

## Addendum One

T. Doug Dale, AIA

Jeffrey R. Barnes, AIA, ASID

Leigh G. Jaunsen, AIA, LEED AP

Russ S. Blount, AIA, LEED AP

Jason M. Agostinelli, AIA

Neil Polen, AIA, LEED GA

In memory of  
Michael A. Barranco, AIA  
1962-2011

### 1. Project Information

IHL#405-004

MSU High Performance Computing Data Center

Date of Addendum One: December 05, 2022

### 2. Notice to Bidders

- a. This Addendum is issued to all plan holders pursuant to the Instruction to Bidders and Conditions of the Contract. This Addendum serves to clarify, revise, and supersede information in the Project Manual, Drawings and previously issued Addenda. Portions of the Addendum affecting the Contract Documents will be incorporated into the Contract by enumeration of the Addendum in the Owner/Contractor Agreement.
- b. The Bidder shall acknowledge receipt of this addendum in the appropriate space on the Bid Form.
- c. The date for receipt of bids is unchanged by this Addendum.

### 3. General

- a. Pre-Bid Meeting Sign-In Sheet and Agenda is attached.

### 4. RFI Question Responses

- a. Please provide details on pipe supports for chill water piping routed overhead.
  - i. *Piping is to be supported from floor or structure above. Refer to specification section 230529 Piping and Equipment Supporting Devices and details on sheet M-500.*
- b. Please provide details on how piping is to be supported within the crawlspace.
  - i. *Pipe is to be supported from floor above. Refer to specification section 230529 Piping and Equipment Supporting Devices and details on sheet M-500.*
- c. Please confirm steel design of the structure accounts for weight of overhead piping
  - i. *Yes*
- d. Please provide details on how underground HVAC piping (18" and 8") is to enter the crawlspace (from the side or underneath grade beam) as well as a detail on how piping is to penetrate the hollow core floor.

- i. *Design intent is for piping to enter crawlspace from below (underneath grade beam). Detail for penetrating Lower Level floor provided on revised sheet M-502.*
- e. Please provide civil profile drawings of underground HVAC piping.
  - i. *No profile of below-grade piping between plant modules and building currently exists. Refer to sheets M-100 and MP-200 as well as specification section 23 2114 Underground (Direct Buried) Piping for underground piping requirements.*
- f. What is TOS elevation for pump/chiller foundation – S-106?
  - i. *Civil shows the highest exterior grade on the south side of the chiller plant at about 305'-5". The 1'-0" clearance from the bottom of Grade beams should be measured from this location.*
- g. S-202, detail 6 and A-301 notes indicate minimum clearance under mechanical piping in crawlspace is 12". Piping in crawlspace will be 26" in diameter, including insulation, and not including supports. How does this affect excavation and mud slab elevation? Also reference mud slab elevation on A-003 of 303'-10".
  - i. *There is no insulation requirement for this piping, the final pipe diameter is 18". Notes have been added to sheet A-003 stating for underground piping to be suspended as close as possible to bottom of structure, this should allow approximately 18" clear from 303' - 10" elevation of the mud slab. The crawlspace door has been shifted to avoid piping and allow clear entry into crawl space.*
- h. Will the inside room temperature be held at a constant temperature? If so what will it be?
  - i. *Temperature in return air plenum above Data Hall is likely to vary based on HPC cabinet air-cooling loads. Anticipated temperature range for return air plenum above Data Hall is 72F - 99F*
- i. Refer to Section 075423, Paragraph 3.3.C.2.h and Paragraph 3.4.A.4- in lieu of adhering the upper layers of roof insulation and the cover board, will it be acceptable to simultaneously attach these boards and the base layer if the specified wind uplift requirement can be met and it is acceptable to the roof manufacturer?
  - i. *No, a fully adhered system is preferred*
- j. Refer to Section 077100, Paragraph 2.3.C- Manufacturer's of prefinished metal view Three-coat fluoropolymer paint finish as a custom color. Three-coat fluoropolymer finish is not a stock item and is made to order. Custom colors have a huge upcharge and a special set-up fee making it much more expensive than the standard Two-coat paint finish. Two-coat fluoropolymer prefinished metal is a stock item and is more readily available. Under Paragraph 2.2.A.1.b -Two-coat fluoropolymer paint finish is specified for the Roof-Edge Fascia. Will the Two-coat paint finish be acceptable for the gutters and downspouts? The manufacturer's paint finish warranty is the same for both.
  - i. *Yes this is acceptable.*

## 5. Project Manual

- a. Issued in this Addendum:
  - i. *Section 00 001 Advertisement for Bid*
  - ii. *Section 00 300 Proposal Form*
    - 1. Revised completion date
    - 2. Added Alternate E2
  - iii. *Section 01 900 Division One Supplement*
    - 1. Revised 1.1 Work Sequence, A., 1.
    - 2. Added Allowance D for locating an existing force main.
    - 3. Added Alternate E2 to 3.1 Description of Alternates
  - iv. *Section 075216 Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing*
    - 1. Spec provided for alternate A1
  - v. *Section 23 6000 Central Cooling Equipment*
    - 1. Added Systecon as acceptable manufacturer for factory fabricated central plan modules.

## 6. Drawing Sheets

- i. *Sheet G-001 Drawing Index*
  - 1. Updated current issued/revision dates for sheets issued/reissued in this Addendum.
- ii. *Sheet – A-003 Crawl Space Plan*
  - 1. Showed crawl space mechanical piping for coordination purposes and shifted over crawlspace access door for a clear entry path into crawlspace.
- iii. *Sheet – A-042- Reflected Ceiling Plan Level 01*
  - 1. Removed Motorized roller Shades from the plan west office suite. Window treatments for these offices will be OFOI. **Motorized Double Roller Shades in the Board room are to remain.**
- iv. *Sheet EL-210 – Lighting Plan – Level 01*
  - 1. Added control switch for motorized shades in Board Room 105
- v. *Sheet EP-210-Power Plan- Level 01*
  - 1. Added motorized shades in Board Room 105.
- vi. *Sheet E-401 Single Line Diagram- Equipment Yard*
  - 1. Revised utility scope of responsibility – electric utility service.
- vii. *Sheet E-504- Electric Details*
  - 1. Added concrete pole base detail.

*viii. Sheet E-609 – Electrical Equipment Schedules – Building Panels*

1. Added circuit for motorized shades to panel BNL3.

*ix. M-502 – Mechanical Details*

1. Added details for piping through floors and walls.

**7. Attachments**

- a. Pre-Bid Meeting Sign-In Sheet
- b. Pre-Bid Meeting Agenda
- c. Section 00 001 Advertisement for Bid
- d. Section 00 300 Proposal Form
- e. Section 01 900 Division One Supplement
- f. Section 075216 Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing
- g. Section 23 6000 Central Cooling Equipment
- h. Sheet G-001 Drawing Index
- i. Sheet – A-003 Crawl Space Plan
- j. Sheet – A-042- Reflected Ceiling Plan Level 01
- k. Sheet EL-210 – Lighting Plan – Level 01
- l. Sheet EP-210-Power Plan- Level 01
- m. Sheet E-401 Single Line Diagram- Equipment Yard
- n. Sheet E-504- Electric Details
- o. Sheet E-609 – Electrical Equipment Schedules – Building Panels
- p. Sheet M-502 – Mechanical Details

**End of Addendum One**



6. Insurance

6. Construction Documents

- a. Use of Site
  - i. Use of Site illustrated in drawings on sheet G-011
- b. Work Restrictions
  - i. Refer to 01 900 Division One Supplement in the Project Manual
- c. Unit prices, alternates, & allowances
  - i. Unit prices: There are 3 unit prices included in the bid package
  - ii. Alternates: There are 7 alternates included in the bid package
  - iii. Allowances: There are 3 allowances included in the bid package
- d. Substitutions following award
  - i. Substitutions will be considered within 30 days of the contract award
  - ii. Burden of proof of "equal" will be on the Contractor or Vendor

7. Schedule

- a. Project Schedule
  - i. Section 01 310 in Project Manual
- b. Completion Date(s)
  - i. 16 months from issuance of NTP, no later than May 18, 2024
- c. Liquidated Damages
  - i. \$500 per day

8. Post-Meeting Addendum

- a. May be issued, as necessary to document the meeting questions & provide proper responses

9. Other Bidder Questions

- a. Architect will record and distribute meeting minutes to attendees and others known by the Architect's office to have received a complete set of Procurement and Contracting Documents
- b. Minutes of meeting are issued as Available Information and do not constitute a modification to the Procurement and Contracting Documents
- c. Modifications to the Procurement and Contracting Documents are issued by written Addendum only

10. Site visit

End



# MISSISSIPPI STATE UNIVERSITY™

## OFFICE OF PLANNING DESIGN & CONSTRUCTION ADMINISTRATION

#405-004 High Performance Computing Data Center  
Pre-Bid Meeting  
November 30, 2022  
Sign in Sheet

Name	Company	Email	Phone
Jason Agostinelli	Dale Partners	jasonagostinelli@dalepartners.com	662-822-6730
Bob Phillips	Burns Dirt Const.	NIC@burnsdirt.com	662-549-6070
Scott Upchurch	Upchurch Plumbing	scott@upchurchplumbing.com	662-453-6860
Mike Lum	West Brothers	estimating@westbrothersconstruction.com	662-328-2438
Chad Davidson	Webster Electric	chadd@webster-electric.com	601-626-0200
Brad Bellman	Wharfn Smith	estimating@wharfnsmith.com	728-784-2068
BRANDON JOHNSTON	ALLIANT Construction	bjohnston@alliantconstruction.com	601-933-3015
Nick Dodd	MSU PDCA	Nad13@msstate.edu	662-325-1898
Will Commarato	Dale Partners	Will.Commarato@dalepartners.com	601-988-7016
JIMMY FOSTER	MSU- PDCA	jf247@msstate.edu	601-316-5033
JD Hardy	MSU- PDCA	jdh2@msstate.edu	662-325-5859
Zach Smith	Burns Dirt Const.	zss144@msstate.edu	601-908-4838
John McMahon	MAC'S CONSTRUCTION	John@macsconstruction.com	601.264.8648
Chris Mansura	ANDERCORP	CHRIS.MANSURA@ANDERCORP.COM	601-201-5218
Hunter Lipscomb	Andor Corp	Hunter.Lipscomb@andorcorp.com	662 822 1730
DANIEL TAYLOR	ANDERCORP	DANIEL.TAYLOR@ANDERCORP.COM	601 724 9005

[illegible]

## Agenda

T. Doug Dale, AIA

Jeffrey R. Barnes, AIA, ASID

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Russ S. Blount, AIA, LEED AP

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Neil Polen, AIA, LEED GA

In memory of  
Michael A. Barranco, AIA  
1962-2011

28 November 2022

IHL# 405-004 MSU High Performance Computing Data Center / Pre-Bid Meeting

### 1. General

- a. Please silence cell phones
- b. Sign-in sheet: Minutes will include list of meeting attendees
- c. Plan holders list: Minutes will include list of plan holders
- d. Description: The scope of work for the MSU High Performance Computing Data Center includes new construction of an approximately 35,000 SF 2-story facility for housing super computers as well as office space and a conference room.

### 2. Team

- a. Owner .....Mississippi State University HPCC / Trey Breckenridge
- b. Owner ..... Mississippi State University PDCA / Ches Fedric
- c. Architect of Record ..... Dale Partners Architects / Jackson, MS / Jason Agostinelli
- d. Design Architect ..... Gensler / Baltimore, MD / Shawn Reichart
- e. Civil ..... Smithers Engineers + Consultants / Flowood, MS / Will Dendinger
- f. Landscape Architect ..... Kimley Horn / Memphis, TN / Henry Minor
- g. Structural .....Structural Design Group / Nashville, TN / Will Grigg
- h. MEP ..... Affiliated Engineers Inc. / Chapel Hill, NC / Bart Hogge

### 3. Procurement and Contracting Requirements

- a. Advertisement for Bids
  - i. Advertisement dates: 11.16.22 & 11.23.22
  - ii. Bid Receipt: Bids to be opened at 2:00 PM on Monday, December 19, 2022
  - iii. Bid Location: Office of Procurement and Contracts, Mississippi State University / P.o. Box 5307, 610 McArthur Hall, Barr Avenue, Mississippi State, MS 39762
- b. Bidder Qualifications
  - i. Bidders must be properly licensed under the laws governing their respective trades
  - ii. List all applicable state & local license & registration nos. on outside of bid envelope

DALE PARTNERS ARCHITECTS, P.A.

Architecture • Interiors • Planning

One Jackson Place, Suite 250  
188 East Capitol Street  
Jackson, MS 39201-2100

P 601.352.5411 • f 601.352.5362

161 Lameuse Street, Suite 201  
Biloxi, MS 39530

P 228.374.1409 • f 228.374.1414

dalepartners.com

- c. Bonding & Insurance
    - i. Bidders must be able to obtain insurance and bonds required for the Work
  - d. Bid Security
    - i. A Bid Security in the amount of 5% of the total maximum bid amount is required
    - ii. Certified check made out to MSU, or bid bond
  - e. Bid Form and Attachments
    - i. Acknowledgement of Addenda
    - ii. Subcontractor identification
  - f. Bid Submittal Requirements
    - i. Envelope requirements (re: Bid Submittal Checklist)
    - ii. Proper identification
  - g. Notice of Award
    - i. Offered within 30 days after receipt of bids
    - ii. Award will be made as soon as possible & successful bidder should be ready to secure bonds & insurance immediately
4. Communication during Bidding Period
- a. Obtaining documents
    - i. Plan holders are required to register and order bid documents at [plans.fm.msstate.edu](http://plans.fm.msstate.edu)
  - b. Bidder's Requests for Information
    - i. Binding answers to questions must be included in an official written addendum and the Contractor or Subcontractor is encouraged to provide written communications to the Architect for proper response
    - ii. Address e-mailed written correspondence to [biddinginfo@dalepartners.com](mailto:biddinginfo@dalepartners.com)
    - iii. No questions will be accepted after 5:00 PM on Tuesday, December 13, 2022 in order to allow the Architect adequate time to prepare any necessary addenda
  - c. Addenda
    - i. Addendum no 1 .....12.05.22
    - ii. Addendum no 2 (tentative) .....12.12.22
    - iii. Addendum no 3 (if required) .....≤ 2:00 PM, 12.15.22
5. Contracting Requirements
- a. The Supplementary Conditions
    - i. Refer to this section for specific comments & directives
      - 1. Change order markups
      - 2. Weather delays
      - 3. Retainage
      - 4. Stored material
      - 5. Liquidated damages

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End

**MISSISSIPPI STATE UNIVERSITY**  
**Office of Planning Design and Construction Administration**

**SECTION 00 000 – Advertisement for Bids**

Bidders shall submit their bids either in a sealed envelope or electronically. Sealed bids will be received at the **Office of Procurement and Contracts, Mississippi State University**, P. O. Box 5307, 610 McArthur Hall, Barr Avenue, Mississippi State, Mississippi 39762. Electronic Bids will be received at **plans.fm.msstate.edu** and shall include a copy of their Certificate of Responsibility as an attachment to the electronic bid. Sealed bids and electronic bids will be received until 2:00 p. m. on 19 December 2022.

Project #: IHL#405-004 Bid File #: 22-149  
Project Title: High Performance Computing Data Center  
Location: MISSISSIPPI STATE UNIVERSITY

at which time they will be publicly opened and read. Contract Documents may be obtained from:

Office of Procurement and Contracts  
Mississippi State University  
610 McArthur Hall, Barr Avenue  
Mississippi State, MS 39762

Phone: (662) 325-2553

Bid documents are being made available via original paper copy or PDF. Plan holders are required to register and order bid documents at **plans.fm.msstate.edu**. Questions can be directed by email to [biddinginfo@dalepartners.com](mailto:biddinginfo@dalepartners.com)

A pre-bid meeting is scheduled for 1:00pm Wednesday, November 30th, 2022, in the Gast Building conference room, 103 Robert Louis Jones Cir, Starkville, MS 39759.

Bid preparation will be in accordance with *Instructions to Bidders* bound in the Project Manual. Mississippi State University reserves the right to waive irregularities and to reject any or all bids.  
**NOTE: Telephones and desks will not be available for bidders use at the bid site.**

By: Donald Buffum, Director of Procurement and Contracts

Dates of Publication:

November 16, 2022

November 23, 2022

\*\*\* End of Section \*\*\*



## PROPOSAL FORM

### SECTION 00 300

To: Mississippi State University  
Mr. Donald Buffum  
Office of Procurement and Contracts  
P. O. Box 5307  
Barr Avenue, 610 McArthur Hall  
Mississippi State, Mississippi 39762

Re: Project #: IHL#205-310  
Project Title: MSU High Performance Computing Data Center  
Location: Starkville, Mississippi

I propose to complete all work in accordance with the Project Manual, Drawings and Addenda within **16 months of the issuance of the Notice to Proceed** for the sum of:

**BASE BID:**

\_\_\_\_\_ Dollars (\$\_\_\_\_\_)

**ALTERNATES:**

**Alternate C1 ( ) Adds ( ) Deducts**

\_\_\_\_\_ Dollars (\$\_\_\_\_\_)

C1 Description: Steel slag in lieu of #610 crushed limestone in the mechanical yard

**Alternate C2 ( ) Adds ( ) Deducts**

\_\_\_\_\_ Dollars (\$\_\_\_\_\_)

C2 Description: Concrete paving in lieu of asphalt

**Alternate L1 ( ) Adds ( ) Deducts**

\_\_\_\_\_ Dollars (\$\_\_\_\_\_)

L1 Description: Include landscape plantings and irrigation

**Alternate A1 ( ) Adds ( ) Deducts**

\_\_\_\_\_ Dollars (\$\_\_\_\_\_)

A1 Description: Change Roofing system to a modified bitumen roofing system

**Alternate A2 ( ) Adds ( ) Deducts**

\_\_\_\_\_ Dollars (\$\_\_\_\_\_)

A2 Description: Include interior fit out of Office Space



**Alternate M1 ( ) Adds ( ) Deducts**

\_\_\_\_\_ Dollars (\$\_\_\_\_\_)

M1 Description: Install Second Chiller Module

**Alternate E1 ( ) Adds ( ) Deducts**

\_\_\_\_\_ Dollars (\$\_\_\_\_\_)

E1 Description: Install UPS system

**Alternate E2 ( ) Adds ( ) Deducts**

\_\_\_\_\_ Dollars (\$\_\_\_\_\_)

E2 Description: Generator Clean Fuel Management System (Fuel Polish System)

**UNIT PRICES:**

**1. Earthwork – Additional Excavation and Backfill**

**ADD:** \_\_\_\_\_ Dollars (\$\_\_\_\_\_) per CY

Description For areas in addition to those required by the contract documents: undercut and removal of existing unsatisfactory fill materials and spoil off site, and material backfill with satisfactory imported fill materials per the project specifications (measured as compacted in place volume).

**2. Drilled Piers – Additional Excavation**

**ADD:** \_\_\_\_\_ Dollars (\$\_\_\_\_\_) per linear  
foot for earth excavation of each size drilled pier.

**3. Drilled Piers – Additional Concrete**

**ADD:** \_\_\_\_\_ Dollars (\$\_\_\_\_\_) per linear  
foot of concrete, in place, including reinforcement, and temporary casing for each size drilled pier.

**ADDENDA ACKNOWLEDGMENT:**

No. \_\_\_\_ Date \_\_\_\_\_ No. \_\_\_\_ Date \_\_\_\_\_ No. \_\_\_\_ Date \_\_\_\_\_

No. \_\_\_\_ Date \_\_\_\_\_ No. \_\_\_\_ Date \_\_\_\_\_ No. \_\_\_\_ Date \_\_\_\_\_

**ACCEPTANCE:**

I certify that I am authorized to enter into a binding contract, if this Proposal is accepted.

Signature \_\_\_\_\_ Date \_\_\_\_\_

Name and Title \_\_\_\_\_

Name of Business \_\_\_\_\_

**(Complete spelling - exact as recorded at the Contractor's Board)**

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

City/State/Zip Code \_\_\_\_\_

Bidder's Certificate of Responsibility Numbers(s): \_\_\_\_\_

Attach copy of Non-Resident Bidder's Preference Law (5.04 of Bidder's Checklist)

List any Mechanical/Plumbing and/or Electrical Subcontractors that will perform work of this contract. COR must be included where a subcontract exceeds \$50,000.00. If no sub-contractor is listed, and such work is within scope of contract, bidders own COR classification(s) must be sufficient to self-perform any such work. If no sub-contractor is listed, then use of subcontractor to perform such scope will not be permitted. This is in accordance with 5.05 and 5.06 of the Bidder's Checklist See section 00 100 Instruction to Bidders.

Mechanical Contractor: \_\_\_\_\_

Certificate of Responsibility No. \_\_\_\_\_

Plumbing Contractor: \_\_\_\_\_

Certificate of Responsibility No. \_\_\_\_\_

Electrical Contractor: \_\_\_\_\_

Certificate of Responsibility No. \_\_\_\_\_

**\*\*\* End of Section \*\*\***

## SECTION 01 900 – DIVISION ONE SUPPLEMENT

### PART 1 - SUMMARY OF WORK SUPPLEMENT

#### 1.1 WORK SEQUENCE

- A. The Contractor must be complete with all work in accordance with the Project Manual and Drawings on or before **16 months** from the Notice To Proceed.
- 1. Owner intends to issue a letter of intent to award (LOI) for the project within 7 days of bid receipt assuming the project is within the Owner's budget. This LOI allows the Contractor to begin the submittal process with the Design Professional if the Contractor desires with the caveat that contract execution is pending approval by IHL Staff. Since time is of the essence, Contractor is to identify long lead time materials and equipment that affect the critical path and submit applicable items within 21 days of contract execution. A Notice to Proceed with Construction can then be issued on a mutually agreed upon date after submittals are approved,

#### 1. PROJECT MILESTONES

- A. The Contractor shall generate and incorporate the following milestones into the Contractor's overall baseline project schedule.
  - i. Lower level drilled piers complete
  - ii. Lower level grade & cross beams complete
  - iii. Equipment room level steel floor framing & slab complete
  - iv. Level 01 Crawl Space drilled piers complete
  - v. Level 01 grade & cross beams complete
  - vi. Level 01 steel floor framing & slab complete
  - vii. Level 02 steel roof framing & decking complete
  - viii. Mechanical yard structure complete and ready for mechanical units
  - ix. Building dry-in
  - x. Exterior enveloped / façade complete
  - xi. Conditioned Air
- B. If the Contractor fails to meet any milestone date, then a Recovery Plan must be submitted for approval within 10 days of the missed milestone date. Recovery Plan must include outline of schedule to expedite the project to achieve the remaining milestone dates.
- C. Milestone dates and a milestone summary sheet must be included in project schedule that is submitted with each Application for Payment. If a milestone date is missed during the payment period then an approved Recovery Plan must be included to process payment.

#### 2. WORK BY OWNER

- A. Concurrent Work by Owner
  - i. Concurrent work by Owner includes but is not limited to the following:
    - 1. Tele/Data work by MSU ITS.
    - 2. Furniture, Fixtures & Equipment.

3. AT&T
4. Wi-Fi systems

### 3. PROJECT COORDINATION

- A. General Contractor Staff: Contractor shall provide the following minimum staff for the project, and shall provide any additional staff as necessary during the course of the Work:
  - i. Offsite:
    1. Senior Project Manager
    2. Scheduler
      - a. This individual shall be responsible for ensuring that the project schedule is maintained and updated in a timely manner in accordance with contract document requirements.
  - ii. Onsite and dedicated to the project:
    1. Project Superintendent
    2. Project Manager
    3. Assistant Superintendent
    4. MEP coordinator
      - a. This individual shall be on-site once rough-ins begin through substantial completion.
  - iii. Other Staff / Consultants
    1. Quality Control Manager – visit site as needed.
    2. Safety Manager – visit site as needed.
  - iv. Contractor's supervision and management personnel are subject to approval by the Owner. Within ten (10) days of the notice to proceed, the contractor shall submit the proposed staff resumes to the Architect and Owner for review and approval.
- B. Survey Verification of Existing Conditions: The Contractor shall be responsible for field dimensioning the existing conditions of the project site and the building, especially as it relates to connection/tie-in locations. The contractor shall employ or assign a qualified surveyor to perform survey of existing structure that is in contact with new structure within 45 days of Notice to Proceed. General Contractor shall report findings to the Architect within 1 week of survey. This will require the Contractor to field verify the existing structure prior to shop drawing completion and submission to ensure that the work under this scope will be coordinated with the existing structure and systems. Notify the design team immediately of any variances from the project documents as it relates to the existing facility.
- C. Material Tracking: The General Contractor shall submit a Material Tracking Log to the Architect & Owner for review and approval per the log at the end of this section within thirty (30) days of Notice to Proceed. Each item will be provided an ID number that matches the specification number. The Required on Site Date provided must coincide with the project schedule. The submittal due date must be coordinated with submittal log. The Lead Time for each item must be provided and verified by the supplier or vendor in writing via email or letter. This log must be updated and

submitted to the design team and owner's representative each week during the weekly coordination meetings.

- i. If material procurement is delayed due to late submission of acceptable submittals then the General Contractor shall make arrangements to expedite the material to ensure that the material arrives on time per the material status log.
  - ii. If a submittal submission is submitted late per the log then the General Contractor shall provide a plan of action to expedite the material procurement of provide documentation from the supplier that the material will arrive on time per the material status log. The plan of action shall be submitted within one week of the later submission.
- D. Submittal Software: General Contractor shall utilize Plan Grid, or an approved equal, web-based data sharing for submitting, processing and tracking contract documents. The General Contractor shall pay for the Plan Grid Exchange service and provide access and account usage to design team and owner.
- E. Deficiency Log - The General Contractor shall maintain a log of deficiencies noted by the design team or owner's representative. The log shall be per the attached form. The log shall track the items from the date they were noted to the date they were completed. The log shall include a picture of the corrected item after correction to document the completion of each item. The General Contractor shall maintain this log and update project team weekly of the status. The deficiencies log shall be submitted with the monthly pay application. The estimated value of repairing any item that is over thirty (30) days old shall be deducted from the progress payment. This shall be on a spreadsheet format and saved on a shared folder with design team and owner.
- F. Concrete Pour Log - The General Contractor shall maintain a concrete pour log that tracks the date of each pour, location of concrete pour, yardage installed, concrete breaks with a column for each break (7-day, 28-day, 56 day). The General Contractor will update and provide to design and owner weekly.
- G. Daily Reports – The Contractor's Superintendent will prepare a report daily which includes as a minimum the Contractor's force on site by craft and skill level and their efforts of the day, supervision, material deliveries, problems encountered, inspections and their results, milestone achieved, significant items of work accomplished or attempted, delays or disruptions that occur, visitors and special instructions which effect their work. Reports shall be uploaded to Submittal Exchange on a weekly basis.
- H. Site Logistics Plan – thirty days before beginning each phase the Contractor shall submit a Site Logistics Plan for review. At a minimum the plan shall include construction entrances, specific material lay down areas, temporary toilet facilities, access roads and hoisting plans.
- I. Quality Control - General Contractor shall enact and enforce quality control procedures by its own personnel or other third party to ensure compliance with the Contract Documents and the quality of work acceptable to the Architect and Owner. The General Contractor shall submit a quality control plan to the owner's representative within thirty (30) days of Notice to proceed. The following are specific quality control measures that will be required to be included in the Quality Control Plan. These are not mandatory methods but are for purposes of intent of the level

of quality control that is to be implemented by the General Contractor. The evidence of the inspections by inspection forms, marking the areas of work inspected and documenting with pictures as mentioned below is required in some manner in order for the owner to have assurance that the inspections are taking place. Each inspection form and associated picture shall be submitted as one file both electronically via Submittal Exchange and hard copy to be provided to the owner representative on a weekly basis for all inspections performed the previous week.

i. Site Utilities:

1. Existing: Contractor shall verify that any existing conduits be videoed prior to tie-in to ensure that the conduits and pipe are not damaged or clogged. Provide video and report to design team prior to commencing work.
2. New: Prior to Substantial Completion new site utilities and existing utilities that connect to new shall be videoed to ensure pipes are not damaged or clogged. Provide video and report to design team prior to requesting Substantial Completion.
3. The Contractor shall provide an opportunity to have all site utilities inspected by the Owner's utility departments prior to covering up work.
4. A steel mandrel of appropriate size shall be pulled through all primary conduits and communication conduits that are 3" and larger.

ii. Structure

1. Implement a plan to inspect each concrete pour and document rough-in prior to installing concrete.
2. Implement a plan to inspect each structural steel, metal decking, etc element of the project.
3. Implement a plan to inspect each CMU wall element of the project.
4. Implement a plan to inspect each precast element of the project.

iii. Exterior Envelope

1. First work approvals – At the start of each of the exterior sheathing/vapor barrier, masonry, window, storefront, roofing and metal panel scope of works the General Contractor shall install a portion of the work for the design team and owner's representative to review. The General Contractor shall not proceed with the installation of work until the design team has issued a "First Work Verification Form".
2. Testing – The following test shall be performed after the issuance of the "First Work Verification Form". These are in addition to the testing required in each specification section of the project manual.
  - a. Windows – perform water leak test per AAMA 501.2.-03 on 5% of the windows on each building. If any water leak test fails then corrections shall be made to that opening and a re-test shall be performed on that window opening and an adjacent window opening. General Contractor shall perform water leak / air infiltration test on mock-up wall.
  - b. Sub-Roof System – water test sub-roofs
  - c. Traffic Coating – manufacturer inspection of installation
3. Photographic Documentation – Document the installation of the following items with a photograph that is saved electronically by the location of the installation. The General Contractor shall be responsible for taking, filing, and submitting the photos to the design team. The Design Team

and Owner's representative shall approve the identification method for submitting these.

- a. Exterior Sheathing / Vapor Barrier – Exterior sheathing after joints have been treated, every 500 sq ft. Window flashing prior to and after window installation, every window. Vapor Barrier every 500 sq ft.
  - b. Masonry – Through-wall flashing at bottom of wall, relief angles, and window/door lintels. Take photos of every lintel and of every 50 linear feet of through-wall flashing at bottom of wall and relief angles. The masonry subcontractor shall perform their own quality control inspection with an approved inspection form and pictures of the work prior to cover up. The Contractor shall perform a similar inspection after the Masonry sub is complete with their inspection.
4. Precast Architectural Concrete
- a. The General Contractor, Erector and Fabricator shall work together to as-built the supporting structures and coordinate fabrication to identify any conflicts. This shall be performed as the concrete and steel are installed. Any modifications shall be performed at the plant prior to shipping. All modifications must be reviewed by the architect and engineer of record.
  - b. Plant quality control check – Prior to shipping material the fabricator must check panels for quality, includes but not limited to dimensions, embeds, finish, shape, etc. This must be performed on each piece with an approved inspection form and associated pictures. This documentation must be submitted to owner on a weekly basis. The Contractor shall perform a minimum of four (4) plant visits to review the quality control process.
  - c. Job site material quality control check - Prior to unloading material the General Contractor must check materials for quality, includes but not limited to dimensions, embeds, finish, shape, etc. This must be performed on each piece with an approved inspection form and associated pictures. This documentation must be submitted to owner on a weekly basis.
  - d. The erector and Contractor shall perform quality control inspections of each section after installation and prior to joint sealants being applied. This must be performed on each piece with an approved inspection form and associated pictures. This documentation must be submitted to owner on a weekly basis.
- iv. In-wall Inspections - Upon completion of the in-wall rough-in for each phase of the project each subcontractor shall appoint a competent quality control supervisor to inspect all work for layout, completion, neatness, and specifications. After making any corrections necessary and verifying that work is complete the supervisor will mark both sides of each stud in the phase to indicate that the area is complete and ready for the General Contractor's inspection. Each trade will be assigned the following colors to paint the studs:
1. Mechanical Contractor – Green
  2. Electrical Contractor – Blue

3. Drywall Contractor – Orange
4. General Contractor – Red

After each trade has inspected their own work and marked the studs accordingly the General Contractor will inspect each room in the phase. The General Contractor will notify the quality control supervisor of each Subcontractor deficiencies that need to be corrected. After the deficiencies have been corrected the General Contractor shall complete an in-wall inspection form and take pictures of each wall of the room. The inspection form and the pictures will be uploaded onto Submittal Exchange for file.

- v. Above Ceiling Inspections – The General Contractor shall implement a similar process to the inwall inspections above.
- vi. Building Systems Inspections – The General Contractor shall provide a plan for checking the following systems to verify that they are installed correctly and operated correctly.
  1. Fire Alarm System
  2. Building Control System
  3. Sprinkler System
  4. Life Safety System
  5. Emergency Generator
  6. Temp air filter maintenance during construction
  7. Duct dust control
  8. Plumbing System
  9. Interior Finishes – Provide a plan to verify substrates are acceptable to install finishes, protect finishes after installing, etc.

#### 4. PROGRESS SCHEDULE SUPPLEMENT

- A. Contractor to employ professional scheduler to manage the project schedule. Another project staff member cannot be the scheduler.
- B. Contractor to utilize Primavera P6 software. Contractor to make P6 electronic file available to the Owner & Architect upon request.
- C. The Contractor shall provide additional activities and logic as needed as the project progresses and as requested by the Owner or Architect to provide an accurate schedule.

#### 5. TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

- A. The Contractor shall maintain construction fence and security at all times. If any portion of the project site fence is damaged the contractor must repair and restore the fence within 24 hours. The Contractor must also keep all gates secured at all times. The Contractor will designate one person to be responsible for locking the project gates at the close of work each day.
- B. The Contractor shall maintain erosion control measures at all times during the project. Contractor must comply to the requirements of the Erosion Control Plan and MDEQ approved Storm Water Pollution Prevention Plan.

#### 6. PROJECT MEETINGS

- A. Contractor shall have adequate A/V system in construction trailer to conduct coordination meetings virtually.



- B. Weekly OAC Coordination Meetings: Contractor to lead meetings as scheduled by owner and design professionals. Project Superintendent and Project Manager shall attend and participate in weekly coordination meetings with owner and design team and prepare the following agenda and information each meeting. The meeting will be held at location selected by owner's representative.
  - 1. Updated schedule with phasing plans and flow of work pdfs.
  - 2. Rain days since previous meeting.
  - 3. Open RFIs needing answer – identify critical RFIs.
  - 4. Open Submittals needing review – identify critical submittals.
  - 5. Updated Project Schedule.
  - 6. Deficiency log with status of items noted
  - 7. Material status log with updated delivery dates
- 7. SURVEY VERIFICATION OF EXISTING CONDITIONS
  - A. The Contractor shall be responsible for field dimensioning the existing conditions of the project site and the building, especially as it relates to connection/tie in locations. Notify the design team immediately of any variances from the project documents.

## PART 2 - ALLOWANCE SUPPLEMENT

### 2.1 SCHEDULE OF ALLOWANCES

- A. Include in the Bid, for inclusion in the Contract Sum, the amount (lump sum) of **\$350,000.00** (*Three Hundred and Fifty Thousand Dollars*) to procure the DDC Building Controls System for this project. The DDC Building Controls System is described in Specification Section 230980 "Controls and Instrumentation and Control for HVAC" illustrated on Division 23 drawings. This allowance is to be carried by the MECHANICAL contractor.
- B. Include in the Bid, for inclusion in the Contract Sum, the amount (lump sum) of **\$150,000.00** (*One Hundred and Fifty Thousand Dollars*) to procure all of the roofing insulation (material only) identified in Section 075423 Thermoplastic-Polyolefin (TPO) that is required to complete the roofing Work of Phase One. All work associated with the installation of the roofing material is to be included in the Contract Sum. This allowance is to be carried by the ROOFING contractor.
- C. Include in the Bid, for inclusion in the Contract Sum, the amount (lump sum) of **\$100,000.00** (*One Hundred Thousand Dollars*) to be used as a contingency allowance at the discretion of the Owner to expedite repairs of unknown conditions that affect critical path.
- D. Include in the Bid, for inclusion in the Contract Sum, the amount (lump sum) of **\$25,000.00** (*Twenty-Five Thousand Dollars*) to locate an existing abandoned 20" metal pipe force main crossing the site and remove it in all areas where piping is 6' and shallower from existing grade. In areas deeper than 6' the contractor shall abandon in place where crossing the site by exposing both ends and filling with excavatable flowable fill in accordance with the project specifications.

## PART 3 - ALTERNATE SUPPLEMENT

### 3.1 DESCRIPTION OF ALTERNATES

- A. Alternate C1: Steel slag in lieu of #610 crushed limestone for crushed stone pavement in the mechanical yard area.
  - 1. All Work associated with installing steel slag in lieu of crushed limestone is to be included as part of this Alternate.
- B. Alternate C2: Concrete in lieu of asphalt.
  - 1. All Work associated with the installation of concrete paving in lieu of asphalt for the front entrance drive and parking lot is to be included as part of this Alternate.
- C. Alternate L1: Include landscape plantings and irrigation.
  - 1. All Work associated with the installation of the landscape plantings, including the plant material, and the installation of the irrigation system, including the purchase of materials, are to be included as part of this Alternate. Irrigation sleeves are to remain part of the Base Bid. Areas shown to receive landscape planting in the Drawings will not be required to have a different material as part of the Base Bid as the Owner will address these areas under a separate Contract if this Alternate is not taken.
- D. Alternate A1: Change Roofing system to a modified bitumen roofing system.
  - 1. All Work associated with the installation of a modified bitumen roof system, including the purchase of the materials, wood blocking, expansion joint cover, etc, are to be included as part of this Alternate. The roof insulation will remain part of an Allowance under this Alternate.
- E. Alternate A2: Include interior fit out of Office space.
  - 1. All Work associated with the installation of interior finishes such as floor coverings, base, wall finishes, and ceilings as well as millwork and interior demising partitions and doors for Rooms 113, 114, 115, 116, 117, 118, 119, and 120.
- F. Alternate M1: Install Second Chiller Module
  - 1. All Work associated with the installation of the second chiller module for N+1 redundancy for cooling for the first 5MW of load, including the purchase of equipment and materials and electrical provisions, are to be included as part of this Alternate.
- G. Alternate E1: Install UPS system
  - 1. All Work associated with the installation of the second UPS system for 2N redundancy for the critical power including the purchase of materials, are to be included as part of this Alternate.
- H. Alternate E2: Generator Clean Fuel Management System (Fuel Polish System)
  - 1. All Work associated with the provision of a clean fuel management system for the emergency generator, as described in Specification 263213, are to be included as part of this Alternate.

## PART 4 - UNIT PRICES

### 4.1 SCHEDULE OF UNIT PRICES

- A. Unit-Price No. 1: Earthwork- Additional Excavation and Backfill – For areas in addition to those required by the contract documents: undercut and removal of existing unsatisfactory fill materials and spoil off site, and material backfill with satisfactory imported fill materials per the project specifications (measured as compacted in place volume).
- B. Unit-Price No. 2: Drilled Piers- Additional Excavation – For areas in addition to those required by the contract documents: Earth excavation per linear foot of each size drilled pier.
- C. Unit-Price No. 3: Drilled Piers- Additional Concrete – For areas in addition to those required by the contract documents: Concrete, in place, including reinforcement, and temporary casing per linear foot for each size drilled pier.
- D. The unit prices stated above and as listed on 00 300 Proposal Form will apply to authorized changes in quantities of items added or deducted from the Work. These unit prices shall remain fixed throughout the length of the contract from the date of the signatures of the contract between the Owner and the Contractor. During this period, the Owner shall have the option to execute change orders to the Contract for Construction for any or all of the items listed below in the quantities selected and at the unit prices so stated.

## PART 5 - ADVERSE WEATHER DELAYS

### 5.1 ADVERSE WEATHER DELAYS

#### A. Definition of Adverse Weather:

- 1. Adverse Weather is defined as the occurrence of one or more of the following conditions within a twenty-four (24) hour day that prevents construction activity exposed to weather conditions or access to the site:
  - a. Precipitation (rain, snow, or ice) in excess of one-tenth inch (0.10”) liquid measure;
  - b. Temperatures that do not rise above that required for the day’s construction activity, if such temperature requirement is specified or accepted as standard industry practice.
- 2. Adverse Weather may include, if appropriate, “dry-out” or “mud” days:
  - a. Resulting from precipitation days that occur beyond the standard baseline;
  - b. Only if there is a hindrance to site access or sitework and Contractor has taken all reasonable accommodations to avoid such hindrance; and,
  - c. At a rate no greater than one (1) make-up day for each day or consecutive days of precipitation beyond the standard baseline that total one (1) inch or more, liquid measure, unless specifically recommended otherwise by the Engineer.
- 3. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the contractor’s scheduled workday and, only if, critical path construction activities were included in the day’s schedule, including a weekend day or holiday if Contractor has scheduled construction activity that day.

4. Contractor shall take into account that certain construction activities are more affected by adverse weather and seasonal conditions than other activities, and that “dry-out” or “mud” days are not eligible to be counted as a Weather Delay Day until the standard baseline is exceeded. Hence, Contractor should allow for an appropriate number of additional days associated with the Standard Baseline days in which such applicable.

B. Extensions of Contract Time:

1. An extension of time on the basis of weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard Baseline for that month.

C. Standard Baseline for Average Climatic Range

1. The Engineer has reviewed weather data available from the National Oceanic and Atmospheric Administration (NOAA) and determined a Standard Baseline of average climatic range for the project location.
2. Standard Baseline is defined as the normal number of calendar days for each month during which construction activity exposed to weather conditions is expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.
3. Standard Baseline is as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
8	7	8	7	7	8	7	6	6	5	6	7

D. Documentation and Submittals

1. The Contractor must submit each month with his Application for Payment, a separate letter stating that he is or is not requesting an extension of time for that period of time when Applications for Payment are considered. No payment on a monthly Application for Payment will be approved until the letter is received. Any adverse weather days that occur after the schedule date of substantial completion will not be considered and will not qualify for an adjustment to the contract time. Once the contract time has concluded, additional time will not be considered due to adverse weather.
2. Supporting Data shall run concurrently with the Application for Payment and shall consist of the following:
  - a. Submit a daily log reporting form for approval prior to the first Application for Payment containing:
    - 1). Record of adverse conditions that hindered work.
    - 2). Time of day work activities were stopped.
    - 3). Temperature.
    - 4). Work in progress.
    - 5). Number of hours work was stopped for each workday.
    - 6). Trades on the job and number of workmen for each trade.
    - 7). Record weather conditions each calendar day of each month, adverse or not.

3. Submit actual weather data to support claim for time extension obtained from nearest NOAA weather station or other independently verified source approved by Designer at beginning of project.
4. Use Standard Baseline data provided in this Section when documenting actual delays due to weather in excess of the average climatic range.

**\*\*\* End of Section \*\*\***

## SECTION 075216 - STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section Includes:

1. Styrene-butadiene-styrene (SBS)-modified bituminous membrane roof system.
2. Roofing membrane sheet materials.
3. Base sheet materials.
4. Styrene-butadiene-styrene (SBS)-modified bituminous cap sheet.
5. Base flashing sheet materials.
6. Asphalt materials.
7. Roof insulation.
8. Insulation accessories and cover board.
9. Walkways.

## 1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site .

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work, including the following:
1. Layout and thickness of insulation.
  2. Base flashings and membrane terminations.
  3. Flashing details at penetrations.
  4. Tapered insulation, including slopes.
  5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
  6. Crickets, saddles, and tapered edge strips, including slopes.
  7. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
  8. Tie-in with adjoining air barrier.
- C. Wind Uplift Resistance Submittal: For roofing system indicating compliance with wind uplift performance requirements.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Sample warranties.

#### 1.5 QUALITY ASSURANCE

- A. Qualifications:

1. Manufacturers: A qualified manufacturer that is listed in SPRI's Directory of Roof Assemblies for roofing system identical to that used for this Project.
2. Installers: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: 20 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Accelerated Weathering: Roof membrane to withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
- B. Impact Resistance: Roof membrane to resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- C. Wind Uplift Resistance: Design roofing system to resist the window uplift pressures shown on the structural drawings.
- D. SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system and are listed in SPRI's Directory of Roof Assemblies for roof assembly identical to that specified for this Project.
  1. Wind Uplift Load Capacity: 90 psf .

## 2.2 MANUFACTURERS

- A. Styrene-Butadiene-Styrene (SBS)-Modified Bituminous Membrane Roof System: See the following articles for individual roof materials required.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Firestone Building Products.
    - b. Polyglass U.S.A., Inc.
    - c. Soprema, Inc.

## 2.3 BASE SHEET MATERIALS

- A. SBS-Modified Bitumen Type I, Glass-Fiber-Mat Base Sheet: ASTM D6163/D6163M, Type I, Grade S, SBS-modified asphalt sheet, reinforced with glass fibers, smooth surfaced, suitable for hot asphalt application or torch application method.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Firestone Building Products.
    - b. Polyglass U.S.A., Inc.
    - c. Soprema, Inc.

## 2.4 STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS CAP SHEET

- A. SBS-Modified Bitumen Type I, Glass-Fiber-Mat, Granule-Surfaced Cap Sheet: ASTM D6163/D6163M, Type I, Grade G, SBS-modified asphalt sheet, reinforced with glass fibers, suitable for hot asphalt application or torch application method.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Firestone Building Products.
    - b. Polyglass U.S.A., Inc.
    - c. Soprema, Inc.
  2. Granule Color: White .

## 2.5 BASE FLASHING SHEET MATERIALS

- A. SBS-Modified Bitumen Metal-Surfaced Flashing Sheet: ASTM D6298, metal-foil-surfaced SBS-modified asphalt sheet, reinforced with glass fibers, suitable for application method specified, and as follows:
1. Metal Surfacing: Aluminum .



## 2.6 ASPHALT MATERIALS

- A. Asphalt Primer: ASTM D41/D41M.
- B. Roofing Asphalt: ASTM D312/D312M, Type III or IV as recommended by roofing system manufacturer for application.
- C. SEBS-Modified Roofing Asphalt: ASTM D6152/D6152M.

## 2.7 ROOF INSULATION (Reference 2.1 Schedule of Allowances of 01 900 Division One Supplement)

- A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Carlisle Syntec Systems.
    - b. Firestone Building Products.
    - c. Polyglass U.S.A., Inc.
  - 2. Size: **48 by 48 inches**.
  - 3. Thickness:
    - a. Base Layer: 4 1/2 inches.
- B. Tapered Insulation: Provide factory-tapered insulation boards.
  - 1. Material: Match roof insulation.
  - 2. Minimum Thickness: 1/2 inch.
  - 3. Slope:
    - a. Roof Field: **1/4 inch per foot** unless otherwise indicated on Drawings.
    - b. Saddles and Crickets: **1/2 inch per foot** unless otherwise indicated on Drawings.

## 2.8 INSULATION ACCESSORIES AND COVER BOARD

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
  - 1. Modified asphaltic, asbestos-free, cold-applied adhesive.
- C. Insulation Cant Strips: ASTM C728, perlite insulation board.
- D. Wood Nailer Strips: Comply with requirements in Section 061000 "Rough Carpentry."

- E. Tapered Edge Strips: .
- F. Glass-Mat Gypsum Cover Board: ASTM C1177/C1177M, water-resistant gypsum board.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Certainteed; SAINT-GOBAIN.
    - b. Georgia-Pacific Gypsum LLC.
    - c. National Gypsum Company.
    - d. USG Corporation.
  - 2. Thickness: **1/2 inch** .
  - 3. Surface Finish: Fiberglass facer .

## 2.9 WALKWAYS

- A. Walkway Pads: Reinforced asphaltic composition pads with slip-resisting mineral-granule surface , manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, **3/8 inch** thick, minimum.
  - 1. Pad Size: Approximately **36 by 60 inches** .
  - 2. Color: Contrasting with cap sheet.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

### 3.2 PREPARATION

- A. Prime surface of concrete deck with asphalt primer at a rate of **3/4 gal./100 sq. ft.**, and allow primer to dry.
- B. Perform fastener-pullout tests according to roof system manufacturer's recommendations.
  - 1. Submit test result within 24 hours of performing tests.
    - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

### 3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions,

- B. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast.
  - 1. Remove and discard temporary seals before beginning work on adjoining roofing.
- C. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified in Section 072713 "Modified Bituminous Sheet Air Barriers."
- D. Asphalt Heating:
  - 1. Heat asphalt to its equiviscous temperature, measured at the mop cart or mechanical spreader immediately before application.
    - a. For cap sheets, heat asphalt according to cap sheet manufacturer's recommendations.
  - 2. Circulate asphalt during heating.
  - 3. Do not raise asphalt temperature above equiviscous temperature range more than one hour before time of application.
    - a. For cap sheets, comply with cap sheet manufacturer's recommendations.
  - 4. Do not exceed asphalt manufacturer's recommended temperature limits during asphalt heating.
  - 5. Do not heat asphalt within 25 deg F of flash point.
  - 6. Discard asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.
  - 7. Apply hot roofing asphalt within plus or minus 25 deg F of equiviscous temperature.
    - a. For cap sheets, comply with cap sheet manufacturer's recommendations.
- E. SEBS-Modified Asphalt Heating: Heat and apply roofing asphalt according to roofing system manufacturer's written instructions.
- F. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

### 3.4 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 45 degrees.
- D. Installation Over Metal Decking:

1. Install base layer of insulation with joints staggered not less than **24 inches** in adjacent rows end joints staggered not less than **12 inches** in adjacent rows and with long joints continuous at right angle to flutes of decking.
  - a. Locate end joints over crests of decking.
  - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  - c. Make joints between adjacent insulation boards not more than **1/4 inch** in width.
  - d. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus **24 inches**.
    - 1) Trim insulation, so that water flow is unrestricted.
  - e. Fill gaps exceeding **1/4 inch** with insulation.
  - f. Cut and fit insulation within **1/4 inch** of nailers, projections, and penetrations.
  - g. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
    - 1) Fasten insulation according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
    - 2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
2. Install upper layers of insulation and tapered insulation, with joints of each layer offset not less than **12 inches** from previous layer of insulation.
  - a. Staggered end joints within each layer not less than **24 inches** in adjacent rows.
  - b. Install with long joints continuous and with end joints staggered not less than **12 inches** in adjacent rows.
  - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  - d. Make joints between adjacent insulation boards not more than **1/4 inch** in width.
  - e. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus **24 inches**.
  - f. Trim insulation, so that water flow is unrestricted.
  - g. Fill gaps exceeding **1/4 inch** with insulation.
  - h. Cut and fit insulation within **1/4 inch** of nailers, projections, and penetrations.
  - i. Adhere each layer of insulation to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
    - 1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus **25 deg F** of equiviscous temperature.
    - 2) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
    - 3) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

### 3.5 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines, with end joints staggered between rows. Offset joints of insulation below a minimum of **6 inches** in each direction.
1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
  2. At internal roof drains, conform to slope of drain sump.
    - a. Trim cover board, so that water flow is unrestricted.
  3. Cut and fit cover board tight to nailers, projections, and penetrations.
  4. Adhere cover board to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
    - a. Set cover board in a solid mopping of hot roofing asphalt, applied within plus or minus **25 deg F** of equiviscous temperature.

### 3.6 INSTALLATION OF ROOFING MEMBRANE, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
  2. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.
  3. Remove and discard temporary seals before beginning work on adjoining roofing.

### 3.7 INSTALLATION OF BASE SHEET

- A. Before installing, unroll base sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature.
- B. Loosely lay one course of sheathing paper, lapping edges and ends a minimum of **2 inches** and **6 inches**, respectively.
- C. Installation of SBS-Modified Fiberglass-Mat Base Sheet:

1. Install base sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
2. Extend roofing sheets over and terminate above cants.
3. Install base sheet in a shingle fashion.
4. Torch-apply to substrate.
  - a. Perform torch application according to NFPA 241, including two-hour fire watch after torches have been extinguished.
5. Install base sheet without wrinkles, rears, and free from air pockets.
6. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
  - a. Lap side laps as recommended by roof membrane manufacturer but not less than **3 inches**.
  - b. Lap end laps as recommended by roof membrane manufacturer but not less than **12 inches**.
  - c. Stagger end laps not less than **18 inches**.
  - d. Completely bond and seal laps, leaving no voids.
  - e. Roll laps with a **20-pound** roller.
7. Repair tears and voids in laps and lapped seams not completely sealed.
8. Apply pressure to the body of the base sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.

D. Installation of Asphalt-Coated Fiberglass-Mat Base Sheet:

1. Install base sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
2. Extend roofing sheets over and terminate above cants.
3. Install base sheet in a shingle fashion.
4. Adhere to substrate in a solid mopping of hot roofing asphalt .
5. Install base sheet without wrinkles or tears, and free from air pockets.
6. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
  - a. Lap side laps as recommended by roof membrane manufacturer but not less than **3 inches**.
  - b. Lap end laps as recommended by roof membrane manufacturer but not less than **12 inches**.
  - c. Stagger end laps not less than **18 inches**.
  - d. Completely bond and seal laps, leaving no voids.
7. Repair tears and voids in laps and lapped seams not completely sealed.

### 3.8 INSTALLATION OF SBS-MODIFIED BITUMINOUS CAP SHEET

- A. Before installing, unroll cap sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature at which cap sheet will be installed.
- B. Install modified bituminous roofing cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.

1. Extend cap sheet over and terminate above cants.
  2. Install cap sheet in a shingle fashion.
  3. Install cap sheet as follows:
    - a. Adhere to substrate in a solid mopping of hot roofing asphalt applied at asphalt temperature recommended by cap sheet manufacturer.
    - b. Torch-apply to substrate.
      - 1) Perform torch application according to NFPA 241, including two-hour fire watch after torches have been extinguished.
  4. Install cap sheet without wrinkles or tears, and free from air pockets.
  5. Install cap sheet so side and end laps shed water.
- C. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
1. Lap side laps as recommended by roof membrane manufacturer but not less than **3 inches**.
  2. Lap end laps as recommended by roof membrane manufacturer but not less than **12 inches**.
  3. Stagger end laps not less than **18 inches**.
  4. Completely bond and seal laps, leaving no voids.
  5. Roll laps with a **20-pound** roller.
  6. Repair tears and voids in laps and lapped seams not completely sealed.
- D. Apply pressure to the body of the cap sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.

### 3.9 INSTALLATION OF FLASHING AND STRIPPING

- A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
1. Prime substrates with asphalt primer if required by roofing system manufacturer.
  2. Flashing Sheet Application, Cold: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer.
- B. Extend base flashing up walls or parapets a minimum of **8 inches** above roofing membrane and **4 inches** onto field of roofing membrane.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
1. Seal top termination of base flashing with a strip of glass-fiber fabric set in asphalt roofing cement.
- D. Install liquid flashing system according to manufacturer's recommendations.
1. Extend liquid flashing not less than **3 inches** in all directions from edges of item being flashed.

2. Embed granules, matching color of roof membrane, into wet compound.
- E. Install roofing cap-sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.
- F. Roof Drains: Set **30-by-30-inch- 4-pound** lead flashing in bed of asphaltic adhesive on completed roofing membrane.
  1. Cover lead flashing with roofing cap-sheet stripping, and extend a minimum of **4 inches** beyond edge of metal flashing onto field of roofing membrane.
  2. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
  3. Install stripping according to roofing system manufacturer's written instructions.

### 3.10 INSTALLATION OF WALKWAYS

- A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size, according to walkway pad manufacturer's written instructions.
  1. Install walkways at the following locations:
    - a. Perimeter of each rooftop unit.
    - b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
    - c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
    - d. Top and bottom of each roof access ladder.
    - e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
    - f. Locations indicated on Drawings.
    - g. As required by roof membrane manufacturer's warranty requirements.
  2. Provide **3-inch** clearance between adjoining pads.
  3. Heat-weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.
- B. Walkway Cap-Sheet Strips: Install walkway cap-sheet strips over roofing membrane, using same application method as used for roofing cap sheet.
  1. Install walkways strips at the following locations:
    - a. Top and bottom of each roof access ladder.
    - b. Locations indicated on Drawings.
    - c. As required by roof membrane manufacturer's warranty requirements.
  2. Provide **3-inch** clearance between adjoining strips.

END OF SECTION 075216



## SECTION 236000 - CENTRAL COOLING EQUIPMENT

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. The following specification details the minimum requirement for the supply and installation of a complete factory assembled Central Cooling Plant (CCP). The CCP will include dedicated cooling and Pumping/HX/TES modules.
- B. The Packaged System shall be factory fabricated, tested and delivered to site by the manufacturer as a complete unit containing all the items listed under Products. Field-fabrication of the Packaged System is not acceptable. The Packaged System shall only require supply and return high temperature and low temperature piping connections, domestic water connection for make-up water, sanitary sewer connection for blowdown, 460V electrical power connections and the necessary terminal contacts to the various field mounted devices and building automation.
- C. This specification is intended to contain the requirements for the major components and equipment for the CCP. Some additional aspects for the design will require reference to separate specification sections (i.e. HVAC, related electrical equipment and feeders, plumbing, etc). Refer to these sections as noted herein.
- D. The Off-Site Construction (OSC) manufacturer is responsible the design, engineering, supply and installation of the complete CCP. Working in coordination with the Engineer of Record (EOR) to coordinate touch points, establish load requirements and design intensions, the OSC will take responsibility of the CCP design and warranty the systems for the time period established in the tender documents
- E. Acceptable OSC manufacturers include Epsilon Industries, TAS (Houston, TX), EAS (High Point, NC), [Systecon](#), or approved equal.
- F. Equal and alternate manufacturers must submit a request to bid in writing to the owner, or owner's consultant prior to tender closing. Alternate bids must be entered with savings over base bid. The manufacturer must provide the following information for consideration prior to entering a bid:
  - 1. Equipment selection data.

2. General equipment and pipe arrangement drawings of the alternate's package in three dimensions demonstrating compliance with space considerations.
3. Piping schematic of the alternate's package.
4. Specification review sheet that lists each paragraph number in this specification and at the vendor complies with each paragraph. If an item does not comply, provide information on why it does not comply.

G. The following products are to be included as part of this Packaged System:

1. Structural Steel Base
2. Double Wall Structural Enclosure
3. Control System Integration
4. Control Valves and Dampers
5. Control Instrumentation
6. Pipe and Pipe Fittings, Support, Identification and Insulation
7. Valves
8. Piping Specialties
9. Pumps, Motors and VFDs
10. Chemical Treatment Systems
11. HVAC Components
12. Water Cooled Electric Chiller
13. Cooling Towers
14. Thermal Energy Storage Tank
15. Electrical Systems
16. Make-Up Water System
17. Roof and Tower Access, And Fall Protection
18. Pipe and Pipe Support
19. Vibration Isolation
20. Electrical System
21. Lighting System
22. Life Safety Systems

H. The Packaged System shall be designed for the heat transfer, generation, flow and total dynamic head as noted. It shall be arranged to fit the space allotted on the plans and allow for equipment service.

## 1.2 DEFINITIONS

1. Furnish: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations
2. Install: Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site
3. Provide: Furnish and install, complete and ready for the intended use

### 1.3 SUBMITTALS AND OPERATION MANUALS

A. Submittals shall include the following as a minimum:

1. Specification review sheet that lists each paragraph number in this specification and at the vendor complies with each paragraph. If an item does not comply, provide information on why it does not comply.
2. Package dimensions and general arrangement drawing in three dimensions including overall 3D orthographic and renders.
3. Electrical power diagram indicating all terminations and connections by others.
4. Structural and loading calculations
5. Equipment submittals for all major components including but not limited to chillers, cooling towers, boilers, pumps and pump ancillary equipment, tanks, variable frequency drives and electrical switchgear.
6. Catalog information on valves, strainers, and piping components specific to this project.
7. Piping schematic of the Packaged System's components showing equipment and valve tags, pipe sizes, connections types, gauges, piping specialties and instrumentation tags.
8. Enclosure details including wall, base, and roof construction.
9. Welding procedures structural
10. Welding procedures piping
11. Pipe and fittings
12. Inspection and test plan

A. Operation and maintenance manuals shall include the following as a minimum:

1. All the items contained in the submittal section above.
2. Installation and maintenance manuals for OEM's products integral to the Package.

B. Submittals and operation and maintenance manuals shall be assembled in a neat and orderly manner and submitted in PDF form.

### 1.4 QUALITY AND PERFORMANCE ASSURANCE

- A. **PERFORMANCE CRITERIA:** The following are to be used as selection criteria and are to be as specified: water flow rates, water temperatures, water pressure drops. The following are to be equaled or bettered: system electricity consumption (parasitic load), acoustical sound pressure levels, chiller, cooling tower and pump performance. Refer to drawings for equipment schedules.
- B. **SYSTEM ENERGY PERFORMANCE:** The system supplier will provide a spreadsheet based calculation of the total system NPLV inclusive of chillers, tower fans, and all pumps at no less than the 100,75,50, and 25% of total system loads or others as needed to match the buyer's request. The chiller and non-chiller parasitic pump/fan loads must be separated. Calculation methods and content should be unlocked and visible for buyer review.

- C. PERFORMANCE TEST: Chillers shall be factory tested at the chiller manufacturer's facilities using the equipment and measuring guidelines defined by ARI and this specification. The test results shall be certified by the manufacturer
- D. CONTROLS RESPONSIBILITY: The Packaged System manufacturer must take responsibility for the independent control logic of the packaged system and associated central plant equipment including but not restricted to chillers, cooling towers, pumps, VFDs and control valves. The Packaged System's controls must be of a recognized manufacturer in the country of destination, and be capable of communicating with the building automation system (BAS) via BACnet.[GH1]
  - 1. Refer to Division 25 specifications for Programmable Logic Controller (PLC) based control system requirements.
- E. ETL: The unit shall be ETL certified as a package. Certification of only the components is not acceptable.
- F. QUALITY ASSURANCE PROGRAM: The manufacturer shall have a quality assurance program in place and have the quality assurance manual available for the owner upon request.
- G. PRESSURE TEST: Once the Packaged System is fully assembled, all piping shall be pressure tested as per ASME B31.1 guideline in the factory before shipping. Pressure testing of individual pipe spools or sub-assemblies is not acceptable.
- H. STRUCTURAL AND SEISMIC REQUIREMENTS: The base, wall and roof steel framework, sheet metal enclosure and integral tower support steel shall be designed to meet or exceed the loading (wind, snow/ sand, live and dead loading, lifting) requirements outlined in the relevant parts of this section. [GH2]
- I. ACOUSTICAL REQUIRMENTS: [GH3]The enclosure panels (if an enclosure is required) shall be acoustically rated at the sound transmission loss levels contained in this section to NRTL standards and listed by NRTL to be in accordance with ETL's procedures for acoustical testing. This listing shall be made available to the owner upon request. Further, as part of the O&M the manufacturer shall provide detailed calculations (when required) demonstrating that the sound pressure levels stipulated in this section for this Packaged System shall not be exceeded when the unit is fully operational.
- J. WELDING: All pipe and structural steel shall be welded in accordance with the procedures outlined in this section – no exceptions. At the owner's request, the manufacturer shall provide certified documentation of both the procedures and the welder's certification for that procedure.

- K. PAINTING: All bases, enclosure floors and exteriors are to be factory painted in accordance with this section. At the owner's request, submit the paint specification demonstrating that it will withstand 500-hour exposure to the salt spray test specified in ASTM B 117.
- L. The control system shall be fully tested prior to shipment. A complete IO check shall be performed and documented. VFDs shall be run to ensure correct phase rotation and control interface.

#### 1.5 OSC MANUFACTURER'S ADMINISTRATIVE PROCEDURES AND ACTIVITIES

- A. The OSC manufacturer is responsible to install the system and manage relevant trades required as it relates to this scope of work
  - 1. The OSC manufacturer will assign a dedicated Project Manager (PM) with relevant experience that enables them to execute the responsibilities listed herein
- B. Coordinate the project schedule and timing of required administrative procedures with other construction activities and activities of other Subcontractors to avoid conflicts and to ensure orderly progress of the Work
- C. Administrative Activities include, but are not limited to the following:
  - 1. Preparation of Construction Schedule
    - a. The OSC manufacturer shall create and update Gantt style project schedules as it relates to the scope of work for this contract
    - b. The OSC manufacturer shall regularly participate in progress schedule conversation and provide input to all stakeholders on the status of this scope of work
  - 2. Preparation of the Schedule of Values
    - a. The OSC manufacturer will create and maintain all billings and schedule of values for the project
    - b. The OSC manufacturer shall progress bill for all work completed that month in accordance with the contract documents
    - c. The OSC manufacturer will supply with said billings all associated backup as required per the contract.
  - 3. Delivery and processing of submittals
    - a. The OSC manufacturer shall first create a schedule of submittals to be submitted for approval that aligns with the project schedule
    - b. The OSC manufacturer will then submit all pertinent submittals for review working with the design team and customer to receive the desired approvals and subsequent release to production in the effort to maintain schedule
  - 4. Progress meetings
    - a. The OSC manufacturer shall have a single point contact as a PM that will participate in all job-related meetings

- b. The OSC manufacturer will schedule an owners' meeting to provide status and updates on progress
  - c. The OSC manufacturer will take meeting minutes of each meeting and distribute to all parties
- 5. Preinstallation conferences
  - a. The OSC manufacturer will schedule a pre-installation meeting with all stakeholders and coordinate factory visit
- 6. Project closeout activities
  - a. The OSC manufacturer will assemble and provide all closeout documentation in accordance with the contract documents.
- 7. Startup and adjustment of systems within the plant
  - a. The OSC manufacturer will coordinate with its own vendors to schedule start-up
  - b. The OSC manufacturer will provide balancing and commissioning assistance

#### 1.6 OSC MANUFACTURER'S INSTALLATION RESPONSIBILITIES

- A. The OSC manufacturer is responsible for receiving and staging of delivery trucks
  - 1. Remove all shipping tie downs for inertia bases on base mounted pumps.
  - 2. Remove shipping protection including plastic shrink wrap and frames
    - a. Bring to designated dumpsters, dumpsters are provided by others
  - 3. Inspect each section for damage and compare to shipping documents
- B. Provide crane and rigging equipment to install:
  - 1. All sections of plant into place, leveling and shimming as required
  - 2. Tower dunnage, towers and mezzanine structure
  - 3. Install tower accessories including ladders, hand/toe rails
  - 4. Install piping within the tower if required (single bottom inlets)
  - 5. Install the sealing of all side, floor and roof line connections using the sheet metal strips, fasteners and caulking to make the plant watertight
- C. Provide all mechanical installation work within the plant to include:
  - 1. Re-connect pipe flanges between section splits
  - 2. Re-connect pipe flanges between piping inside the plant and above the roof, under the towers
  - 3. Coordinate with site contractor for the plant's drain termination points to the customer supplied site sanitary connection(s)
  - 4. Install all outside mounted devices, fan accessories, louvers and dampers as required
  - 5. Tighten up all flanged connections within the plant
  - 6. Provide concrete in all inertia bases on base mounted pumps per the manufacturer's requirements
  - 7. Provide and install insulation for piping and equipment in accordance with the contract documents
  - 8. Provide all tagging and labeling on the equipment, piping, valves as per the contract documents

9. Provide all heat trace (if required) and piping insulation of outdoor piping system between towers and enclosure
  - a. Outdoor piping supplied by the OSC manufacturer will be sealed with an aluminum jacket
  - b. Provide final power connections to the heat trace from the designated panel
- D. Wiring and Electrical installation to include:
  1. Install 480v conductors that are coiled for shipping splits
  2. Re-connect DIN connectors between splits for 120v and control voltage
  3. Install all wiring from outside mounted junction boxes to tower fan disconnects, basin heaters and tower mezzanine lighting
  4. Install all control conductors for towers (vibration cut out and basin level), control valves and instrumentation/end devices located above the enclosure
- E. Coordinate with site contractor for utility hook up, including
  1. Electrical tie-in
  2. Chilled Water supply/return
  3. Domestic Water
  4. Drains
- F. Life safety systems: installation inside the CCP, including
  1. Sprinkler system
    - a. Supply and installation of sprinkler heads, conductors, controllers, tests and certifications
- G. Calibrate refrigerant detection monitor
- H. Re-align all base mounted pumps using standard levelling techniques
- I. Start-up and Commissioning of equipment
  1. Cleanup of shipping protective plastic and miscellaneous articles
  2. Touch up painting of interior and exterior after commissioning process
- J. Coordination with customer for commissioning of equipment and system
  1. Provide manhours to work with the Cx Agent during the commissioning process
- K. Coordination of Flushing and filling system (see site contractor below)

## 1.7 INSTALLATION RESPONSIBILITIES OF SITE CONTRACTOR

- A. The site contractor, as referred to in the section below, is the entity retained by the owner or construction manager (as applicable) to execute work for this project that is related to but not included in the OSC manufacturer's scope
- B. The site needs to be prepared to accept the central plant and must be able to accept oversized trucks to deliver the CCP in sections in proximity to the crane (obstructions such as curbs, bends and bumps and hills must be considered and mitigated)
- C. Provide a local staging area with ample room to store all modules / sections and for rigging convenience
  - 1. Acceptable access for crane and riggers is the responsibility of site contractor
  - 2. Accessibility for specialized trucks that are delivering the system sections
- D. The central plant is understood to be installed on concrete slab
  - 1. Concrete pad/structural steel support is designed and poured/installed by others and leveled to the OSC manufacturer's specification
- E. Drainage system with all required trapping below connection point from enclosure
  - 1. The enclosure will not have the height for internal drain traps
  - 2. Connections for external drain termination points from the enclosure to site drains
- F. Provide all utilities with coordination from the OSC manufacturer, plant utilities include:
  - 1. Electrical feed(s)
  - 2. Low Temperature Loop supply/return connections
  - 3. High Temperature Loop supply/return connections
  - 4. Domestic Water
  - 5. Sanitary Sewer Drain
- G. Terminate electrical feeds inside CCP
  - 1. The OSC manufacturer will provide exterior junction boxes and internal conduit to the panels
- H. Site contractor is responsible for flushing and charging the system, coordinated through The OSC manufacturer, using pumps inside the system
- I. High and Low Temperature Loop remote differential pressure transmitter installation and wiring back to plant controller for local DP setpoint control, if devices shipped loose



- J. Life safety systems: installation inside the CCP, including:
  - 1. Sprinkler system
    - a. Connection of site fire sprinkler main to the sprinkler system in the CCP
  - 2. Smoke/Fire alarms
    - a. Supply and installation of all conductors, controllers, termination devices and the integration into the site's system
  - 3. Security and Surveillance systems
  - 4. See life safety section above for details
- K. Lightning protection system
- L. All permits/licenses and local approvals required for installation and rigging of the plant
- M. All security fencing
- N. Waste disposal of plastic, wood and steel frames used for protective wrapping

## 1.8 WARRANTY

- A. The entire Packaged System shall be guaranteed for parts and workmanship for a period of 12 months from start-up or 18 months from shipment from the vendor's facility, whichever comes first.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Furnish and install the following equipment as part of a factory assembled and tested Packaged System. The CCP shall be designed with sufficient clearance (as defined by the equipment manufacturer) around equipment to provide regularly scheduled service and maintenance.
- B. Refer to Specification Section 23 0000 – General HVAC Requirements
- C. Refer to Specification Section 23 0594 – Water Systems Test Adjust Balance

- D. Refer to Specification Section 23 0595 – Air Systems Test Adjust Balance
- E. Refer to Specification Section 23 0598 - Acceptance Testing of Rotating Equipment

## 2.2 STRUCTURAL STEEL BASE

- A. The steel base shall consist of a structural steel perimeter with intermediate structural steel members at a minimum height of 6". A 3/16" checkered plate floor shall be continuously welded to the base and serve as an integral part of the structure.
- B. The base shall be designed for a maximum deflection of L/240 when the unit is fully operational and supported only at the section perimeter and at unit splits every eight (8) feet.
- C. The base frame shall be welded to a factory certified procedure that shall conform to the requirements of AWS D1.1

## 2.3 DOUBLE WALL STRUCTURAL ENCLOSURE<sup>[GH4]</sup>

- A. All mechanical and electrical equipment shall be housed inside a factory fabricated double wall enclosure. The enclosure shall be fabricated by the same manufacturer as the steel base, pipe work and pipe supports to ensure structural integrity of the entire Packaged System. The use of a self-framing or sheet metal building that does not incorporate a structural steel wall framework, structural steel roof framework, lifting lugs [and cooling tower support steel] is not acceptable.
- B. The components of the enclosure shall be:
  - 1. Floor: shall be a minimum of 3/16" steel checker plate. When used with an enclosure, the perimeter of the floor shall be broken upward 1.5" to form a water dam and the corner seams shall be seal welded to form a watertight floor. The use of z-bar is permitted provided that the z-bar is continuously seam welded, not caulked.
  - 2. Wall Panels: Wall and roof panels shall be fabricated from 16ga. satin coat steel (exterior wall panels) and 22ga. galvanized sheet metal wash-down (interior wall panels) and sealed with an individual strip of ½" tape sealer. Wall panel shall be 4" thick with seams turned inward to provide flush exterior finish. Exterior roof panels shall be 4" thick. Wall and roof exterior panels shall wrap around wall and roof structural framework to ensure thermal break.
  - 3. Structural Steel Base: When used with an enclosure, the perimeter members shall be, at a minimum, 6"x6"x0.25" hollow structural steel tube (HSS) and shall enable the installing

- contractor to shim the unit at 12-foot spans on site. The use of a c-channel or flanged steel perimeter is permitted provided the base is at least 12" deep.
4. Wall and Roof Structural Steel Framework: an integral structural steel framework of hollow structural steel shall support the walls and roof. The framework members shall be, at a minimum, 3"x3"x0.188" HSS at 10-foot centers. The roof steel shall also support all pipe in the Packaged System higher than four feet from the floor or base level. The framework shall be primed and finish painted using the paint system described in this section.
  5. Roof Mounted Lifting Lugs: If an enclosure is required and the package is to be split for shipping, then the wall and roof structural steel framework will be extended through the roof of the enclosure and incorporate lifting lugs so that the entire package can be lifted from the roof. Base mounted lifting lugs are not acceptable.
  6. The enclosure shall be designed for a minimum live load of 25 pounds per square foot in addition to snow load capacity to permit safe access during erection and maintenance.
- C. Wall and roof panels shall have the following minimum air infiltration and water leakage rates (submit test data):
1. Air Infiltration for Roof Panels: No air leakage through the assembly when tested according to ASTM E 1680 at test-pressure of 12 lbf/sq.ft.
  2. Air Infiltration for Wall Panels: No air leakage through the assembly when tested according to ASTM E 283 at test-pressure of 12 lbf/sq.ft.
  3. Water Penetration for Roof Panels: No water penetration when tested according to ASTM E 1646 at test-pressure of 15 lbf/sq.ft.
  4. Water Penetration for Wall Panels: No water penetration when tested according to ASTM E 331 at a test-pressure of 15 lbf/sq.ft.
- D. The enclosure panels shall be acoustically designed with a sound Transmission Loss (TL) rating. The TL values must be rated across the eight octave bands. Sound pressure levels shall be predictable from any distance from the enclosure when sound power levels from the sound generating equipment are known. Calculations that support the sound data shall be provided on request.
- E. All bases, enclosure floors and exteriors are to be factory painted:
1. All structural steel members and the floor are to be blast cleaned to Sa2½ (ISO 8501-1:1988) near white-metal to remove oxidation & foreign materials. The structural steel base and floor shall be primed with International Interzinc 52 (zinc/epoxy primer) as a first coat and International Intergard 264 (epoxy primer) as a second coat to provide chemical and corrosion resistance. The topcoat will be PPG Acrycote Acrylic Enamel 694 Series to provide a semi-gloss finish.
  2. Exterior enclosure paint shall have weather resistant finish that will withstand 500-hour exposure to the salt spray test specified in ASTM B 117. Paint shall be applied and allowed to dry for a sufficient amount of time before shipping. The paint shall be a non-isocyanate enamel that produces a durable, chemically resistant coating similar to urethane. All exterior surfaces shall be wiped down with thinners and prepared with a zero-induction epoxy primer before applying paint.

## 2.4 ROOF AND TOWER ACCESS, AND FALL PROTECTION

- A. Access to the package roof will be provided at minimum by an OSHA compliant ladder, with an optional steel stair if customer specified. Ladders will include cages and/or fall restraints as required by OSHA and customer specifications. The roof will be provided according customer preference with either an OSHA compliant full perimeter hand rail complete with kick plates; or by multiple certified tie-off points at not more than 15 foot centers to protect the full area of the roof not inherently guarded by piping or other structures.
- B. Tower access platforms or walkways will be provided to the same standard for ladders or stairs per customer preference. All ladders and stairs will be equipped with a swing gate at the upper entry. The top deck of cooling towers will be accessed by an OSHA ladder and equipped with full perimeter handrails. Tower without velocity stacks providing inherent fall protection into the fan area will include at least one tie off point certified for no less than two men regardless of presence of a screen guard over the fan.
- C. In systems with towers mounted above the integrated package, all cooling tower related valves, actuators, sensors, or similar devices will be safely accessible from the roof of the package without use of ladders or climbing

## 2.5 MOTORS AND VFDs

- A. Refer to Specification Section 20 0513 – Motors
- B. Refer to Specification Section 20 0514 – Variable Frequency Drive (VFD) System

## 2.6 CONTROL SYSTEMS INTEGRATION

- A. Refer to Specification Section 25 0901 – Control System Integration to coordinate with other required system instrumentation. Aspects specific to these cooling and pump modules can be found herein
- B. Automated process control shall be an Allen Bradley CompactLogix Class PLC based system. An Allen Bradley ControlLogix Class PLC shall be used when 2N capability is required. Non-PLC based systems are not acceptable.
- C. The controller software has the ability to automatically diagnose and report process hardware failures and make equipment substitutions, where applicable to maintain the process.

- D. The control system shall be UPS backed [Allen Bradley 1609 Industrial UPS] to provide power loss ride through capability. In the event of an extended power loss after power is restored the control system will resume normal operation without operator intervention.
- E. 24VDC Power supply redundancy shall be provided using Allen Bradley (2) 1606-XL480EP 20A 24VDC power supplies monitored with a 1606-XLRED20-30 – 20A Redundancy Module to maintain power to the PLC, BMS interface, Webport, 24VDC instrumentation
- F. BMS Interface shall be provided. All measured process information alarms, temperatures, pressures; flow will be exported to the BMS in real time.
- G. A 21.5" operator interface display touch screen shall be provided to allow process monitoring, alarm display, process trending and secure setpoint edits. The monitored process will be represented in a graphical display showing all equipment.
- H. The control system shall have the capability of web based remote access to allow remote troubleshooting or system updates.
- I. The control system shall be fully tested prior to shipment. A complete IO check shall be performed and documented. VFDs shall be run to ensure correct phase rotation and control interface.

## 2.7 CONTROL VALVES AND DAMPERS

- A. Refer to Specification Section 23 0902 - Control Valves and Dampers

## 2.8 CONTROL INSTRUMENTATION

- A. Refer to Specification Section 25 0903 – Control Instrumentation to coordinate with other required system instrumentation. Instrumentation specific to these cooling and pump modules can be found herein
- B. RTD TEMPERATURE TRANSMITTERS:
  - 1. Manufacturers: Rosemount, Burns, Minco Products, Weed, Greystone, or Pyromation.
  - 2. Transmitters shall provide 2 wire, 4-20 mA current output signal proportional to specified temperature span of transmitter and compatible with DDC equipment.

- a. These shall be 100 Ohm platinum RTD type temperature instruments for process immersion
- b. Operating Temperature: 20 to +180°F
- c. Power Supply Voltage: 13 to 35 VDC unregulated
- d. Accuracy or Output Error: 0.1% of span of sensor and transmitter combination
- e. Temperature Coefficient: 0.00385 ohm/ohm/°C
- f. Thermowells: By same manufacturer as Sensor/Transmitter or approved alternate.

C. MAGNETIC FLOWMETER/TRANSMITTER:

1. Manufacturers: ABB, McCrometer, Rosemount, Onicon, or Toshiba.
2. Electromagnetic induction type with linear response proportional to flow rate. Selected span shall be not greater than twice design flow range. Select units for 10:1 turndown.
3. Unit shall be complete with 150 lb. raised face flanged flowtube, PTFE, EPDM neoprene or PFA liner, magnetic coils, self-cleaning 316 stainless steel or Hastelloy C4 electrode, integral grounding rings and 4-20 mA transmitter/power supply housed in NEMA 4 enclosure. Transmitter shall be fully field configurable microprocessor based unit.
  - a. Minimum Accuracy:  $\pm 0.5\%$  of Span including hysteresis
  - b. Repeatability:  $\pm 0.1\%$  of reading
  - c. Operating Temperature: 0-125°F
  - d. Power Requirements: 120 VAC / 60 Hz
4. Power supply shall be coordinated between electrical contractor and controls contractor and provided by the electrical contractor.

D. REFRIGERANT DETECTION SYSTEM

1. The Contractor shall provide local alarm and detection system to detect refrigerant leak in chillers. Refrigerant vapor photo-acoustic infrared type sensor shall comply with the most recent ASHRAE 15 Standards. Provide local alarm and control panel to accept these inputs and provide outputs for warning alarm and hazard alarm, which shall energize emergency ventilation system. Both alarms shall have DPDT relays and shall energize local and remote horn-strobe alarms and also provide for connection to the plant control system.
2. Refrigerant leak detection system to have the following minimum performance:
 

a. Accuracy	0	-	100 ppm $\pm 1$ ppm
	100	-	-1000 ppm $\pm 10\%$ of reading
3. Linearity
 

	0	-	100 ppm linear
	100	-	-1000 ppm $\pm 2\%$ of full scale

  - a. Sensitivity 1 ppm
  - b. Resolution 1 ppm
  - c. Operating Temperature 15 -45°C (59-113°F)
  - d. Temperature Effect  $\pm 0.3\%$  per °C of reading
  - e. Relative Humidity 0 -99% non-condensing
  - f. Power Requirement 120 Volts AC  $\pm 10\%$
  - g. Analog Output 0 -5 V. and 4-20 mA
  - h. Alarm Horn Volume 110 dBA Minimum
4. Leak detection sensors shall not be affected by hydrocarbons.

5. Sensor tubing shall be copper in accordance with Section 23 2116.
6. Horn-strobe shall have red strobe light.

E. PRESSURE/DIFFERENTIAL PRESSURE TRANSMITTER:

1. Manufacturer: ABB, Invensys Foxboro, Smar International, Fisher, Rosemount, Honeywell, Yokogawa
2. Static gauge pressure transmitters shall provide linear output signal proportional to process gauge pressure. Maximum instrument span shall not be greater than twice process range.
3. Differential pressure transmitters shall provide linear output signal proportional to process differential pressure (DP).
4. Sensor shall be capacitance, reluctance, or piezo-electric type with welded stainless-steel housing.
5. Maximum instrument span shall not be greater than twice process range.
6. Zero control shall be continuously adjustable between zero percent and 100 % of range limits. Zero and span shall be independently field adjustable with no interaction.
7. Minimum proof pressure rating shall be 50% greater than maximum sensor range.
8. Five valve manifold (use on all dp transmitters), three valve manifold (use on all gage pressure transmitters)
  - a. Manufacturer: Rosemount, Daniel, Ladish, Rubber Fab, or approved alternate.
  - b. Provide a five-valve or three-valve manifold for each transducer. Pressures of up to 500 psig shall not damage the manifold. All wetted parts shall be inert in the presence of up to a 40% concentration of ethylene or polypropylene glycol in water.
  - c. The manifold shall be designed for direct mounting on the transducer it serves and utilizes two quarter turn valves to provide zeroing, blocking and normal service modes.
    - 1) Seat: Hard
    - 2) Body Material: Stainless Steel
    - 3) Inlet (Process) Size: 1/2"
    - 4) Inlet Connection Type: FNPT
    - 5) Packing: Teflon
    - 6) Type: Single Flanged
9. Instrument shall be microprocessor based. It shall be fully field configurable via Highway Addressable Remote Transmitter (HART) communication protocol from controller card.
10. Instrument shall have configurable fail mode (Fail High or Fail Low).
11. Diaphragm Material: Manufacturer's standard Stainless Steel or Hastelloy
12. Fill Fluid: Silicone
13. Process Connection: 1/2" NPT Stainless Steel or Hastelloy
14. Power Supply Voltage: 13 - 35 VDC unregulated or 24 VAC
15. Output Signal: 4-20 mA 24 VDC two wire type
16. Over Pressure: Minimum over pressure rating shall be 15 psig or twice maximum sensor range whichever is greater.
17. Operating Temperature: -20° to 180°F
18. Min Enclosure Rating: NEMA 4
19. Performance:

- a. Zero: Zero control shall be continuously adjustable between 0% and 100% of upper range limit. Total calibrated span and zero adjustment cannot exceed upper range limit. Zero and span shall be independently field adjustable with no interaction.
- b. Accuracy: Error  $\pm 0.15\%$  of calibrated span
- c. Drift: Error  $\pm 0.25\%$  of upper range limit over 12-month period
- d. Power Supply Effect: Error  $< 0.01\%$  of output span per V
- e. Static Pressure Effect: Error  $\pm 0.25\%$  zero error,  $\pm 0.2\%$  span error/1000 psig
- f. Temperature Effect: Error  $\pm 0.6\%$  of calibrated span/100°F

## 2.9 ULTRASONIC TYPE LEVEL TRANSMITTER:

- A. Ultrasonic type continuous level transmitter to measure basin level. Provide level transmitter with integral 4-20 mA transmitter. Calibrate meter for installation height within cooling tower.

- 1. Range: 4" to 10'
- 2. Supply Voltage: 24 VDC
- 3. Output: 2 wire, 4-20 mA DC
- 4. Fail Safe: Low Level output on instrument failure
- 5. Ambient Temperature Limits: -4 to 140°F
- 6. Minimum Enclosure Rating: NEMA 4X
- 7. Performance:
  - a. Accuracy:  $\pm 0.2\%$  of range
  - b. Resolution: 0.019"
  - c. Deadband: 4" Maximum

## 2.10 PIPE AND PIPE FITTINGS, SUPPORT, IDENTIFICATION, INSULATION AND VALVES

- A. Refer to Specification Section 20 0549 – Pipe and Equipment Supporting Devices
- B. Refer to Specification Section 20 0549 – Seismic Anchorage and Restraints
- C. Refer to Specification Section 20 0553 – Mechanical System Identification
- D. Refer to Specification Section 20 0573 – Mechanical System Firestopping
- E. Refer to Specification Section 20 0700 – Mechanical System Insulation
- F. Refer to Specification Section 23 0550 – Vibration Isolation



- G. Refer to Specification Section 23 2116 – Pipe and Pipe Fittings
- H. Refer to Specification Section 23 2118 – Valves
- I. Pipe welding shall be in accordance with ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessel Code, Section IX. Ensure complete penetration of deposited metal with base metal. All welded pipe joints shall be made by the fusion welding process employing a shielded metallic arc process (SMAW) or gas metal arc welding process (GMAW/ MIG). Inside of pipe shall be free of excessive reinforcement. The use of backing plates is not acceptable. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welds during the welding operation.
- J. The use of grooved mechanical connections is only acceptable for equipment connections as required, except where joining to OEM equipment with grooved connections. The use of grooved mechanical connections elsewhere is not acceptable.

## 2.11 PIPING SPECIALTIES

- A. Refer to Specification Section 23 2120 –Piping Specialties to coordinate with other required system components. Equipment specific to these cooling and pump modules can be found herein.

## 2.12 EXPANSION TANKS

- A. Manufacturers: Amtrol, Taco, Bell and Gossett, Armstrong, Wheatley, or Wessels
- B. Tanks shall be replaceable bladder type air pre-charged to initial fill pressure as scheduled. Furnish tank suitable for 125 psig WP, constructed, tested and stamped in accordance with ASME Code, and sealed-in elastomer bladder suitable for operating temperature of 240°F. Bladder shall be compatible with water and with ethylene and propylene glycol. Furnish mounting saddles for horizontal tanks and mounting base for vertical tanks. Furnish tanks with system connections; drain connections for floor-mounted tanks, and air charging valves.
- C. Expansion tanks shall be manufactured in an ISO recognized facility. Each unit shall be factory tested per Hydraulic Institute standards at the factory of origin.
- D. AIR AND DIRT SEPARATORS

1. Manufacturers: Spirotherm Spirovent. Caleffi or Wessels
2. Coalescing type combination air and dirt separator, designed for 150 psig WP, temperature up to 270°F stamped and registered in accordance with ASME Section VIII, Division 1 for unfired pressure vessels. Connections 2-1/2" and larger shall be flanged. Connections 2" and smaller may be flanged or threaded.
3. Coalescing medium shall consist of copper core tubes or stainless steel tubes with enhanced surface to facilitate coalescing action. Media shall substantially fill the vessel. Provide photography of a typical unit with top open with product submittal.
4. Standard-velocity units shall be rated up to 6.0 fps and pressure drop shall not exceed 8 ft water head.
5. Unit air and dirt removal performance shall be certified by independent third-party testing agency.
  - a. Dirt separation efficiency shall be certified for 80% removal of particles 30 microns and larger within 100 passes.
6. Venting chamber shall be provided with integral full-port float actuated venting mechanism.
7. Unit shall include valved side tap for flushing of floating dirt or liquids and for quick venting of air during system fill or refill.
8. Drain valve at bottom of unit for flushing/dirt removal, 1" for units size 12" and smaller, 2" for units size 14" and above.

E. PUMP SUCTION DIFFUSERS

1. Manufacturers: Bell & Gossett, Armstrong, Mueller Steam Specialty, Wheatley or Taco
2. Cast iron or ductile iron body with angle pattern flow straightening vanes and combination diffuser-strainer-orifice cylinder with 3/16" diameter openings, 175 psig WP, at 250°F. Threaded ends for 2" and smaller and flanged ends for 2-1/2" and larger. Orifice cylinder shall have free area of at least 5 times cross section area of pump suction opening. Furnish each unit with disposable fine mesh start-up strainers, gauge tappings, blow down connection, and adjustable support foot to carry weight of suction piping.
3. Pump suction diffusers manufactured by grooved coupling manufacturer will be acceptable where grooved pipe connection system is allowed.

F. CENTRIFUGAL SEPARATORS

1. Manufacturers: Lakos Separators, Griswold, or approved equal
2. Vertical centrifugal vortex design shall remove 98% of solids 74 microns and larger. Unit shall be designed with tangential entry into acceptance chamber, then drawn through internal tangential slots and accelerated into reduced diameter separation cylinder. Solids heavier than water shall be deposited into collection chamber. Collected solids shall be drawn off through bottom outlet. Furnish units with removable heads on each end for complete serviceability and cleaning.
3. Furnish separate bag filter housing and filter to collect up to 25 lbs of filtered debris larger than 40 microns. Housing to have inlet and outlet connections. Furnish one extra filter bag per filter housing.
4. Separator and filter housings shall be constructed of standard carbon steel for 125 psig WP constructed in accordance with ASME Code. Connections larger than 2" shall have

150 lb 150 psi weld flange connections. Factory paint housings with 2 coats of enamel based paint, plus metal primer coat.

5. Submit independent lab test report indicating separator efficiency.
6. Provide dry contact for monitoring by BAS of solids recovery vessel to indicate required maintenance.

G. HEAT EXCHANGERS (PLATE AND FRAME TYPE)

1. Manufacturers: Bell and Gossett, Kelvion, Polaris, APV, Graham, Tranter, Danfoss, Armstrong, or Alfa-Laval with size, capacity, and operating characteristics as scheduled.
2. Heat exchangers shall be plate and frame type with removable gasketed plates constructed and stamped in accordance with the latest ASME Code. Each unit shall be registered with National Board of Boiler and Pressure Vessel Inspectors.
3. Heat exchangers shall be suitable for working pressure of 150 psi and test pressure of 195 psi.
4. Heat exchangers shall be certified according to AHRI Standard 400 and listed on AHRI org site.
5. Heat exchange plates shall be 304 or 316 stainless steel with gasketing material suitable for potable water systems and compatible with hot water heating system chemical treatment.
6. End plate shall be steel, studded for flange connection.
7. Furnish units with epoxy coated structural steel framework as required to adequately support assembled plates.
8. Construct nozzles, where used, of same material as plates.
9. Provide structural steel framework as indicated and as required to adequately support unit.
10. Install piping to heat exchangers with flanges or unions as specified to allow for removal of tube bundle.

2.13 PUMPS

- A. Refer to Specification Section 23 2123 – Pumps

2.14 MAKE-UP WATER SYSTEM

- A. A make-up water system shall be connected to the outlet of the air separator. This system shall include a pressure reducing valve, backflow preventer, shut-off valves, Y-strainer, pressure gauge and manual by-pass.

## 2.15 CHEMICAL TREATMENT SYSTEMS

- A. Refer to Specification Section 23 2514 – Chemical Treatment Systems to coordinate with other required system components. Equipment specific to these cooling and pump modules can be found herein.
- B. The package housing design will incorporate exterior forklift access to a single location for all chemical drums or totes such that no manual handling is required for container storage, swap, or fill. If chemical drums or totes are not planned to include double containment, the chemical area will include two separate containment basins of SS or epoxy coated steel each capable of holding 150% the volume of the largest planned container. Informal spotting of drums or containers through the package is unsafe and not permitted.
- C. The system will include multiple injection points factory installed in all closed and open loops as required to meet the customer's chemical vendor's requirements for count and location. Each injection point will be sized to accommodate an appropriate injection barb and equipped with an isolation valve to permit barb replacement without system drain down. Any closed loop will also be equipped with a manual pot feeder. The package system supplier will install and integrate customer provided chemical control panel(s), including loop flow connections, interlocks with the system blow down valve(s), and flexible tubing connections from customer provided chemical pumps to the injection points. All blowdown valve controls will be implemented by a request to the system master control PLC; direct control by the chemical panel is not permitted. The system will also be supplied with sight tubes and no less than three corrosion coupon holders per loop. The chemical treatment area will include a SS slop sink with drain to waste and hot and cold potable water.
- D. The system will include a tempered eye wash and safety shower adjacent to the chemical storage area. The customer should provide at minimum a portable eye wash if hard piped eye wash and shower are not included. [GH5]

## 2.16 HVAC COMPONENTS

- A. Refer to Specification Section 23 3114 – Ductwork
- B. Refer to Specification Section 23 3314 – Ductwork Specialties
- C. Refer to Specification Section 23 3400 – Fans
- D. Refer to Specification Section 23 3713 – Diffusers, Registers and Grilles

- E. Refer to Specification Section 23 4114 – Filters
- F. Refer to Specification Section 23 8123 – Self-Contained Air Conditioning Units
- G. Refer to Specification Section 23 8214 – Heating and Cooling Terminal Devices
- H. Refer to Specification Section 23 8216 – Coils

## 2.17 WATER COOLED ELECTRIC CHILLER

- A. Refer to Specification Section 23 6100 – Primary Cooling Equipment

## 2.18 COOLING TOWERS

- A. Refer to Specification Section 23 6500 – Cooling Towers

## 2.19 THERMAL ENERGY STORAGE TANK

- A. Refer to Specification Section 23 7100 – Thermal Energy Storage Tank System

## 2.20 ELECTRICAL SYSTEMS

- A. Refer to Specification Division 26

## 2.21 LIGHTING SYSTEM

- A. Unit lighting is provided using 120VAC Philips Fluxstream LED lighting fixtures, a lighting analysis is performed to ensure that a minimum lighting supply of 28-foot candles per square foot.
- B. Interior emergency lighting shall be provided over each exit in the unit

- C. Exterior lighting shall be provided complete with motion detector sensors over each exit to the unit.

## 2.22 LIFE SAFETY SYSTEMS

- A. The sprinklers will include factory installed rough ins of mains and branch out piping, Sch. 10 threaded piping and are designed per NFPA 13. The design of the sprinkler system will be supplied by the customer or customer's site contractor.
- B. The smoke and fire alarm system will include factory installed conduit and end device box material only, per NFPA 72 Class B. Fire / Smoke alarm design supplied by others.

## PART 3 - EXECUTION

### 3.1 INSPECTION AND TESTING

- A. The entire plant will be factory assembled. All piping and electrical across shipping splits are to be connected in order to complete factory testing. The cooling towers will not be included in the factory assembly, but all tower piping will be included in factory assembly and testing up to the tower connection flanges. Testing includes:
  - 1. Pneumatic pressure test on the complete piping system.
  - 2. Electrical grounding test of the system. All medium voltage (460V) terminated loads are to be powered and tested. All low voltage (208V / 120V) internal loads are to be powered and tested.
  - 3. A bench test is provided and includes a point to point test after the controls are installed.
  - 4. When factory terminated, perform a pump rotation test for all pumps.
- B. Include all test data and reports as required by this section as part of the Operation and Maintenance manual, including:
  - 1. Vendor's Inspection and Test Report verifying compliance with this specification on an item by item basis.
  - 2. ETL label.
  - 3. Pneumatic pressure test results, per ASME B31.1
  - 4. Structural [and seismic] calculations.

### 3.2 SHIPPING PERPARATION

- A. All equipment and open pipes or nozzles shall be sealed to prevent entry of water, dirt or other foreign matter. Seals used in pips or nozzles shall not affect threads, weld preparation or flange faces. Each open side of the Packaged System shall be shrink wrapped with a minimum 10 mil plastic. All equipment and components shipped loose or on skids shall be properly packaged to withstand recommended method of shipment without damage. Each package shall be clearly labeled on the outside.
- B. Include a complete packing list and bill of material.
- C. Provide consumables required during the installation for all equipment furnished including, but not limited to, flange bolts, sheet metal screws, rubber roofing for unit splits, roofing glue and caulking.

END OF SECTION 236000



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FP-101	FIRE PROTECTION PLAN - CRAWL SPACE	11/10/2022		
FP-200	FIRE PROTECTION PLAN - LOWER LEVEL 01	11/10/2022		
FP-210	FIRE PROTECTION PLAN - LEVEL 01	11/10/2022		
FP-300	ENLARGED FIRE PROTECTION PLANS	11/10/2022		
FP-400	FIRE PROTECTION RISER DIAGRAM	11/10/2022		
FP-500	FIRE PROTECTION DETAILS	11/10/2022		
FP-501	FIRE PROTECTION DETAILS	11/10/2022		
P-000	PLUMBING SYMBOLS AND ABBREVIATIONS	11/10/2022		
P-100	PLUMBING UNDERGROUND PLAN	11/10/2022		
P-101	PLUMBING PLAN - CRAWL SPACE	11/10/2022		
P-200	PLUMBING PLAN - LOWER LEVEL 01	11/10/2022		
P-210	PLUMBING PLAN - LEVEL 01	11/10/2022		
P-220	PLUMBING PLAN - ROOF LEVEL	11/10/2022		
P-300	ENLARGED PLUMBING PLANS	11/10/2022		
P-301	ENLARGED PLUMBING PLANS - CHILLER MODULES	11/10/2022		
P-400	DOMESTIC WATER RISER DIAGRAMS	11/10/2022		
P-401	SANITARY AND VENT RISER DIAGRAM	11/10/2022		
P-402	STORM WATER RISER DIAGRAM	11/10/2022		
P-403	CHILLING MODULES PLUMBING RISER DIAGRAM	11/10/2022		
P-500	PLUMBING DETAILS	11/10/2022		
P-501	PLUMBING DETAILS	11/10/2022		

Sheet Number	Sheet Name	Sheet Issue Date	Current Revision Number	Revision Issue Date
P-600	PLUMBING SCHEDULES	11/10/2022		
M-000	MECHANICAL SYMBOLS & ABBREVIATIONS	11/10/2022		
M-100	MECHANICAL SITE PLAN	11/10/2022		
MD-200	MECHANICAL DUCT PLAN - LOWER LEVEL 01	11/10/2022		
MD-210	MECHANICAL DUCT PLAN - LEVEL 01	11/10/2022		
MP-200	MECHANICAL PIPE PLAN - LOWER LEVEL 01	11/10/2022		
MP-210	MECHANICAL PIPE PLAN - LEVEL 01	11/10/2022		
M-300	ENLARGED MECHANICAL PLANS - LOWER LEVEL MECHANICAL ROOM	11/10/2022		
M-500	MECHANICAL DETAILS	11/10/2022		
M-501	MECHANICAL DETAILS	11/10/2022		
M-502	MECHANICAL DETAILS	12/05/2022		
M-510	VRF SYSTEM DETAILS	11/10/2022		
M-511	VRF SYSTEM DETAILS	11/10/2022		
M-600	MECHANICAL SCHEDULES	11/10/2022		
M-601	MECHANICAL SCHEDULES	11/10/2022		
M-700	MECHANICAL INSTRUMENTATION SYMBOLS & ABBREVIATIONS	11/10/2022		
M-701	CONTROL NETWORK ARCHITECTURE	11/10/2022		
M-702	MAIN ELECTRICAL ROOM AND DATA HALL FLOW AND CONTROL DIAGRAM	11/10/2022		
M-703	DEDICATED OUTDOOR AIR SYSTEM FLOW AND CONTROL DIAGRAM	11/10/2022		
M-704	VRF SYSTEM FLOW AND CONTROL DIAGRAM	11/10/2022		
M-705	ELECTRICAL AND PLUMBING EQUIPMENT POINTS LISTS	11/10/2022		
M-706	DX AIR HANDLING UNIT FLOW AND CONTROL DIAGRAM	11/10/2022		
MEP-300	MEP SECTIONS	11/10/2022		
MEP-301	MEP RENDERINGS	11/10/2022		
MEP-302	MEP RENDERINGS	11/10/2022		
CP-000	CHILLER PLANT SYMBOLS & ABBREVIATIONS	11/10/2022		
CP-300	ENLARGED CHILLER PLANT PLANS - PUMP MODULE	11/10/2022		
CP-301	ENLARGED CHILLER PLANT PLANS - CHILLER MODULES INTERIOR	11/10/2022		
CP-302	ENLARGED CHILLER PLANT PLANS - CHILLER MODULES COOLING TOWERS	11/10/2022		
CP-500	CHILLER PLANT DETAILS	11/10/2022		
CP-503	CENTRAL CHILLER PLANT RENDERINGS	11/10/2022		
CP-600	CHILLER PLANT SCHEDULES	11/10/2022		
CP-700	CHILLER PLANT INSTRUMENTATION SYMBOLS & ABBREVIATIONS	11/10/2022		
CP-701	CHILLER PLANT PLC SYSTEM NETWORK ARCHITECTURE	11/10/2022		
CP-702	CHILLER PLANT POINTS LIST AND ALARM SCHEDULE	11/10/2022		
CP-703	CHILLER PLANT FLOW AND CONTROL DIAGRAM - PUMP MODULE	11/10/2022		
CP-704	CHILLER PLANT FLOW AND CONTROL DIAGRAM - CHILLER MODULE CHILLED WATER	11/10/2022		
CP-705	CHILLER PLANT FLOW AND CONTROL DIAGRAM - CHILLER MODULE CONDENSER & PROCESS CHILLED WATER	11/10/2022		
E-000	ELECTRICAL SYMBOLS AND ABBREVIATIONS	11/10/2022		
E-400	SINGLE LINE DIAGRAM - MASTERPLAN	11/10/2022		
E-401	SINGLE LINE DIAGRAM - EQUIPMENT YARD	11/10/2022	01	12/5/2022
E-402	SINGLE LINE DIAGRAM - HPCC DISTRIBUTION SYSTEM	11/10/2022		
E-403	SINGLE LINE DIAGRAM - MECHANICAL DISTRIBUTION SYSTEM	11/10/2022		
E-404	GROUNDING RISER DIAGRAM	11/10/2022		
E-500	ELECTRICAL DETAILS	11/10/2022		
E-501	ELECTRICAL DETAILS	11/10/2022		
E-502	ELECTRICAL DETAILS	11/10/2022		
E-503	ELECTRICAL DETAILS	11/10/2022		
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E-600	LIGHTING FIXTURE SCHEDULE	11/10/2022		
E-601	ELECTRICAL EQUIPMENT ELEVATIONS & SCHEDULES	11/10/2022		
E-602	ELECTRICAL EQUIPMENT ELEVATIONS & SCHEDULES	11/10/2022		
E-603	ELECTRICAL EQUIPMENT ELEVATIONS & SCHEDULES	11/10/2022		
E-604	ELECTRICAL EQUIPMENT SCHEDULES - CHILLER MODULES	11/10/2022		
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E-606	ELECTRICAL EQUIPMENT SCHEDULES - HPC 1	11/10/2022		
E-607	ELECTRICAL EQUIPMENT SCHEDULES - HPC 2	11/10/2022		
E-608	ELECTRICAL EQUIPMENT SCHEDULES - UPS SYSTEM	11/10/2022		
E-609	ELECTRICAL EQUIPMENT SCHEDULES - BUILDING PANELS	11/10/2022	01	12/5/2022
E-610	ELECTRICAL EQUIPMENT SCHEDULES	11/10/2022		
EG-100	ELECTRICAL GROUNDING SITE PLAN	11/10/2022		
EG-200	LIGHTNING PROTECTION PLAN	11/10/2022		
EL-100	LIGHTING SITE PLAN	11/10/2022		
EL-200	LIGHTING PLAN - LOWER LEVEL 01	11/10/2022		
EL-210	LIGHTING PLAN - LEVEL 01	11/10/2022	01	12/5/2022
EL-400	ENLARGED LIGHTING PLANS - LOWER LEVEL 01	11/10/2022		
EO-200	OVERHEAD RACEWAY PLAN - LOWER LEVEL 01	11/10/2022		
EP-200	POWER PLAN - LOWER LEVEL 01	11/10/2022		
EP-210	POWER PLAN - LEVEL 01	11/10/2022	01	12/5/2022
EP-400	ENLARGED POWER PLANS - LOWER LEVEL 01	11/10/2022		
EP-410	ENLARGED POWER PLANS - LEVEL 01	11/10/2022		
EU-100	POWER SITE PLAN & ELECTRICAL YARD UNDERGROUND PLAN	11/10/2022		
EU-200	ELECTRICAL UNDERGROUND RACEWAY PLAN	11/10/2022		
EU-210	ELECTRICAL CRAWL SPACE RACEWAY PLAN	11/10/2022		
T-000	TECHNOLOGY SYSTEMS SYMBOLS AND ABBREVIATIONS	11/10/2022		
T-001	TECHNOLOGY SCHEDULES AND NOTES	11/10/2022		
T-100	TECHNOLOGY SITE PLAN	11/10/2022		
T-200	TECHNOLOGY SYSTEMS PLAN - LOWER LEVEL 01	11/10/2022		
T-210	TECHNOLOGY SYSTEMS PLAN - LEVEL 01	11/10/2022		
TO-200	TECHNOLOGY OVERHEAD RACEWAYS	11/10/2022		
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TS-200	SECURITY SYSTEMS PLAN - LOWER LEVEL 01	11/10/2022		
TS-210	SECURITY SYSTEMS PLAN - LEVEL 01	11/10/2022		
T-400	TECHNOLOGY SYSTEMS ENLARGED PLANS	11/10/2022		
T-500	TECHNOLOGY SYSTEMS DETAILS	11/10/2022		
T-501	TECHNOLOGY SYSTEMS DETAILS	11/10/2022		
T-502	SECURITY SYSTEMS DETAILS	11/10/2022		
T-503	SECURITY SYSTEMS DETAILS	11/10/2022		
T-600	TECHNOLOGY SYSTEMS RISER DIAGRAMS	11/10/2022		

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G-001

DRAWING INDEX



GENERAL NOTES

- A. REFER TO SHEET G-011 FOR SYMBOLS.  
B. ALL PARTITION TYPES TO BE D1" U.N.O.  
C. MAINTAIN 6" CLEARANCE BETWEEN EDGE OF DOOR FRAME & INTERSECTING PARTITION, U.N.O.  
D. DIMENSIONS AND ALIGNMENTS ARE FROM FACE OF FINISH TO FACE OF FINISH. PROVIDE FURRING AS NECESSARY TO ACHIEVE ALIGNMENTS SHOWN.  
E. VERIFY DIMENSIONS NOTED "CLEAR", "HOLD", "MIN", OR "V.I.F." DURING LAYOUT OF WORK. NOTIFY ARCHITECT OF DISCREPANCIES PRIOR TO PROCEEDING.  
F. PROVIDE BLOCKING IN ALL PARTITIONS TO ACCOMMODATE MILLWORK INSTALLATIONS & OTHER WALL & CEILING HUNG ELEMENTS AS REQUIRED. REFER TO FURNITURE PLANS TO COORDINATE LOCATION OF OVERHEAD UNITS.  
H. PROVIDE MOISTURE AND MOLD RESISTANT TYPE GYP. BD. AT ALL WET AREAS SCHEDULED.  
J. FIRESAFE ALL FLOOR OPENINGS TO MEET PROPER FIRE-RATING AT STRUCTURAL FLOORS. MAINTAIN FIRE RATING WHERE PENETRATIONS OCCUR AT RATED ASSEMBLIES.  
K. ALL DOWNSPOUT BOOTS TO TIE INTO SUBGRADE DRAINAGE, REF. CIVIL.  
L. DIMENSIONS FROM COLUMN GRID LINE TO EXTERIOR FACE OF STUD AT EXTERIOR WALLS IS TYPICALLY 1'-2" UNLESS NOTED OTHERWISE.  
M. WHERE STRUCTURAL BEAMS/TRUSSES OR OTHER ELEMENTS PENETRATE WALLS, SEAL TIGHTLY AROUND THE STRUCTURAL FRAMING USING EITHER SPRAY FOAM OR ACOUSTICAL SEALANT TO ENSURE A SOUND PROOF, AIR TIGHT SEAL WHERE ELEMENTS ARE VISIBLE. ACOUSTICAL SEALANT IS TO BE USED AND CLEANLY INSTALLED.  
N. FURNITURE IS OWNER PROVIDED. COORDINATE ELECTRICAL DATA CONNECTIONS AS REQUIRED, REF. ELECTRICAL.

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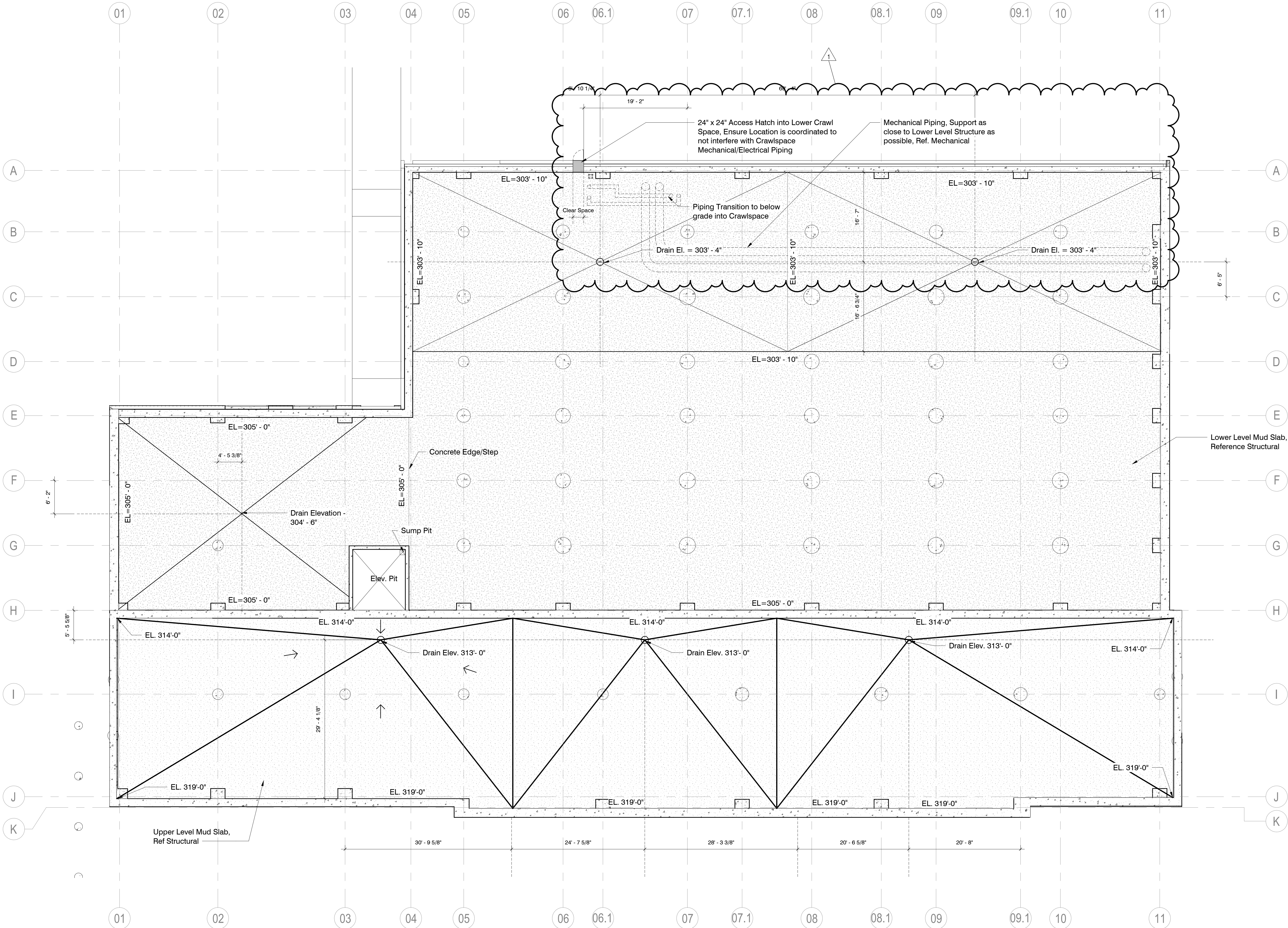
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A-003

CRAWL SPACE PLAN



1 CONSTRUCTION PLAN - Crawl Space Plan  
1/8" = 1'-0"



- A. CENTER GRID AND TILE IN ROOMS AS SHOWN.
- B. COORDINATE WINDOW MOTORIZED ROLLER SHADES WITH ELECTRICAL
- C. ALL EXPOSED ELECTRICAL/MECHANICAL/PLUMBING EXPOSED STRUCTURE TO BE PAINTED AS DIRECTED BY THE ARCHITECT
- D. GO TO CLEAN ALL DEBRIS FROM THE PLENUM SPACE ABOVE CEILING IN ALL AREAS, NO TRASH, MATERIALS ETC., TO BE LEFT ABOVE THE CEILING
- E. REFERENCE ELECTRICAL AND TECHNOLOGY DRAWINGS
- F. GO TO ENSURE ALL LIGHT FIXTURES INSTALLATION COMPONENTS INCLUDING ANY ADDITIONAL CEILING SUSPENSION SYSTEMS ARE INCLUDED IN THEIR SCOPE OF WORK TO FULLY COMPLETE THE LIGHTING DESIGN ILLUSTRATED IN THE DRAWINGS

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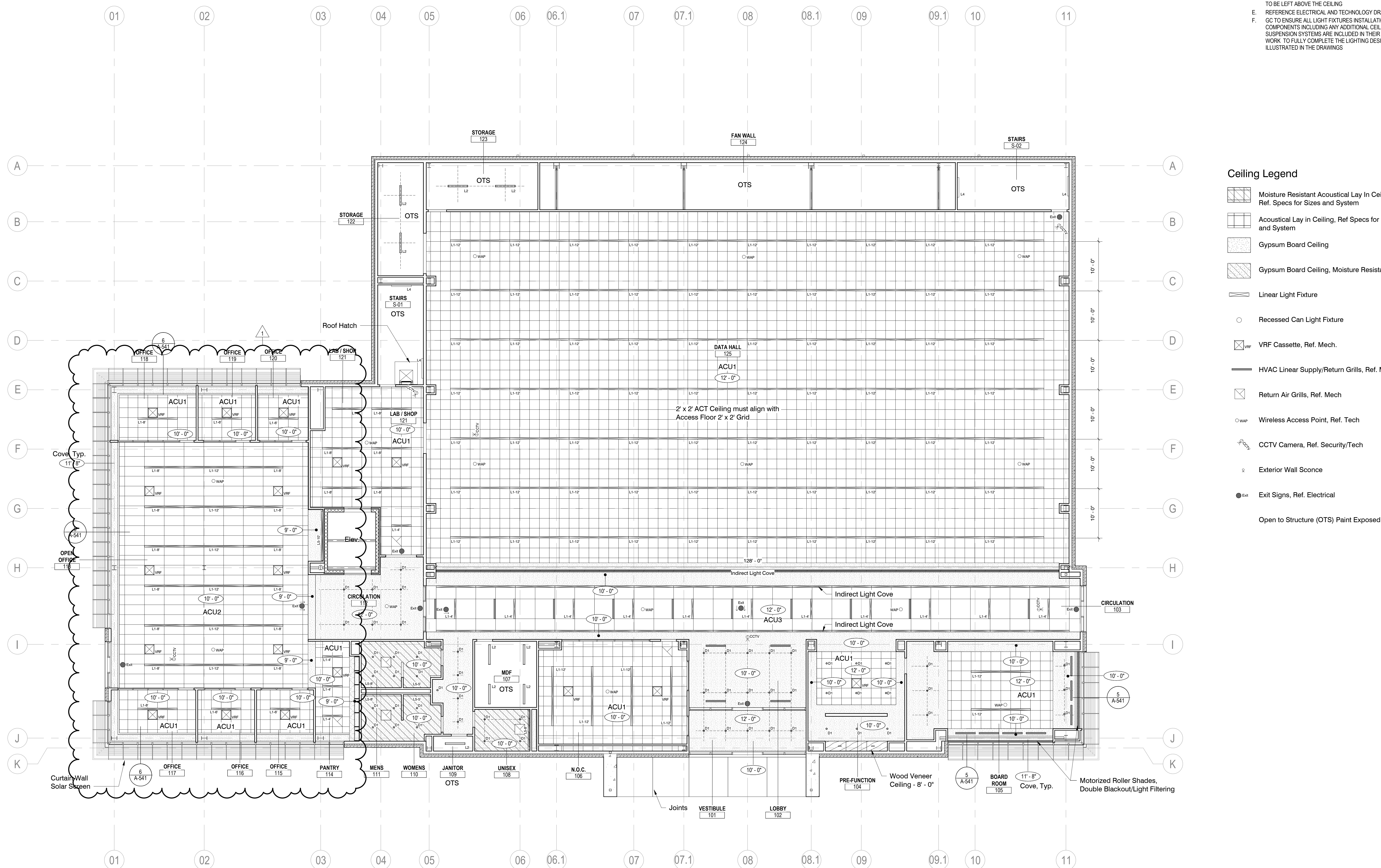


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Construction Documents

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Revisions	Rev D.
1	12/05/20

A-042  
REFLECTED CEILING  
PLAN - LEVEL 01



01 REFLECTED CEILING PLAN - LEVEL 01  
1/8" = 1'-0"

GENERAL NOTES:  
1. NORMAL LIGHTING ON THIS SHEET IS SERVED BY  
PANEL BNH1, UNLESS NOTED OTHERWISE.  
2. EMERGENCY LIGHTING ON THIS SHEET IS SERVED BY  
PANEL BEH1, UNLESS NOTED OTHERWISE.

**SHEET NOTES**  
66 SWITCH FOR ROLLER SHADE OPERATION.

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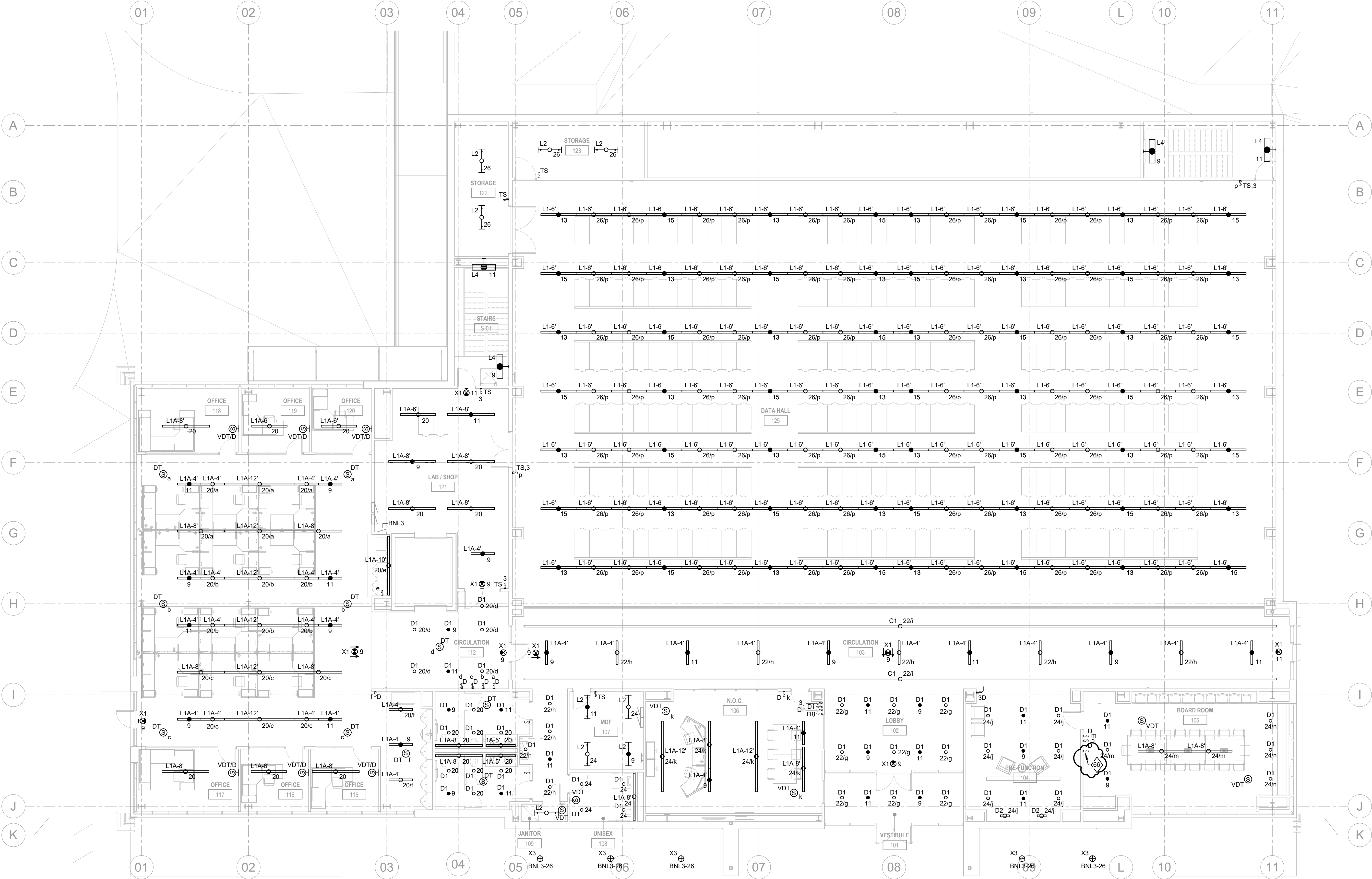
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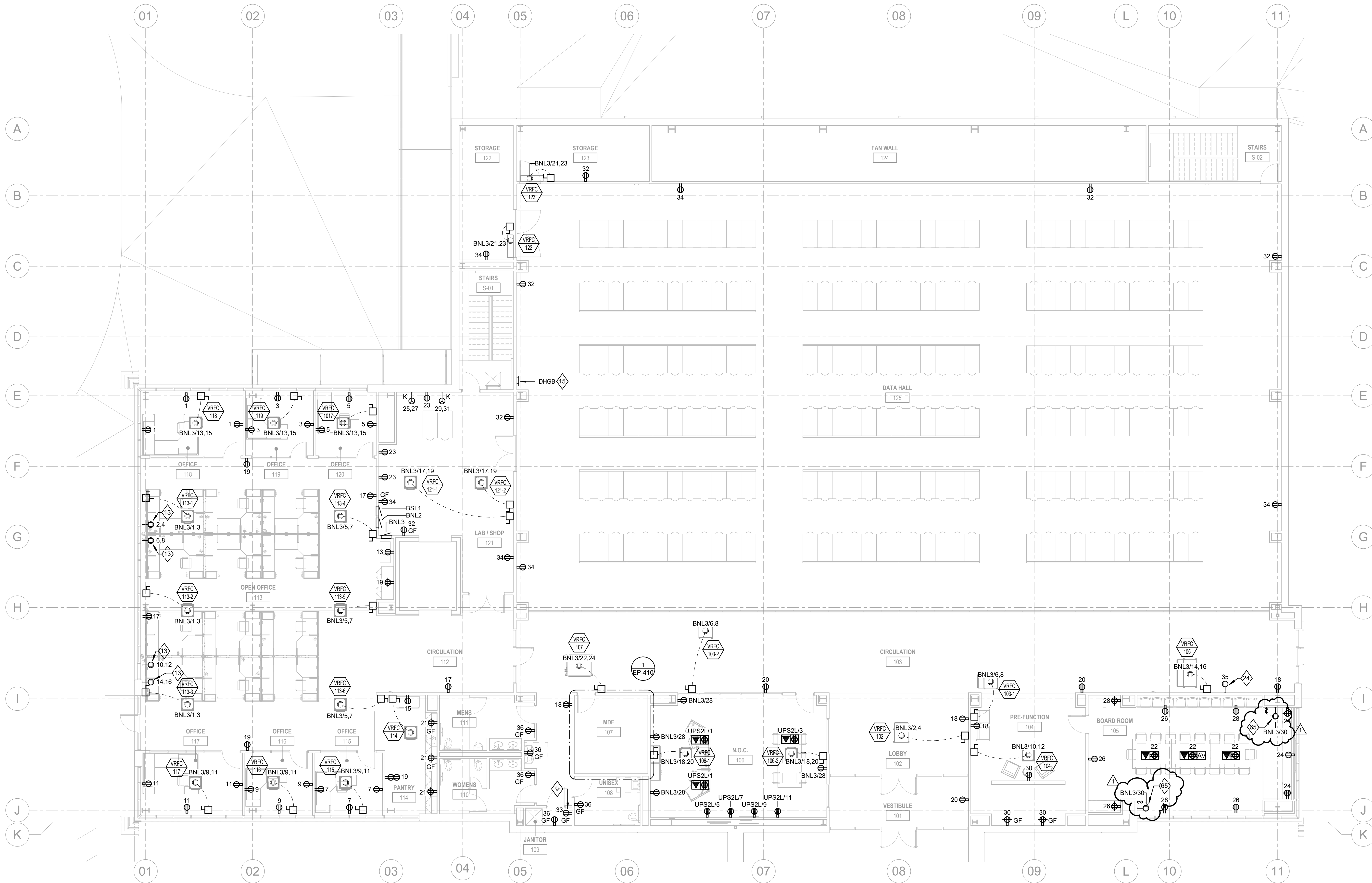
EL-210

LIGHTING PLAN - LEVEL  
01



**1 LEVEL 01 - ELECTRICAL LIGHTING PLAN**  
SCALE: 1/8" = 1'-0"  
0 4' 8' 16'  
SCALE: 1/8" = 1'-0"





**1 LEVEL 01 - ELECTRICAL POWER PLAN**  
SCALE: 1/8" = 1'-0"  
0 4' 8' 16'  
SCALE: 1/8" = 1'-0"

- GENERAL NOTES:**
1. NORMAL POWER RECEPTACLES ON THIS SHEET ARE SERVED BY PANEL BNL2, UNLESS NOTED OTHERWISE.
  2. DISCONNECT SWITCHES FOR VRF CASSETTES SHALL BE LOCATED ABOVE ACCESSIBLE CEILING NEAREST THE ASSOCIATED CASSETTE. COORDINATE EXACT LOCATION WITH ABOVE-CEILING UTILITIES.
  3. COORDINATE THE FINAL AV EQUIPMENT LOCATIONS AND MOUNTING HEIGHTS WITH THE OWNER PRIOR TO ROUGH-IN.

- SHEET NOTES**
- 9 TRAP PRIMER: COORDINATE EXACT LOCATION AND ELEVATION WITH OTHER TRADES PRIOR TO ROUGH-IN.
  - 13 PRE-WIRED FURNITURE CONNECTION. PROVIDE DEDICATED NEUTRALS FOR EACH CIRCUIT. CIRCUIT BREAKERS SERVING A SINGLE FURNITURE CONNECTION SHALL BE MECHANICALLY LINKED.
  - 15 GROUND BAR LOCATED BENEATH RAISED ACCESS FLOOR.
  - 24 PROVIDE DEDICATED 120V CIRCUIT FOR AV WALL: COORDINATE EXACT MOUNTING LOCATION AND ELEVATION WITH OTHER TRADES PRIOR TO ROUGH-IN.
  - 65 PROVIDE 120V CONNECTION TO ROLLER SHADE MOTOR VIA LOCAL DISCONNECT SWITCH. PROVIDE ALL REQUIRED POWER AND CONTROL WIRING CONNECTIONS PER MANUFACTURER'S SHOP DRAWINGS AND INSTALLATION INSTRUCTIONS.

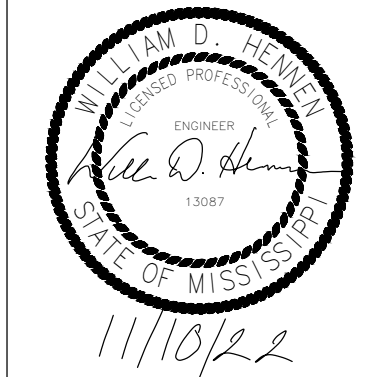
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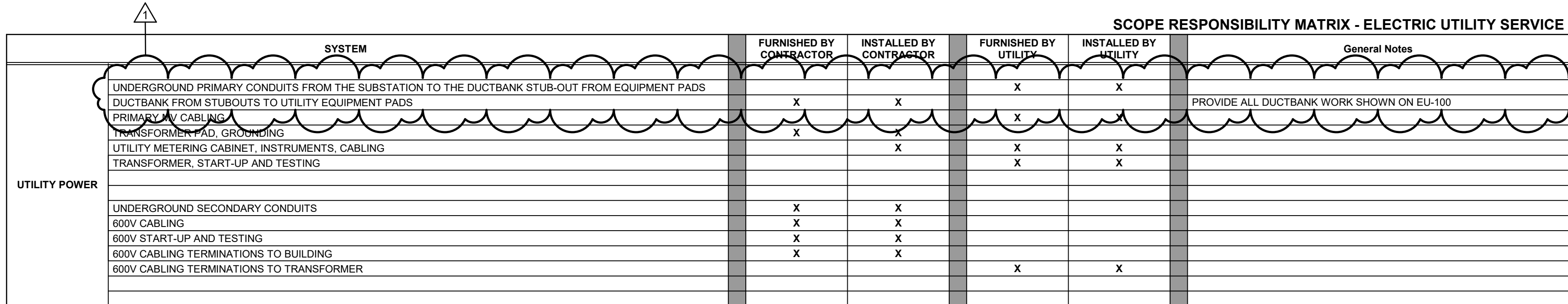
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EP-210

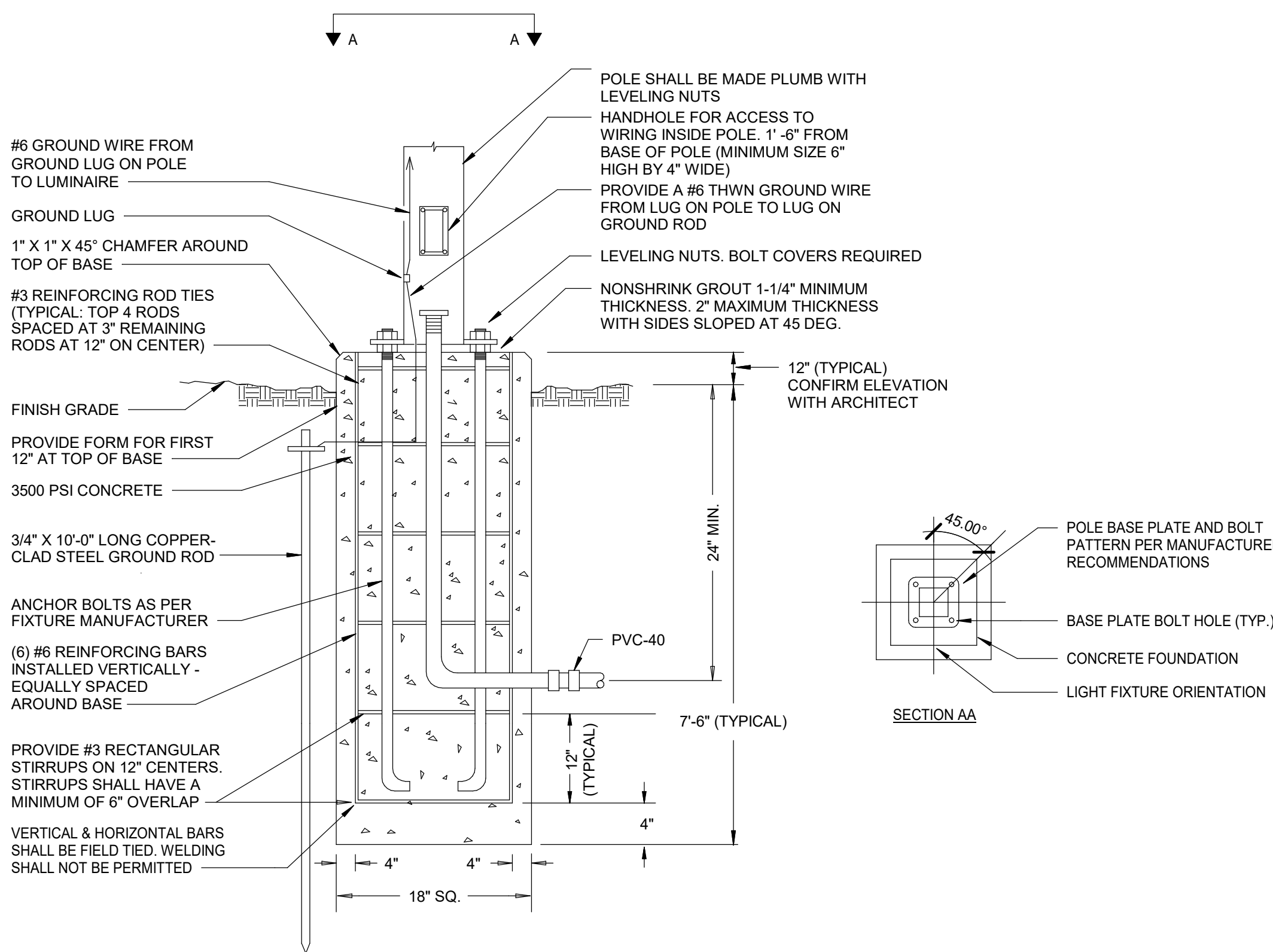
POWER PLAN - LEVEL 01



Cu FEEDER SCHEDULE - 3 WIRE AND GROUND						
FEEDER TAG	# OF SETS	CURRENT CARRYING CONDUCTORS	GROUND CONDUCTOR	CONDUIT SIZE	FEEDER AMPACITY	COMMENTS
80 - 3	1	3 #2	1 #8	1-1/4"	95	

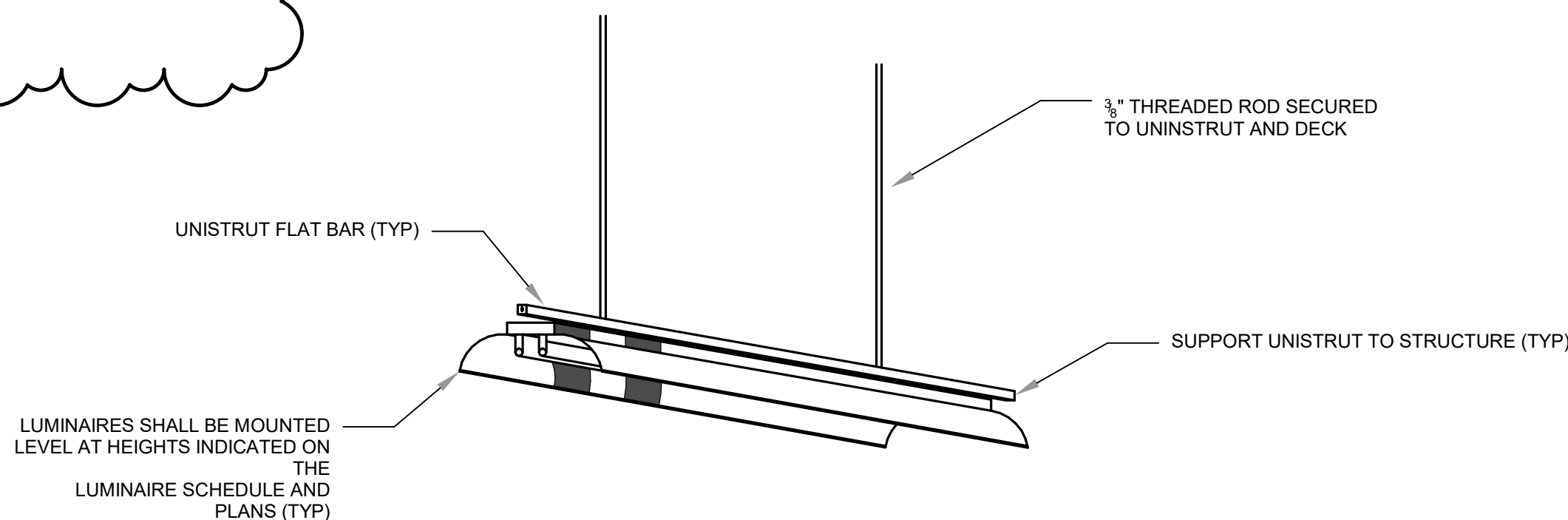
Cu FEEDER SCHEDULE - 4 WIRE AND GROUND						
FEEDER TAG	# OF SETS	CURRENT CARRYING CONDUCTORS	GROUND CONDUCTOR	CONDUIT SIZE	FEEDER AMPACITY	COMMENTS
3000 - 4	8	4 # 500 KCMIL	1 # 400 KCMIL	4"	3040	PROVIDE (1) ADDITIONAL SPARE CONDUIT

Cu FEEDER SCHEDULE - SERVICES							
FEEDER TAG	# OF SETS	CURRENT CARRYING CONDUCTORS	GROUND CONDUCTOR	CONDUIT SIZE	FEEDER AMPACITY	GEC	COMMENTS
3000 - S	8	4 # 500 KCMIL	-	4"	3040	1 # 3/0	PROVIDE (1) ADDITIONAL SPARE CONDUIT

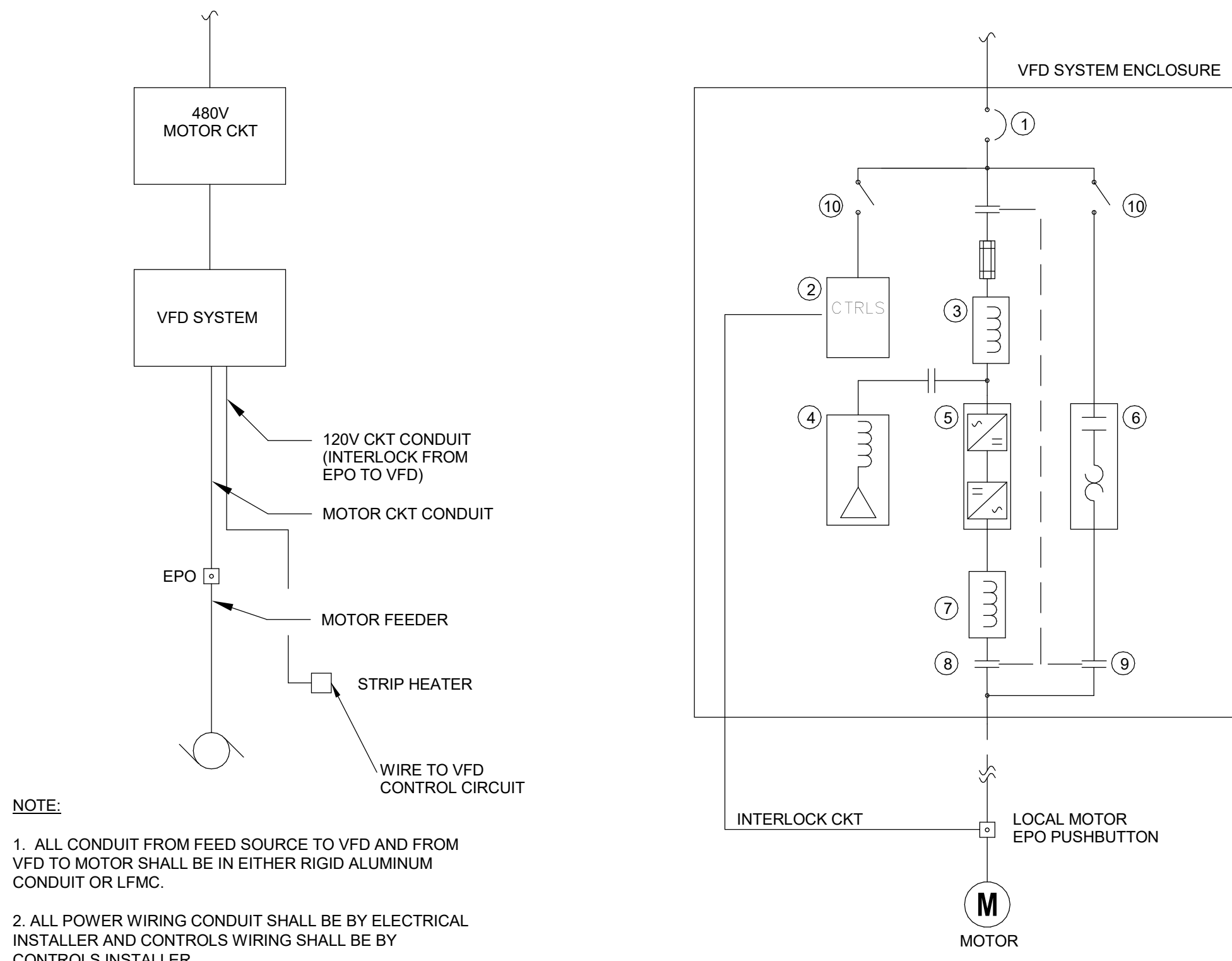


- NOTES:**
- FOUNDATION EXCAVATION SHALL BE BY 24\"/>

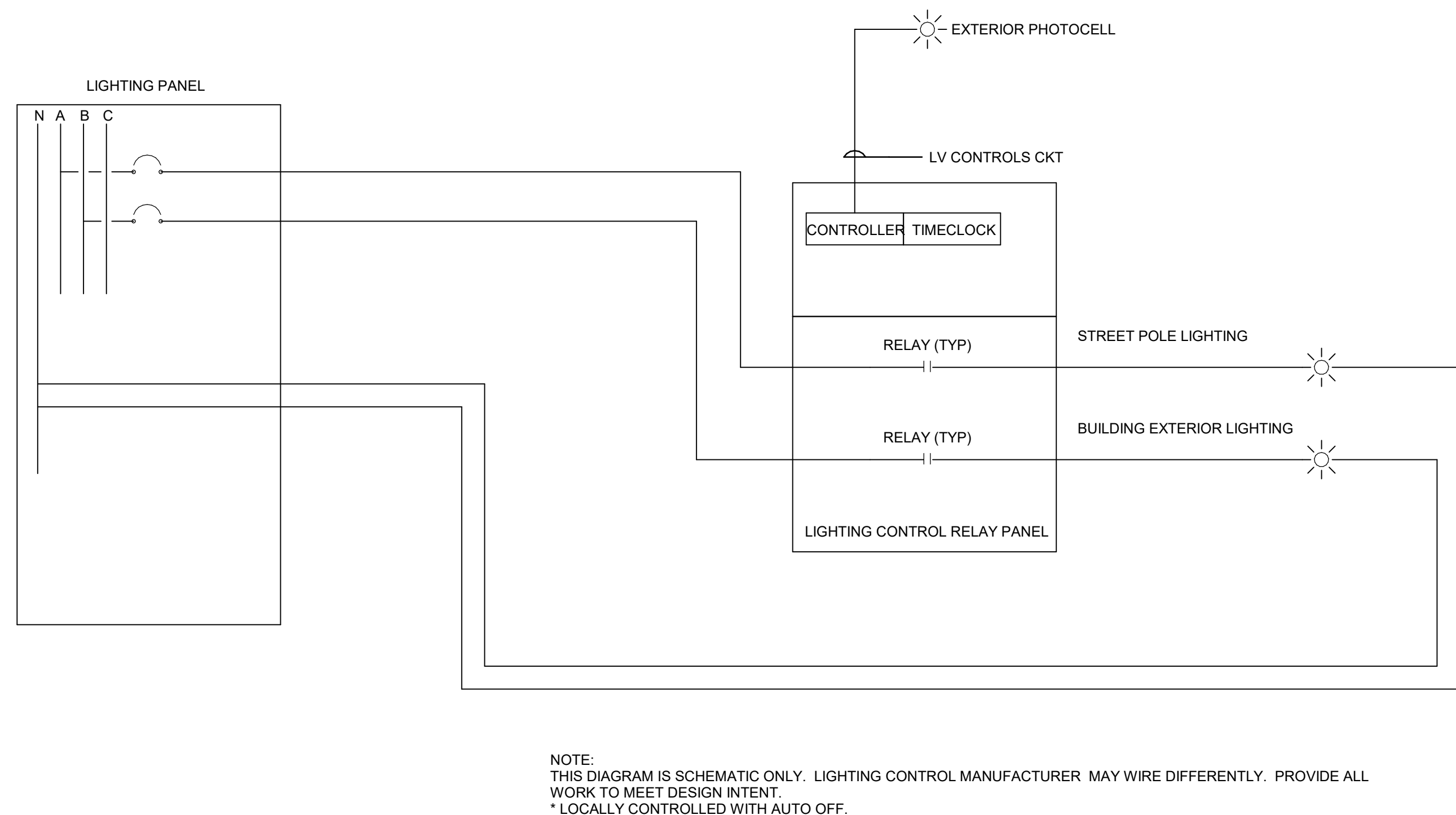
**6 CONCRETE POLE BASE DETAIL**  
SCALE: NOT TO SCALE



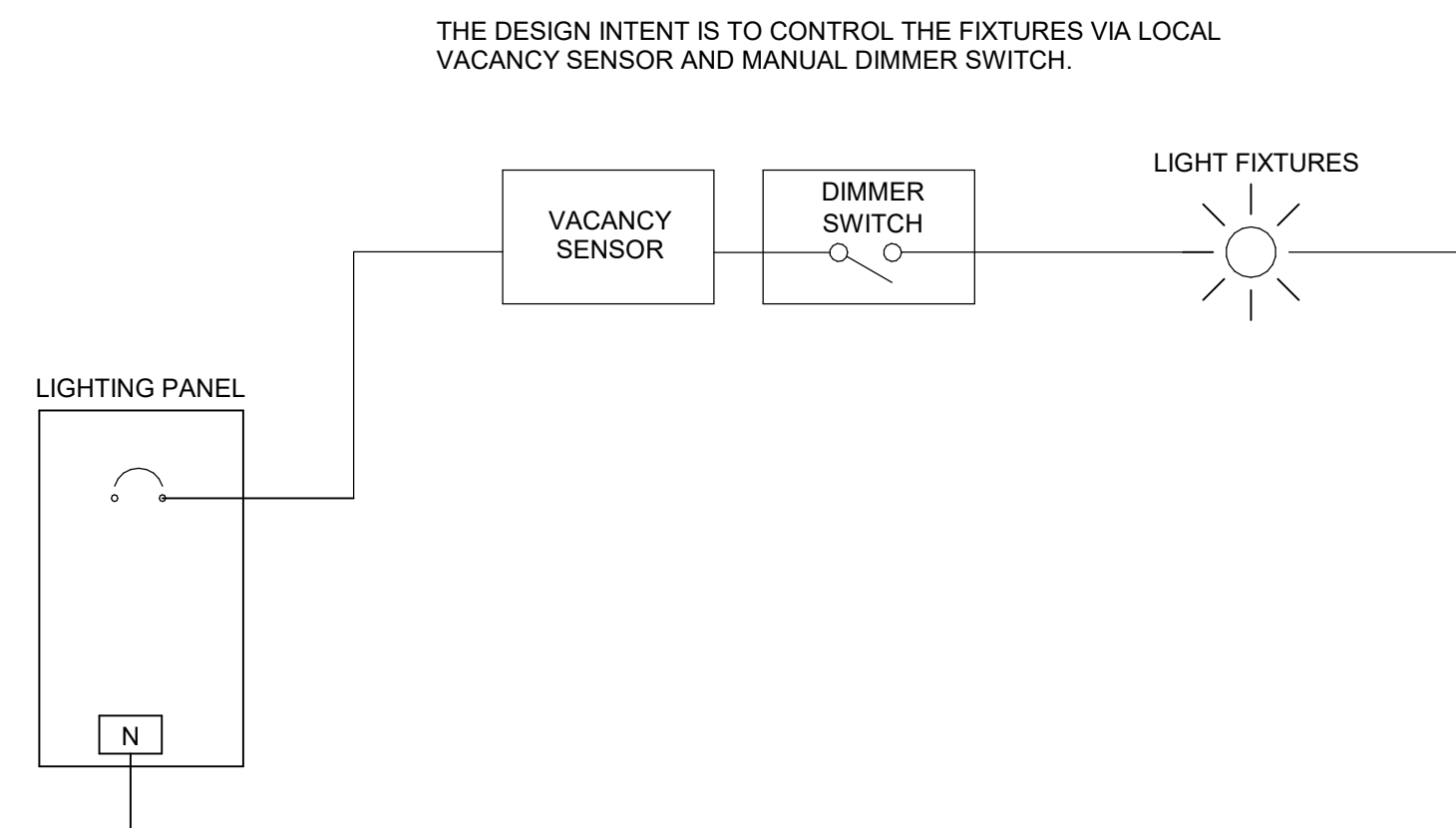
**4 STRIP FIXTURE INSTALLATION**  
SCALE: NOT TO SCALE



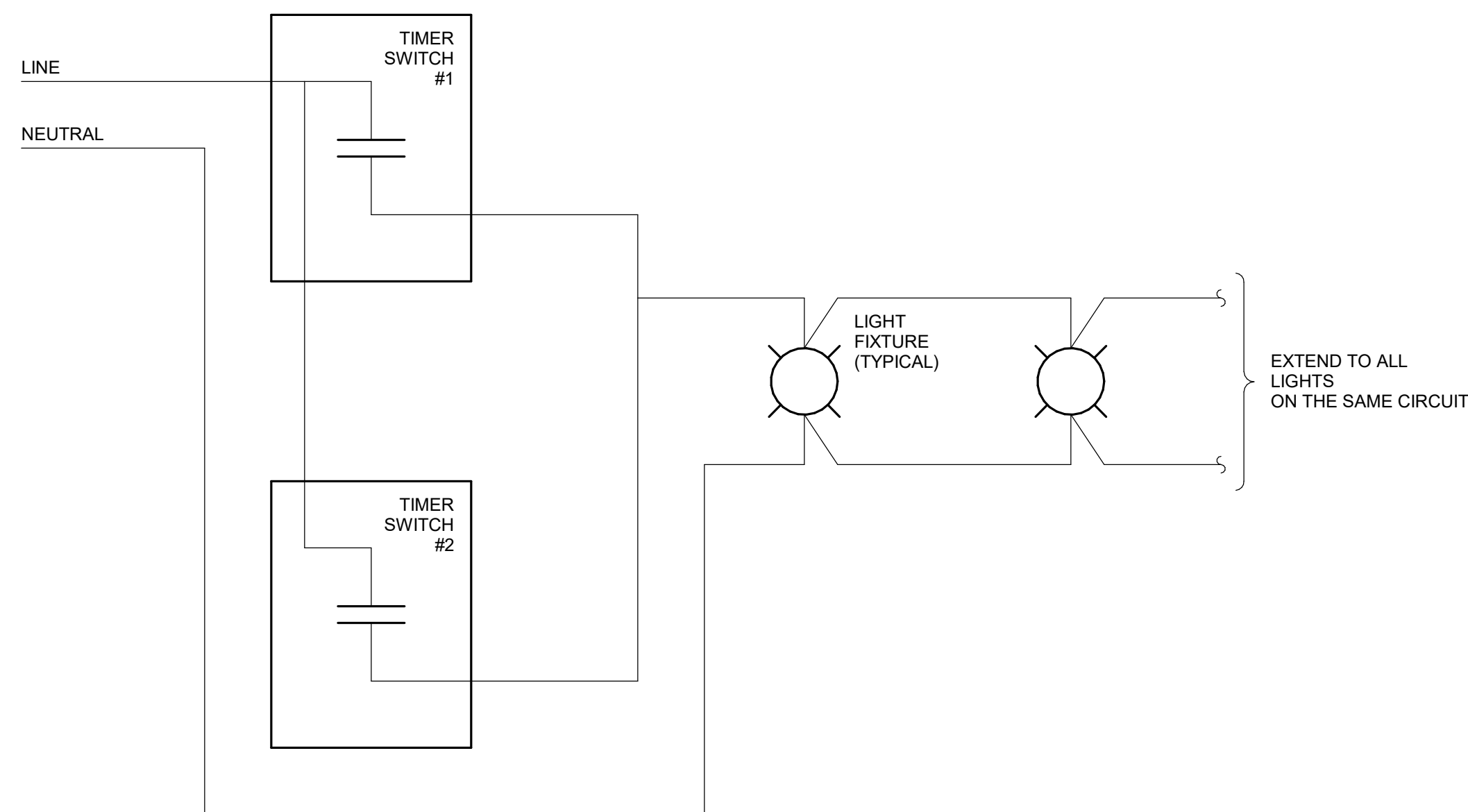
**5 VFD SYSTEM WIRING/CONDUIT DIAGRAM**  
SCALE: NOT TO SCALE



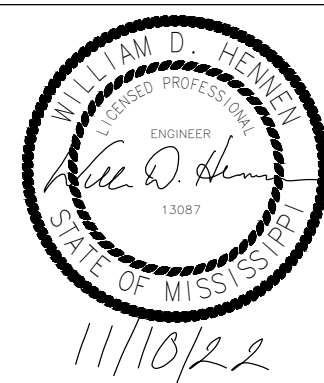
**1 EXTERIOR LIGHTING CONTROL SYSTEM DIAGRAM**  
SCALE: NOT TO SCALE



**2 OFFICE LIGHTING CONTROL DIAGRAM**  
SCALE: NOT TO SCALE



**3 THREE-WAY ROTARY TIMER SWITCH WIRING DIAGRAM**  
SCALE: NOT TO SCALE



MAIN TYPE

MCB

MAIN RATING

125 A

BUS RATING

400 A

VOLTAGE

480/277 Wye

3 PHASE

4 WIRE

MOUNTING

Surface

ENCLOSURE

Type 1

LOCATION

LOWER LEVEL-E-POWER EQUI...

FED FROM

ATS EM

SCCR

42 kA

CALCULATED AVAILABLE FAULT...

31.9 kA

REMARKS: NEC 700 EMERGENCY PANEL - ALL BREAKERS MUST SELECTIVELY COORDINATE TO 0.1S

		LEFT SIDE, kVA				RIGHT SIDE, kVA							
DESCRIPTION	BRKR NOTES	BRKR AMP. POLES	CKT NO	A	B	C	A	B	C	CKT NO	BRKR AMP. POLES	BRKR NOTES	DESCRIPTION
EM EGRESS LTG LOWER LEVEL		20 A	1	0.76		0.41				2	1	20 A	EM EGRESS LTG CHILLER MODULES
EM EGRESS LTG LOWER LEVEL		20 A	1	3	0.71			0.41		4	1	20 A	EM EGRESS LTG CHILLER MODULES
EM EGRESS LTG EXTERIOR		20 A	1	5		0.16							
EM EGRESS LTG EXTERIOR		20 A	1	7	0.12								
EM EGRESS LTG LEVEL 1		20 A	1	9		0.89							
EM EGRESS LTG LEVEL 1		20 A	1	11		0.84							
EM EGRESS LTG DATA HALL		20 A	1	13	0.22								
EM EGRESS LTG DATA HALL		20 A	1	15	0.22								
				17									
				19									
				21									
				23									
				25									
				27									
				29									
				31									
				33									
				35									
Space	--	1	37	--		2.50				36	3	50 A	T-BEL1
Space	--	1	39	--	--		2.00			40	--	--	--
Space	--	1	41	--	--			2.00		42	--	--	--

TOTAL PHASE SUMMARY

	A	B	C
PHASE SUBTOTAL (kVA):	4.01	4.22	3.0
PHASE SUBTOTAL (AMPS):	15 A	16 A	11 A

LOAD CLASSIFICATION	CONNECTED (KVA)	DEMAND FACTOR	DEMAND (KVA)
POWER	3.50 kVA	100%	3.75 kVA
LIGHTING	4.73 kVA	125%	5.91 kVA
MOTOR	0.00 kVA	125% LARGEST, 100% OTHER	0.00 kVA
RECEPTACLE	3.00 kVA	100% FIRST 10kVA, 50% OTHER	3.00 kVA
HEATING	0.00 kVA	125%	0.00 kVA
TOTAL LOAD	11.23 kVA		12.66 kVA
TOTAL AMPS	14 A		15 A

MAIN TYPE

MCB

MAIN RATING

100 A

BUS RATING

100 A

VOLTAGE

120/208 Wye

3 PHASE

4 WIRE

MOUNTING

Surface

ENCLOSURE

Type 1

LOCATION

LOWER LEVEL-E-POWER EQUI.

FED FROM

T-BEL1

SCCR

10 kA

CALCULATED AVAILABLE FAULT...

1.99 kA

REMARKS:

NEC 700 EMERGENCY PANEL - ALL BREAKERS MUST SELECTIVELY COORDINATE TO 0.1S

"BL" IN BRKR NOTES COLUMN INDICATES A BREAKER LOCK SHALL BE PROVIDED

LEFT SIDE, kVA

RIGHT SIDE, kVA

DESCRIPTION	BRKR NOTES	BRKR AMP. POLES	CKT NO	A	B	C	A	B	C	CKT NO	BRKR AMP. POLES	BRKR NOTES	DESCRIPTION	
ELEVATOR CAB LIGHTS		20 A	1	0.50		1.00				2	1	20 A	BL	VESDA CONTROL PANEL - RMM008
			3					1.00		4	1	20 A	BL	FATC - RMM006
			5						1.00	6	1	20 A	BL	FABPS - RMM006
			7			1.00				8	1	20 A	BL	FACP - RMM107
			9					1.00		10	1	20 A	BL	DACT - RMM107
			11					1.00	12	1	20 A	BL	FABPS - RMM107	
			13							14				
			15							16				
			17							18				
			19							20				
			21							22				
			23							24				
			25							26				
			27							28				
			29							30				
			31							32				
			33							34				
			35							36				
			37							38				
			39							40				
			41							42				

TOTAL PHASE SUMMARY

	A	B	C
PHASE SUBTOTAL (kVA)	2.50	2.00	2.0
PHASE SUBTOTAL (AMPS)	21 A	17 A	17 A

LOAD CLASSIFICATION	CONNECTED (KVA)	DEMAND FACTOR	DEMAND (KVA)
POWER	3.50 kVA	100%	3.75 kVA
LIGHTING	0.00 kVA	125%	0.00 kVA
MOTOR	0.00 kVA	125% LARGEST, 100% OTHER	0.00 kVA
RECEPTACLE	3.00 kVA	100% FIRST 10kVA, 50% OTHER	3.00 kVA
HEATING	0.00 kVA	125%	0.00 kVA
TOTAL LOAD	6.50 kVA		6.75 kVA
TOTAL AMPS	18 A		19 A

MAIN TYPE

MCB

MAIN RATING

100 A

BUS RATING

100 A

VOLTAGE

120/208 Wye

3 PHASE

4 WIRE

MOUNTING

Recessed

ENCLOSURE

Type 1

LOCATION

FED FROM

LEVEL 01 LAB / SHOP 121

BNL1

SCCR

10 kA

CALCULATED AVAILABLE FAULT...

3.2 kA

REMARKS:

LEFT SIDE, kVA														RIGHT SIDE, kVA													
DESCRIPTION	BRKR NOTES	BRKR AMP. POLES	CKT NO	A	B	C	A	B	C	CKT NO	BRKR AMP. POLES	BRKR NOTES	DESCRIPTION														
VRFC - 113-1, 113-2 & 113-3	--	15 A	2	1	0.09			0.18		2	2 15 A	--	VRFC - 102														
	--	--	3		0.09				0.18	4	--	--															
VRFC - 113-4, 113-5 & 113-6	--	15 A	2	5		0.09			0.36	6 2 15 A	--	VRFC - 103-1 & 2															
	--	--	7	0.09				0.36		8	--	--															
VRFC - 115, 116 & 117	--	15 A	2	9		0.10			0.05	10 2 15 A	--	VRFC - 104															
	--	--	11					0.10	0.05	12	--	--															
VRFC - 118, 119 & 120	--	15 A	2	13	0.09		0.47			14 2 15 A	--	VRFC - 105															
	--	--	15	0.09			0.47			16	--	--															
VRFC - 121-1 & 121-2	--	15 A	2	17		0.06		0.36	0.36	18 2 15 A	--	VRFC - 106-1 & 2															
	--	--	19	0.06			0.36			20	--	--															
VRFC - 122 & 123	--	15 A	2	21		0.06			0.80	22 2 15 A	--	VRFC - 107															
	--	--	23						0.80	24	--	--															
Spare		20 A	1	25	0.00			0.08		26 1 20 A		EXTERIOR FACADE LTG															
Spare		20 A	1	27	0.00			0.72		28 1 20 A		REC - RM RM105															
Spare		20 A	1	29		0.00			0.50	30 1 20 A		ROLLER SHADES - RM105															
Spare		20 A	1	31	0.00			0.00		32 1 20 A																	
Spare		20 A	1	33	0.00			0.00		34 1 20 A																	
Spare		20 A	1	35		0.00			0.00	36 1 20 A		Spare															
Space	--	1	37	--						38 1	--	Space															
Space	--	1	39	--						40 1	--	Space															
Space	--	1	41	--						42 1	--	Space															

TOTAL PHASE SUMMARY

A

B

C

PHASE SUBTOTAL (kVA):

1.78

2.55

2.3

PHASE SUBTOTAL (AMPS):

15 A

22 A

21 A

LOAD CLASSIFICATION	CONNECTED (KVA)	DEMAND FACTOR	DEMAND (KVA)
POWER	0.00 kVA	100%	0.00 kVA
LIGHTING	0.08 kVA	125%	0.09 kVA
MOTOR	5.40 kVA	125% LARGEST, 100% OTHER	5.80 kVA
RECEPTACLE	1.22 kVA	100% FIRST 10kVA, 50% OTHER	1.22 kVA
HEATING	0.00 kVA	125%	0.00 kVA
TOTAL LOAD	6.70 kVA		7.11 kVA
TOTAL AMPS	19 A		20 A

BSH1

MAIN TYPE		MCB	VOLTAGE		480/277 Wye	LOCATION		LOWER LEVEL
MAIN RATING		250 A	3 PHASE		4 WIRE	FED FROM		T-BSH1
BUS RATING		250 A	MOUNTING		Surface	SCCR		14 kA
			ENCLOSURE		Type 1	CALCULATED AVAILABLE FAULT...		2.23 kA

REMARKS: "ST" = CIRCUIT BREAKER EQUIPPED WITH SHUNT TRIP CAPABILITY.

LEFT SIDE, kVA												RIGHT SIDE, kVA											
DESCRIPTION	BRKR NOTES	BRKR AMP. POLES	CKT NO	A	B	C	A	B	C	CKT NO	BRKR AMP. POLES	BRKR NOTES	DESCRIPTION										
ELEVATOR CONTROLLER	ST	80 A	3	1	11.10				5.32	2	3	25 A	MFW - 1										
--	--	--	--	3			11.10			5.32	4	--	--										
--	--	--	--	5			11.10			5.32	6	--	--										
WSHP-3		60 A	3	7	7.98				0.00	8	3	25 A	Spare										
--	--	--	--	9			7.98			0.00	10	--	--										
--	--	--	--	11						0.00	12	--	--										
Spare		20 A	1	13	0.00				5.32	14	3	25 A	MFW - 3										
Spare		20 A	1	15		0.00			5.32	16	--	--	--										
Spare		20 A	1	17			0.00		5.32	18	--	--	--										
Space	--	1	19	--	--	--			0.00	20	3	25 A	Spare										
Space	--	1	21	--	--	--			0.00	22	--	--	--										
Space	--	1	23	--	--	--			0.00	24	--	--	--										
Space	--	1	25	--	--	--			0.00	26	3	25 A	Spare										
Space	--	1	27	--	--	--			0.00	28	--	--	--										
Space	--	1	29	--	--	--			0.00	30	--	--	--										
Space	--	1	31	--	--	--			5.32	32	3	25 A	MFW - 6										
Space	--	1	33	--	--	--			5.32	34	--	--	--										
Space	--	1	35	--	--	--			5.32	36	--	--	--										
T-BSL1		80 A	3	37	0.90				0.00	38	1	20 A	Spare										
--	--	--	--	39		0.54			0.00	40	1	20 A	Spare										
--	--	--	--	41			0.00		0.00	42	1	20 A	Spare										

TOTAL PHASE SUMMARY			
	A	B	C
PHASE SUBTOTAL (kVA):	35.9	35.5	35
PHASE SUBTOTAL (AMPS):	130 A	129 A	126 A

LOAD CLASSIFICATION	CONNECTED (KVA)	DEMAND FACTOR	DEMAND (KVA)
POWER	33.30 kVA	100%	41.63 kVA
LIGHTING	0.00 kVA	125%	0.00 kVA
MOTOR	71.82 kVA	125% LARGEST, 100% OTHER	77.81 kVA
RECEPTACLE	1.44 kVA	100% FIRST 10kVA, 50% OTHER	1.44 kVA
HEATING	0.00 kVA	125%	0.00 kVA
TOTAL LOAD	106.56 kVA		120.87 kVA
TOTAL AMPS	128 A		145 A

BSL1

MAIN TYPE		MCB	VOLTAGE		120/208 Wye	LOCATION		LEVEL 01 LAB / SHOP 121									
MAIN RATING		100 A	3 PHASE		4 WIRE	FED FROM		T-BSL1									
BUS RATING		100 A	MOUNTING		Recessed	SCCR		10 kA									
			ENCLOSURE		Type 1	CALCULATED AVAILABLE FAULT...		1.2 kA									
REMARKS:																	
LEFT SIDE, kVA									RIGHT SIDE, kVA								
DESCRIPTION		BRKR NOTES	BRKR AMP. POLES	CKT NO	A	B	C	A	B	C	CKT NO	BRKR AMP. POLES	BRKR NOTES	DESCRIPTION			
REC - RMS#005 & 008			20 A	1	1	0.90					2						
REC - MDF RM#107			20 A	1	3		0.54				4						
				5							6						
				7							8						
				9							10						
				11							12						
				13							14						
				15							16						
				17							18						
				19							20						
				21							22						
				23							24						
				25							26						
				27							28						
				29							30						
				31							32						
				33							34						
				35							36						
				37							38						
				41							42						
TOTAL PHASE SUMMARY																	
					A	B	C										
					PHASE SUBTOTAL (kVA)	0.90	0.54	0.00									
					PHASE SUBTOTAL (AMPS)	8 A	5 A	0 A									
LOAD CLASSIFICATION		CONNECTED (kVA)			DEMAND FACTOR				DEMAND (kVA)								
POWER		0.00 kVA			100%				0.00 kVA								
LIGHTING		0.00 kVA			125%				0.00 kVA								
MOTOR		0.00 kVA			125% LARGEST, 100% OTHER				0.00 kVA								
RECEPTACLE		1.44 kVA			100% FIRST 10kVA, 50% OTHER				1.44 kVA								
HEATING		0.00 kVA			125%				0.00 kVA								
TOTAL LOAD		1.44 kVA							1.44 kVA								
TOTAL AMPS		4 A							4 A								



## 2 PIPE THRU INTERIOR WALL