND ELECTRIC HEAT
GENERAL:
- Start/stop – DO
- Discharge Supply Air Temperature - AI
- Space Humidity Setpoint – AI
- Space Temperature Setpoint – AI
- Space Humidity – AI
- Space Temperature – AI
- Unit Staging – DI
- Supply Fan Speed – AI

The unit shall have supply fan, DX Cooling Coil, Electric Heating Coil, and Modulating Hot Gas Reheat Coil, Outdoor Air Intake Damper, and Return Air Intake Damper. The supply fan shall have a variable frequency drive (VFD) for balancing and soft start purposes only. The unit will be provided with its own factory controller. The unit shall be provided with a BACnet interface that allows the BAS to monitor all available BACnet points and write temperature setpoint/humidity setpoints. BAS shall provide occupancy scheduling for enabling disabling unit.

EXHAUST FANS

- Fan start/stop – DO
- Fan status – DI

Interlock exhaust fans (EF-01, EF-02, and EF-03) to run with RTU's serving the same area and run when the RTU's are operating in the occupied mode.

Fans controlled by local thermostat (VF-1) shall be monitored by CT.

IDF and MDF ROOMS

- Space temperature – AI
- Space temperature Setpoint – AO

The B.A.S shall monitor the space temperature in the IDF and MDF rooms.Integrate into AC/CU unit with BACnet integration. The B.A.S shall report a high temperature alarm to the computers, pagers, and/or text message compatible cell phones designated by the School district personnel if the space temperature rises above 68°F (adjustable) for five (5) minutes (adjustable).

END OF DIVISION 250000

Peak Advantage Guarantee

Building Owner:
Fort Bend Independent School District
555 Julie Rivers Road
Sugar Land, TX 77478

Guarantee Number: ANM118031460
Expiration Date: August 19, 2042
Job Name: Fort Bend ISD - Tri-Plex Center
Date of Completion: August 19, 2022

Building Name:
Tri-Plex Center
550 Julie Rivers Drive
Sugar Land, TX 77478

Approved Roofing Contractor:
CS ADVANTAGE USAA INC
PO BOX 12407
COLLEGE STATION, TX 77842

Terms & Maximum Monetary Obligation to Maintain a Watertight Roofing System.

Years: 20 Year **$** No Dollar Limit

Coverage:
The components of the Roofing System covered by this Guarantee are:
Total Squares: 940

Sec.	Sqs.	Roof Type	Membrane Spec.	Insulation Type Layer 1	Layer 2	Layer 3	Cover Board
1	940	SBS	2FIT-P8	No Insulation			JM Securock Gypsum-Fiber Roof Board

Accessories:

Type	Product Name	Quantity
Expand-O-Flash (1) Style:		lin. ft.
Expand-O-Flash (2) Style:		lin. ft.
Expand-O-Flash (3) Style:		lin. ft.
Fascia Style:		lin. ft.
Copings Style:		lin. ft.
Drains (1) Style:		ea.
Vents Style:		ea.

These Johns Manville Guaranteed components are referred to above as the "Roofing System" and ALL OTHER NON-JM COMPONENTS OF THE OWNER'S BUILDING ARE EXCLUDED FROM THE TERMS OF THIS GUARANTEE, including any amendments thereto.

Johns Manville* guarantees to the original Building Owner that during the Term commencing with the Date of Completion (as defined above), JM will pay for the materials and labor reasonably required in Johns Manville's sole and absolute discretion to repair the Roofing System to return it to a watertight condition if leaks occur due to: ordinary wear and tear, or deficiencies in any or all of the Johns Manville component materials of the Roofing System, or workmanship deficiencies only to the extent they arise solely out of the application of the Roofing System. Non-leaking blisters are specifically excluded from coverage. Should any investigation or inspection reveal the cause of a reported leak to be outside the scope of coverage under this Guarantee, then all such investigation and inspection costs shall be borne solely by the Building Owner.

WHAT TO DO IF YOUR ROOF LEAKS

If you should have a roof leak please refer to the Maintenance Program page within this document.

LIMITATIONS AND EXCLUSIONS

This Guarantee is not a maintenance agreement or an insurance policy; therefore, routine inspections and maintenance are the Building Owner's sole responsibility (see Maintenance Program page of this document). This Guarantee does not obligate JM to repair or replace the Roofing System, or any part of the Roofing System, for leaks or appearance issues resulting, in whole or in part, from one or more of the following (a) natural disasters including but not limited to the direct or indirect effect of lightning, flood, hail storm, earthquake, tornados, hurricanes or other extraordinary natural occurrences and/or wind speeds in excess of 55 miles per hour; (b) misuse, abuse, neglect or negligence; (c) Failure by the Building Owner to use reasonable care in maintaining the roofing system, said maintenance which is recommended to include those items listed on the Maintenance Program page of this Guarantee; (d) installation or material failures other than those involving the component materials expressly defined above as the Roofing System or exposure of the Roofing System components to damaging substances such as oil, fertilizers, or solvents or to damaging conditions such as vermin; (e) any and all (I) changes, alterations, repairs to the Roofing System, including, but not limited to, structures, penetrations, fixtures or utilities (including vegetative and solar overlays) based upon or through the Roofing System as well as any (II) changes to the Building's usage that are not pre-approved in writing by JM; (f) failure of the Building substrate (mechanical, structural, or otherwise and whether resulting from Building movement, design defects or other causes) or improper drainage; (g) defects in or faulty/improper design, specification construction or engineering of the Building or any area over which the Roofing System is installed; (h) defects in or faulty/improper architectural, engineering or design flaws of the Roofing System or Building, including, but not limited to, design issues arising out of improper climate or building code compliance; or (i) in instances of a recover project, Johns Manville is not responsible for the performance of pre-existing materials that predated the recover. Instead, Johns Manville's sole responsibility in recover systems where JM materials are adhered to existing materials is limited to the installed recover JM Roofing materials up to the wind speed listed herein. Guarantee coverage is limited to replacing recover JM Roofing materials only (and not the pre-existing materials – which is the Owner's responsibility) as required to return the roofing system to a watertight condition due to a claim covered under the terms and conditions herein. Johns Manville is not responsible for leaks, injuries or damages resulting from any water entry from any portion of the Building structure not a part of the Roofing System, including, but not limited to, deterioration of the roofing substrate, walls, mortar joints, HVAC units and all other non-Johns Manville materials and metal components. Moreover, the Building Owner is solely and absolutely responsible for any removal and/or replacement of any overburdens, super-strata or overlays, in any form whatsoever, as reasonably necessary to expose the Roofing System for inspection and/or repair.

This Guarantee becomes effective when (1) it is delivered to Owner; and (2) all bills for installation, materials, and services have been paid in full to the Approved Roofing contractor and to JM. Until that time, this Guarantee is not in force, has no effect – and JM is under no obligation whatsoever to perform any services/work.

The Parties agree that any controversy or claims relating to this Guarantee shall be first submitted to mediation under the Construction Industry Arbitration and Mediation Rules of the American Arbitration Association (Regular Track Procedures) or to such other mediation arrangement as the parties mutually agree. No court or other tribunal shall have jurisdiction until the mediation is completed. In any action or proceeding brought against the Building Owner to enforce this Guarantee or to collect costs due hereunder, Johns Manville shall be entitled to recover its reasonable costs, expenses and fees (including expert witness' fees) incurred in any such action or proceeding, including, without limitation, attorneys' fees and expenses, and the Building Owner shall pay it.

TO THE FULLEST EXTENT PERMITTED BY LAW, JM DISCLAIMS ANY IMPLIED WARRANTY, INCLUDING THE WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND LIMITS SUCH WARRANTY TO THE DURATION AND TO THE EXTENT OF THE EXPRESS WARRANTY CONTAINED IN THIS GUARANTEE.

THE EXCLUSIVE RESPONSIBILITY AND LIABILITY OF JM UNDER THIS GUARANTEE IS TO MAKE REPAIRS NECESSARY TO MAINTAIN THE ROOFING SYSTEM IN A WATERTIGHT CONDITION IN ACCORDANCE WITH THE OBLIGATIONS OF JM UNDER THIS GUARANTEE. JM AND ITS AFFILIATES WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES TO THE BUILDING STRUCTURE (UPON WHICH THE ROOFING SYSTEM IS AFFIXED) OR ITS CONTENTS AND OR OCCUPANTS, LOSS OF TIME OR PROFITS OR ANY INCONVENIENCE, INJURY. JM SHALL NOT BE LIABLE FOR ANY CLAIM MADE AGAINST THE BUILDING OWNER BY ANY THIRD PARTY AND THE BUILDING OWNER SHALL INDEMNIFY AND DEFEND JM AGAINST ANY CLAIM BROUGHT BY ANY THIRD PARTY AGAINST JM RELATING TO OR ARISING OUT OF THE ROOFING SYSTEM OR JM'S OBLIGATIONS UNDER THIS GUARANTEE. JM AND ITS AFFILIATES SHALL NOT BE LIABLE FOR ANY DAMAGES WHICH ARE BASED UPON NEGLIGENCE, BREACH OF WARRANTY, STRICT LIABILITY OR ANY OTHER THEORY OF LIABILITY OTHER THAN THE EXCLUSIVE LIABILITY SET FORTH IN THIS GUARANTEE. THIS GUARANTEE DOES NOT COVER, AND EXPLICITLY EXCLUDES, ANY AND ALL INJURIES, CLAIMS AND/OR DAMAGES RESULTING, IN WHOLE OR IN PART, FROM ANY WATER ENTRY FROM ANY PORTION OF THE BUILDING STRUCTURE INCLUDING, BUT NOT LIMITED TO, THE ROOFING SYSTEM.

No one is authorized to change, alter, or modify the provision of this Guarantee other than the Regional Service Manager, or authorized delegate. JM's delay or failure in enforcing the terms and conditions contained in this Guarantee shall not operate as a waiver of such terms and conditions. This Guarantee is solely for the benefit of the Building Owner identified above and Building Owner's rights hereunder are not assignable. Upon sale or other transfer of the Building, Building Owner may request transfer of this Guarantee to the new owner, and JM will transfer this Guarantee, only after completing JM's transfer requirements including JM receiving satisfactory information and payment of a transfer fee, which must be paid no later than 30 days after the date of Building ownership transfer.

In the event JM pays for repairs which are required due to the acts or omissions of others, JM shall be subrogated to all rights of recovery of the Building Owner to the extent of the amount of the repairs.

Because JM does not practice Engineering or Architecture, neither the issuance of this Guarantee nor any review of the Building's construction or inspection of roof plans (or the Building's roof deck) by JM representatives shall constitute any warranty by JM of such plans, specifications, and construction or in any way constitute an extension of the terms and conditions of this Guarantee. Any roof inspections are solely for the benefit of JM.

JM does not supervise nor is it responsible for a roofing contractor's work except to the extent stated herein, and roofing contractors are not agents of JM.

*JOHNS MANVILLE ("JM") is a Delaware corporation.

Joseph Smith

By: Joseph Smith
Title: President Roofing Systems

Addendum(s)

Wind

This Wind Speed Rider is an addendum to Johns Manville Guarantee ANM118031460. This Wind Speed Rider is expressly limited in scope to obligate Johns Manville to address leaks, damage and/or blow offs to the existing Roofing System at the Building (if any) that result exclusively from wind speeds up to and including 120 mph as measured using the three-second gust wind speed measurement technique.

The terms of this Wind Speed Rider are subject to the conditions and limitations described both herein and in Guarantee ANM118031460, including, but not limited to, the exclusion of Johns Manville's liability for incidental and/or consequential damages to the Building upon which the Roofing System is affixed, its structure, its tenants (if any) and/or its contents (which limitations and conditions are expressly adopted and incorporated herein by this reference).

The applicable wind speed shall be determined over the lifespan of the Guarantee from the National Climatic Data Center facility located nearest to the above-identified Building Address.

This Wind Speed Rider shall not obligate Johns Manville to either address or to make any repairs to any leaks, damage and/or blow offs either resulting from or due to, either solely or collectively, the following events:

i. Failure of any portion of the building structure, any deck substructure, or the roof decking itself including any lightweight concrete fill. Examples of structural and roof decking components include, but are not limited to joists, deck puddle welds, deck fasteners, clips, nails, beams, and/or EPS fill. Failure of the roof deck automatically renders this rider null and void whether directly causing any failure of the roofing system or not.
ii. Failure of any portion of the perimeter wood blocking or shop fabricated metal edge on the Building.
iii. Tornadoes or microbursts
iv. Any and all wind borne debris.
v. An occasion where, at any point in time over the lifespan of the roofing system and/or Guarantee, a wind event exceeds 120 mph. In such instance, this Wind Speed Rider and the original Guarantee are both automatically null and void without the need for any notice to the building Owner.
vi. The Building Owner's failure at any time to properly maintain the roofing system at the Building in accordance with Johns Manville's Maintenance Program outlined on the back of the original Guarantee ANM118031460. Failure to properly maintain the Building Roofing System in accordance with the Johns Manville Maintenance Program shall automatically render this Wind Speed Rider and the original Guarantee null and void, without the need for any notice to the Building Owner.
vii. The Building Owner is responsible for reporting to Johns Manville any wind event in excess of 72 mph ("Qualifying Wind Event") within 30 days, time being of the essence, in order to have the Roofing System inspected by a Johns Manville representative for a fee - which the Building Owner shall pay. Failure by the Owner to (1) notify Johns Manville of the Qualifying Wind Event within the prescribed period; (2) have the Roofing System inspected; or (3) pay Johns Manville for the inspection, shall automatically render this Wind Speed Rider and the original Guarantee null and void, without the need for any notice to the building Owner.

Johns Manville does not practice either engineering or architectural services and expressly disclaims all liability for any design or engineering related issues. As such, it is the Building Owner's sole and ultimate responsibility to (1) design and engineer the perimeter blocking attachment protocol; (2) verify that the perimeter blocking attachment protocol has been followed; (3) verify the sufficiency of the design or engineering of any of the structural components of your building, including the roofing deck, to withstand the structural load cause by a wind velocity or uplift pressure not exceeding the maximum wind velocity stated in this rider or uplift pressure generated by that velocity when calculated in accordance with ASCE 7-05; (4) verify that any upgrades to the roof decking required by the specified roofing system have been made.

JM's delay or failure in enforcing the terms and conditions contained in this Guarantee shall not operate as a waiver of such terms and conditions.

Hail:

The subject Guarantee has been amended to include coverage against hail up to 2" in diameter under the following conditions of coverage:
-- The subject Guarantee covers leaks due to hail up to 2" in diameter as reported by the National Climatic Data Center.
-- Johns Manville will not be responsible for any changes in appearance or surface imperfections caused by hail events.
-- All hail events, regardless of size, must be reported to Johns Manville. Failure to do so could result in the Hail rider being rendered Null and Void.
-- Any hail in excess of 2" will automatically render this hail rider Null and Void.

Maintenance Program

The following Maintenance Program is recommended and should be implemented and followed:

1. Building Owner must notify JM's Owner Services Group (see below) immediately upon discovery of the leak and in no event later than thirty (30) days after initial discovery of the leak, time being of the essence. Failure of the Building Owner to provide timely notice to JM Guarantee Services of any leak is a material ground for termination of the Guarantee.

2. In response to timely notice, JM will arrange to inspect the Roofing System, and
   (i) If, in JM's opinion, the leak(s) is/are the responsibility of JM under this Guarantee (see Limitations and Exclusions), then JM will take prompt appropriate action to return the Roofing system to a watertight condition, or
   (ii) If, in JM's opinion, the leak(s) is/are not the responsibility of JM under this Guarantee, then JM will advise the Building Owner within a reasonable time of the minimum repairs that JM believes are required to return the Roofing System to a watertight condition. If the Building Owner, at his expense, promptly and timely makes such repairs to the Roofing System (time being of the essence) then this Guarantee will remain in effect for the unexpired portion of its Term. Failure to make any of these repairs in a timely and reasonable fashion will void any further obligation of JM under this Guarantee as to the damaged portion of the Roofing System as well as any other areas of the Roofing System impacted by such failure.

3. In the event an emergency condition exists which requires immediate repair to avoid damage to the Building, its contents or occupants, then Building Owner may make reasonable, essential temporary repairs. JM will reimburse Building Owner for those reasonable repair expenses only to the extent such expenses would have been the responsibility of JM under the Guarantee.

There are a number of items not covered by this Guarantee that are the sole, exclusive responsibility of the Building Owner. In order to ensure that your new roof will continue to perform its function and to continue JM's obligations under the Guarantee, you should examine and maintain these items on a regular basis. All damage or leak investigation findings that are the direct result of non-covered maintenance items are the sole responsibility of the owner.

- Maintain a file for your records on this Roofing System, including, but not limited to, this Guarantee, invoices, and subsequent logs of all inspections performed and repairs that are made to the Roofing System.
- Inspect your Roofing System at least semi-annually. This is best done in the spring, after the Roofing System has been exposed to the harsh winter conditions, and, in the Fall after a long hot summer. It is also a good idea to examine the Roofing System for damage after severe weather conditions such as hailstorms, heavy rains, high winds, etc.
- Since these types of Roofing Systems typically have a low slope, they are easily examined. However, care must be taken to prevent falling and other accidents. JM expressly disclaims and assumes no liability for any inspections performed on the Roofing System.

When checking the Roofing System:

- Remove any debris such as leaves, small branches, dirt, rocks, etc. that have accumulated.
- Clean gutters, down spouts, drains and the surrounding areas. Make certain they allow water to flow off the Roofing System. Positive drainage is essential.
- Examine all metal flashings for rust and damage that may have been caused by wind or traffic on the Roofing System, and make certain they are well attached and sealed. Any damaged materials due to foot traffic or service work, loose clamps at penetrations, or poorly sealed materials at drains or penetrations pockets must be repaired by a JM Approved Roofing Contractor only.
- Examine the areas that abut the Roofing System. Damaged masonry, poorly mounted counter flashing, loose caulking, bad mortar joints, and any loose stone or tile coping can appear to be a membrane leak. Have these items repaired if found to be defective.
- Examine the edges of the Roofing System. Wind damage often occurs in these areas. Materials that have been lifted by the wind need to be corrected by a JM Approved Roofing Contractor.
- Examine any roof top equipment such as air conditioners, evaporative coolers, antennas, etc. Make certain they do not move excessively or cause a roof problem by leaking materials onto the Roofing System.
- Check the building exterior for settlement or movement. Structural movement can cause cracks and other problems which in turn may lead to leaks in your Roofing System.
- Examine protective coatings; any cracked, flaking, or blistered areas must be recoated.

Protecting your investment:

- Avoid unnecessary roof top traffic.
- If you allow equipment servicemen to go onto the Roofing System, advise them to be careful. Dropped tools, heavy equipment, etc. can damage the membrane. It is recommended to keep a log of all such trips to the Roofing System.
- Do not allow service personnel to make penetrations into the Roofing System; these are to be made only by a JM Approved Roofing Contractor.

All the terms and conditions of this Guarantee shall be construed under the internal law of the state of Colorado without regard to its conflicts of law principles. Invalidity or unenforceability of any provisions herein shall not affect the validity or enforceability of any other provision which shall remain in full force and effect to the extent the main intent of the document is preserved.

This form is not to be copied or reproduced in any manner. This Guarantee is valid only in the United States of America.

Owner Services Team
(800) 922-5922
E-mail: OwnerServices@jm.com
www.jm.com/roofing

Johns Manville
A Berkshire Hathaway Company

Dear Building Owner:

Attached to this letter is the Peak Advantage® Roofing Systems Guarantee for the new roof recently installed on your building. We believe your building is now protected by one of the finest commercial roofing systems available on the market today. We appreciate the opportunity to provide you with a level of protection unmatched in the industry.

There are some things you should be aware of before you file this document away in a safe place:

1. This is NOT a maintenance agreement or an insurance policy. Johns Manville liability is strictly governed by the terms of the guarantee. If you have any questions about this Guarantee, contact Johns Manville Owner Services at the appropriate number given below.

2. You are required to perform routine maintenance on the roofing system to keep the coverage to the guarantee intact. For your convenience, a list of maintenance items is printed on the back of the guarantee.

We hope that you never experience any difficulty with your roofing system. If you do have a problem, you should contact Johns Manville Owner Services at the appropriate numbers provided. Please have the guarantee on hand so that we may more efficiently handle your inquiry.

Sincerely,

Mandy Schweitzer
Owner Services Leader
Johns Manville Roofing Systems
(800) 922-5922, opt. 1
OwnerServices@jm.com
www.jm.com

PROTECT YOUR JM ROOF GUARANTEE

Prevent Roofing Problems

Your Johns Manville roofing system is made of premium quality materials, and it's backed by a valuable guarantee. Both help secure your investment as a building owner, but they also rely on your commitment to responsible maintenance. Knowing when and why to inspect your roof for optimum performance is critical to a long lasting JM Roof System.

THE RIGHT WAY TO MAINTAIN YOUR ROOF

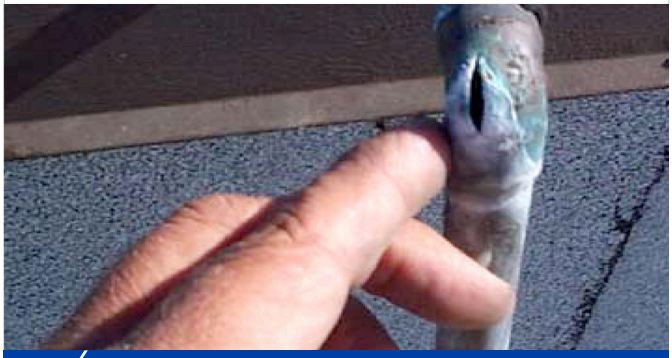
Do...

- Perform inspections at least twice a year or as required by the guarantee. It's best to inspect your roof at the end of winter and the end of summer, when it has gone through the most thermal stress.
- Conduct inspections immediately after unusual occurrences such as heavy rains, high winds, hail, nearby fires, explosions, etc.
- Watch your roof for trouble spots, and clear away any debris or contaminants on a regular basis. This includes unclogging drains in the spring and fall.
- Establish a rooftop control policy, and keep any access doors or hatches locked.
- Keep a file of all records, inspection reports and activity related to your roof.
- Advise equipment service personnel to be careful handling tools and heavy equipment on your roof.

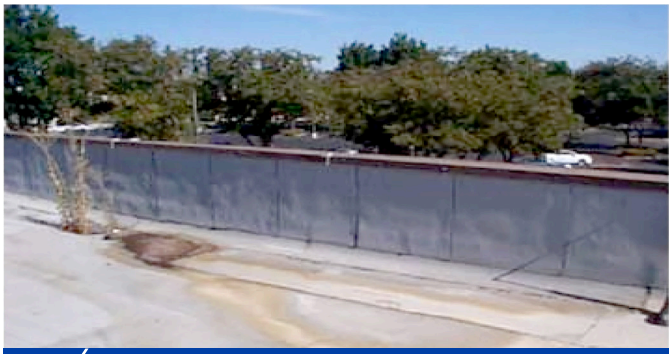
Don't...

- Allow unqualified personnel to access or maintain your roof.
- Permit equipment service personnel to make penetrations into your roof. These should be handled by an approved roofing contractor.
- Power wash your roof, as it may cause unintended damage.
- Move heavy equipment across your roof.
- Puncture the membrane.

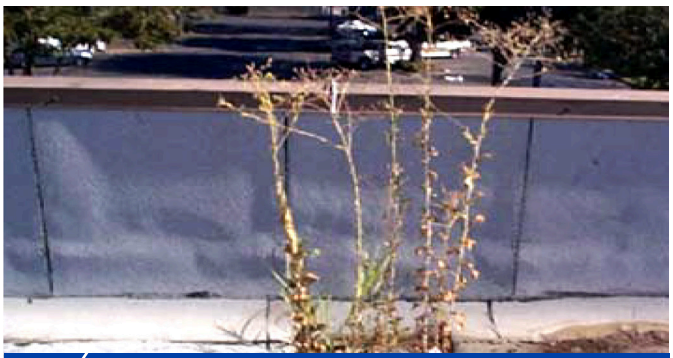
CAUSE & EFFECT



1 When a water line split on this roof ...



2 the leak created a persistent pool ...



3 and gave weeds a chance to grow.

Johns Manville

PROTECT YOUR JM ROOF GUARANTEE

Prevent Roofing Problems

MAINTENANCE CHECKLIST

Below is a checklist of things to look for while on your roof. Use this as a guideline for semi-annual maintenance, and maintain the records to help ensure the integrity of your roofing system.

Building Exterior	General Condition	Inspect all areas for signs of leaks and/or deterioration.	☐
	Walls & Roof Edge – Coping Caps or Gravel Stop, Gutter	A coping is a covering for the top of a wall that is exposed to weather. It is usually sloped to shed water to the roof. Inspect for deterioration, missing mortar and stains in walls indicating possible leaks. Check for cracking, splits and mortar integrity. Replace any damaged, loose or cracked areas. Caulk joints if necessary.	☐
	Fascia	Inspect all surfaces for signs of leaks and/or deterioration.	☐
Building Interior	General Condition	Inspect all areas for signs of leaks and/or deterioration.	☐
	Walls	Inspect all surfaces for signs of leaks and/or deterioration.	☐
	Underside of Deck	Inspect for stains, discoloration, spalled or rusted surfaces.	☐
	Ceilings	Inspect for evidence of staining.	☐
Field of Roof	General Condition	Remove any debris such as leaves, small branches, dirt or rocks that have accumulated.	☐
	Surfacing	Minimize the amount of foot traffic on the roof whenever possible. Place walkway pads at roof entry areas and at rooftop equipment access panels.	☐
	Laps	Inspect the condition of membrane laps, if applicable.	☐
Drainage System	General Condition	Water should flow freely, unobstructed from the roof.	☐
	Gutters, Scuppers, Downspouts, Drains	Remove any debris from inside and the surrounding areas. Make sure strainers and clamping rings are secure.	☐
Perimeter/Flashings	General Condition	Inspect attachment to make sure it remains watertight. All metal work must be caulked and watertight. Only JM metal is covered by the JM Peak Advantage Guarantee.	☐
	Base Flashing	Inspect for adequate fastening at top of the flashing. Check attachment to the substrate. Inspect vertical flashing end laps and horizontal laps at membrane.	☐
	Counterflashing	Ensure that the counterflashing is well secured. Periodically remove and replace caulking to ensure watertight conditions. Only use commercial grade caulk suitable for rooftop application.	☐
Roof Top Units	General Condition	All roof penetrations are prone to leaks. All units should be installed using compatible roof materials and should be properly flashed. Be sure to have a JM approved contractor assist in the installation and flashing of new rooftop equipment.	☐
	HVAC	Check condensation lines for positive drainage and ensure they are flowing freely to roof drains. Condensation lines should rest on wood blocks or rubber supports and never directly on the roof surface. Ensure equipment is in good condition and working properly. Install protection/walkpads around perimeter of any equipment that requires periodic maintenance.	☐
	Equipment Supports: Satellite Dishes, Signs, Antennas, etc.	Properly support all heavy equipment on vertical curbs. All vertical curbs should be properly flashed and covered with a metal cap. Use protection/walkpads below all lightweight horizontal wood equipment supports.	☐
	Lightning Protection	Should not penetrate the roof surface. Ensure there are no overly loose or dangling cables.	☐
	Equipment Flashing	Ensure equipment base flashings are secure, watertight and counterflashed.	☐
Penetrations	General Condition	Do not allow exhaust fats, petroleum or other chemicals or contaminants directly onto the roof. Contact JM if any chemicals or service fluids come into contact with the roofing system.	☐
	Pipes and Vent Penetration Pan, Pitch Pocket	Inspect the lap at membrane and vertical lap. Ensure that the top to the flashing is secured and caulked properly. An enclosure made of sheet metal, rubber or other material used to flash penetrations through a roof system. Often a source of leaks. Must be topped-off annually with compatible sealer.	☐
Expansion Joints	General Condition	A structural separation between two building elements that allows free movement between the elements without damage to the building or roofing system. Check for excessive movement or deterioration. Check all end laps and repair or replace lap splice as necessary. JM Expand-O-Flash expansion joints are covered under the terms of the JM Peak Advantage Guarantee.	☐

PEAKLIFE

Secure your property and your investment through the JM Peak Life program and get the best value for your roof system and guarantee.

Contact us at (800) 922-5922 Option 1 or ownerservices@jm.com to learn more about Peak Life.

RS-7395 10-20 (Replaces 3-19)
CMT-00114

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2323 Texas Parkway
Missouri City, TX 77489
jessica.melchor@fortbendisd.gov
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Location: DocuSign

Signer Events	Signature	Timestamp
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Ryan J. Kiefer ryan.kiefer@fortbendisd.gov Security Level: Email, Account Authentication (None)	DocuSigned by: Ryan J. Kiefer 1F973D1CC91A41D... Signature Adoption: Pre-selected Style Using IP Address: 161.51.250.108	Sent: 11/15/2024 8:29:19 AM Viewed: 11/15/2024 8:49:00 AM Signed: 11/15/2024 8:56:56 AM
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Ashley Dixon ashley.dixon@fortbendisd.gov Security Level: Email, Account Authentication (None)	DocuSigned by: Ashley Dixon 6F7254EFC4E6406... Signature Adoption: Pre-selected Style Using IP Address: 161.51.250.108	Sent: 11/15/2024 8:56:59 AM Viewed: 11/15/2024 9:03:33 AM Signed: 11/15/2024 9:06:53 AM
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Daniel Bankhead daniel.bankhead@fortbendisd.gov Security Level: Email, Account Authentication (None)	Signed by: Daniel Bankhead AABFCACAF7E9453... Signature Adoption: Pre-selected Style Using IP Address: 161.51.250.108	Sent: 11/15/2024 9:06:56 AM Viewed: 11/15/2024 2:53:09 PM Signed: 11/15/2024 2:53:17 PM
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In Person Signer Events	Signature	Timestamp

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Intermediary Delivery Events	Status	Timestamp

Certified Delivery Events	Status	Timestamp

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Jane Thompson cn_jane.thompson@fortbendisd.gov Executive Assistant to Daniel Bankhead Fort Bend ISD Security Level: Email, Account Authentication (None) **Electronic Record and Signature Disclosure:** Not Offered via DocuSign	COPIED	Sent: 11/15/2024 9:06:56 AM
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Antoinette Lewis Antoinette.Lewis1@fortbendisd.gov Security Level: Email, Account Authentication (None) **Electronic Record and Signature Disclosure:** Not Offered via DocuSign	COPIED	Sent: 11/18/2024 7:05:38 AM

Witness Events	Signature	Timestamp

Notary Events	Signature	Timestamp

Envelope Summary Events	Status	Timestamps
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Signing Complete	Security Checked	11/18/2024 7:05:35 AM
Completed	Security Checked	11/18/2024 7:05:38 AM

Payment Events	Status	Timestamps
Electronic Record and Signature Disclosure		

ELECTRONIC RECORD AND SIGNATURE DISCLOSURE

From time to time, Fort Bend Independent School District (we, us or Company) may be required by law to provide to you certain written notices or disclosures. Described below are the terms and conditions for providing to you such notices and disclosures electronically through the DocuSign, Inc. (DocuSign) electronic signing system. Please read the information below carefully and thoroughly, and if you can access this information electronically to your satisfaction and agree to these terms and conditions, please confirm your agreement by clicking the 'I agree' button at the bottom of this document.

Getting paper copies

At any time, you may request from us a paper copy of any record provided or made available electronically to you by us. You will have the ability to download and print documents we send to you through the DocuSign system during and immediately after signing session and, if you elect to create a DocuSign signer account, you may access them for a limited period of time (usually 30 days) after such documents are first sent to you. After such time, if you wish for us to send you paper copies of any such documents from our office to you, you will be charged a $0.00 per-page fee. You may request delivery of such paper copies from us by following the procedure described below.

Withdrawing your consent

If you decide to receive notices and disclosures from us electronically, you may at any time change your mind and tell us that thereafter you want to receive required notices and disclosures only in paper format. How you must inform us of your decision to receive future notices and disclosure in paper format and withdraw your consent to receive notices and disclosures electronically is described below.

Consequences of changing your mind

If you elect to receive required notices and disclosures only in paper format, it will slow the speed at which we can complete certain steps in transactions with you and delivering services to you because we will need first to send the required notices or disclosures to you in paper format, and then wait until we receive back from you your acknowledgment of your receipt of such paper notices or disclosures. To indicate to us that you are changing your mind, you must withdraw your consent using the DocuSign 'Withdraw Consent' form on the signing page of a DocuSign envelope instead of signing it. This will indicate to us that you have withdrawn your consent to receive required notices and disclosures electronically from us and you will no longer be able to use the DocuSign system to receive required notices and consents electronically from us or to sign electronically documents from us.

All notices and disclosures will be sent to you electronically

Unless you tell us otherwise in accordance with the procedures described herein, we will provide electronically to you through the DocuSign system all required notices, disclosures, authorizations, acknowledgements, and other documents that are required to be provided or made available to you during the course of our relationship with you. To reduce the chance of you inadvertently not receiving any notice or disclosure, we prefer to provide all of the required notices and disclosures to you by the same method and to the same address that you have given us. Thus, you can receive all the disclosures and notices electronically or in paper format through the paper mail delivery system. If you do not agree with this process, please let us know as described below. Please also see the paragraph immediately above that describes the consequences of your electing not to receive delivery of the notices and disclosures

electronically from us.

How to contact Fort Bend Independent School District:

You may contact us to let us know of your changes as to how we may contact you electronically, to request paper copies of certain information from us, and to withdraw your prior consent to receive notices and disclosures electronically as follows:

To advise Fort Bend Independent School District of your new e-mail address

To let us know of a change in your e-mail address where we should send notices and disclosures electronically to you, you must send an email message to us at jessica.melchor@jacobs.com and in the body of such request you must state: your previous e-mail address, your new e-mail address. We do not require any other information from you to change your email address..
In addition, you must notify DocuSign, Inc. to arrange for your new email address to be reflected in your DocuSign account by following the process for changing e-mail in the DocuSign system.

To request paper copies from Fort Bend Independent School District

To request delivery from us of paper copies of the notices and disclosures previously provided by us to you electronically, you must send us an e-mail to jessica.melchor@jacobs.com and in the body of such request you must state your e-mail address, full name, US Postal address, and telephone number. We will bill you for any fees at that time, if any.

To withdraw your consent with Fort Bend Independent School District

To inform us that you no longer want to receive future notices and disclosures in electronic format you may:

i. decline to sign a document from within your DocuSign session, and on the subsequent page, select the check-box indicating you wish to withdraw your consent, or you may;
ii. send us an e-mail to jessica.melchor@jacobs.com and in the body of such request you must state your e-mail, full name, US Postal Address, and telephone number. We do not need any other information from you to withdraw consent.. The consequences of your withdrawing consent for online documents will be that transactions may take a longer time to process..

Required hardware and software

Operating Systems:	Windows® 2000, Windows® XP, Windows Vista®; Mac OS® X
Browsers:	Final release versions of Internet Explorer® 6.0 or above (Windows only); Mozilla Firefox 2.0 or above (Windows and Mac); Safari™ 3.0 or above (Mac only)
PDF Reader:	Acrobat® or similar software may be required to view and print PDF files
Screen Resolution:	800 x 600 minimum
Enabled Security Settings:	Allow per session cookies

** These minimum requirements are subject to change. If these requirements change, you will be asked to re-accept the disclosure. Pre-release (e.g. beta) versions of operating systems and browsers are not supported.

Acknowledging your access and consent to receive materials electronically

To confirm to us that you can access this information electronically, which will be similar to

other electronic notices and disclosures that we will provide to you, please verify that you were able to read this electronic disclosure and that you also were able to print on paper or electronically save this page for your future reference and access or that you were able to e-mail this disclosure and consent to an address where you will be able to print on paper or save it for your future reference and access. Further, if you consent to receiving notices and disclosures exclusively in electronic format on the terms and conditions described above, please let us know by clicking the 'I agree' button below.
By checking the 'I agree' box, I confirm that:

- I can access and read this Electronic CONSENT TO ELECTRONIC RECEIPT OF ELECTRONIC RECORD AND SIGNATURE DISCLOSURES document; and

- I can print on paper the disclosure or save or send the disclosure to a place where I can print it, for future reference and access; and

- Until or unless I notify Fort Bend Independent School District as described above, I consent to receive from exclusively through electronic means all notices, disclosures, authorizations, acknowledgements, and other documents that are required to be provided or made available to me by Fort Bend Independent School District during the course of my relationship with you.