



**BID ADDENDUM**

MiraCosta Community College District  
One Barnard Drive  
Oceanside, California 92056  
760.795.6691/FAX 760.757.8185

**Distribution:**

Owner  Architect  
 MiraCosta College Bid Opportunities Website

**PROJECT:** MiraCosta Community College District  
Project: SAN 400 & 900 Building Renovations  
Bid # MM-20-020 (“Projects”)

**ADDENDUM NUMBER: 3 – B400**

**OWNER:** MiraCosta Community College District

**DATE OF ISSUANCE: March 17, 2021**

THIS ADDENDUM HAS BEEN PREPARED TO CLARIFY, MODIFY, DELETE, OR ADD TO THE DRAWINGS, SPECIFICATIONS, AND/OR OTHER ASPECTS REGARDING THE COMPETITIVE BID FOR THE ABOVE REFERENCED PROJECT. THE ITEMS LISTED HEREIN SUPERSEDE DESCRIPTIONS PREVIOUSLY PUBLISHED IN THE INITIAL CALL FOR BIDS. ALL CONDITIONS NOT SPECIFICALLY REFERENCED HERE SHALL REMAIN THE SAME. IT IS THE OBLIGATION OF THE CONTRACTOR TO MAKE SUBCONTRACTORS AWARE OF ANY ITEMS HEREIN THAT MAY AFFECT ALL BIDS AND SUB-BIDS.

**GENERAL INFORMATION:**

1. Through this Addendum Number 3-B400, **the new Bid Due date is Now March 29, 2021 at 2:00 PM.** All other Bidding Instructions remain as described in the bidding documents and Addendum Number 1.
2. Through Attachment 2 to this Addendum Number 3-B400, the District is providing, as a Reference Document Only, a Limited Hazardous Materials Survey Report dated February 24, 2021.
3. Through Attachment 3 to this Addendum Number 3-B400, the District is providing the Responses to all Requests for Clarification received through March 10, 2021.

**DRAWING MODIFICATIONS/CLARIFICATIONS:**

- See Attachment 1 to Addendum 3-B400 – Architect’s Addendum One with Attachments

**SPECIFICATION MODIFICATIONS/CLARIFICATIONS:**

- See Attachment 1 to Addendum 3-B400 – Architect’s Addendum One with Attachments

## **ATTACHMENTS:**

1. Architect's Bid Addendum One with Attachments
2. Limited hazardous Materials Report dated February 24, 2021 – REFERENCE DOCUMENT ONLY
3. Requests for Clarification and District Responses

**End of Addendum No. 3 – B400**



## ARCHITECTURAL BID ADDENDUM NO. 01

March 17,2021

### MCC B400 SCIENCE LAB

### MiraCosta Community College District

One Barnard Drive  
Oceanside, California 92056

### DSA App. Nos. 04-119580

TO: PROSPECTIVE BIDDERS

This Addendum forms a part of the Contract Documents and modifies the original Bidding Drawings and Specifications. Acknowledge receipt of this Addendum in spaces provided on the Bid Form. Failure to acknowledge may subject Bidder to disqualification.

### **DRAWING MODIFICATIONS/CLARIFICATIONS:**

#### ARCHITECTURAL

- A0.01
  - Modified label of the Site plan detail 2, to read DEMO SITE PLAN.
  - Modify keynote 7 for clarification on existing wet/dry utilities work to be completed at/near the Greenhouse.
- A0.10
  - Modify Demolition general note number 2.
  - Modify Floor plan keynote number 10.
  - Added/located keynote 10 within floor plan.
- A0.30
  - Modified keynotes 1, 2, 6, 7, 8, 9, 10, 11 and 14.
  - Added/located keynotes within the Demolition Roof Plan.
  - Modified removal and replacement of clay tiles along Gridline X4 and XC.
  - Modified notes at the Roof Legend for clarification of work to be performed.
  - Added note 3 at Roof Legend for additional clarification.
  - Modified language at Roof legend for Demo/Removal plaster.
- A0.40
  - Modified language at Demolition RCP legend.
- A0.50
  - Modify keynote 2 for additional clarification.
- A5.10
  - Modified framing for radius for light fixture at wall section 2.
- A8.10
  - Modified wall finish type at Materials and Finishes General Note 4.
  - Modified Flooring Finish Legend at RF-1 basis of design and color.

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ADDENDUM NO. 1

- A8.30
  - Modified Basis of Design for window types.
  - a. Modified dimensions at Window Types 1 and 4.
- A9.10
  - a. Modified details 1, 8, 9, 11, 12, 13 and 24, for clarification on waterproofing and profile of window system.
  - b. Added details
- A9.30
  - a. Modified details 1, 2, 3, 4, 6, 7, 8, 9, 11, 13, 15, 23, 25 and 26. Clarifications on demolition, waterproofing, and coordination with consultant drawings.
- A9.31
  - a. Modified details 1 and 2. Clarifications on demolition, framing and coordination with consultant drawings.
  - b. Added detail 11, SBS roofing detail.
- A9.40
  - a. Modified details 20 and 22. Clarifications on demolition, framing and coordination with consultant drawings.
  - b. Added detail 24 for waterproofing at roof/wall.
- A9.90
  - a. Modified details 1, 2, 4, 5, 9, 10 and 17. Clarification on demolition, framing and coordination with consultant drawings.

**PLUMBING**

- P0.02
  - Added new fixtures for replacement of backflow preventer and pressure regulator per lessons learned.
- P2.11
  - Added note to replace existing backflow preventer and pressure regulator. Removed water meter reference for make-up water. Being picked up by controls contractor.

**MECHANICAL**

- M2.11
  - Added General Note 1, referencing structural sheets for shear wall locations, details, and notes on penetrations. HVAC ducting and piping was routed to avoid shear walls.
- M2.21
  - Added General Note 1, referencing structural sheets for shear wall locations, details, and notes on penetrations. HVAC ducting and piping was routed to avoid shear walls.
- M5.01
  - Added General Note 1, a cross referenced note to the drawings for equipment locations.
- M6.03
  - Revised detail 3/M6.03, per SC Engineers request. Detail provides flexibility. for control valve to be 2-way, 3-way, or non-existent (“where occurs”). P2S strongly recommends that controls requirements be closely coordinated with TRANE.

**ELECTRICAL**

- E0.01
  - Added demolition scope notes.
- E0.03
  - Revised KAIC rating for panel “LB1”

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ADDENDUM NO. 1

- E2.11
  - Revised general note to include cabling for new lighting controls
  - Revised note to provide new conduit for lighting
- E2.21
  - Revised notes 5 and 28.
  - Revised receptacle circuitry and locations located in shear walls
- E5.01
  - Revised note to integrate meter into panelboard.
- E6.01
  - Added conduit sleeve details
- ED2.11
  - Revised to include circuiting indicated in as-builts.
- ED2.21
  - Revised to include circuiting indicated in as-builts.
  - Added note for devices in shear walls.

**LABORATORY**

- LF2.0
  - Modify note at Bio Lab/Classroom 404, Physical Lab/Classroom 405, and lass Lecture/Lab 409 at fixed Podiums that they are CFCI per Architectural detail 20/A9.90 in lieu of OFOI.

**HVAC HORIZONTAL CONTROL**

- IA-001
  - Revised IAS Network Architecture; added networked natural gas meter.
- IA-101
  - Removed occupancy sensors from zone served by WSHP-1; added occupancy sensor in zone served by WSHP-5.
- IA-202
  - Detail 2 – Revised Occupancy Sensor Requirement
  - Detail 3 – Revised Natural Gas Meter Detail.

**SPECIFICATION MODIFICATIONS/CLARIFICATIONS:**

- Division 07
  - 073216 Concrete Roof Tiles
    - Section 3.05: Add note: Installation is subject to DSA IR 15-1 and 15-2 regulations for concrete and clay roof tiles.
- Division 08
  - 086200 Unit Skylights
    - Section 2.02: Add note J, Provide tempered glass lens below the plastic dome.
- Division 23
  - 238146
    - Part 2, 2.02.A Revised Manufacturers and Basis of Design being Trane.
- Division 25
  - 250800 Fault Detection and Diagnostics for HVAC
    - Section 2.3: noted FDD offsite hosting by Ecovox. The IAS Contractor will need to coordinate with Ecovox.

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ADDENDUM NO. 1

- 251100 IAS Instrumentation and Control Devices for HVAC
  - Section 1.2 and 1.3: Added Magnetic Flow Meter for Water Service to the submittals.
  - Section 2.7: Added Indoor Occupancy Sensors.
  - Section 2.11: Updated Water Service Meter
  - Section 2.12: Added Magnetic Flow Meter for Water Service.
- 259500 Integrated Automation Control Sequences (IAS) for HVAC
  - Section 1.11: Updated WSHP Sequence of Operations
  - Section 1.7F.2: Updated Fluid Cooler Point Requirement
- Issuance of the following guidelines:
  - Guideline A – IAS Graphics requirements
  - Guideline B – IAS Point Tagging requirements
- Division 26
  - 260943 Network Lighting Controls
    - Replaced in its entirety
  - 262416 Panelboards
    - Part 1, 1.04.B added notes h and i.
- Division 28
  - 280500 Security System General Requirements
    - Remove from the specification 1.11.F, there is no Division 14.

**ATTACHMENTS:**

1. Drawings

- A0.01
- A0.10
- A0.30
- A0.40
- A0.50
- A5.10
- A8.30
- A9.10
- A9.30
- A9.31
- A9.40
- A9.90
- P0.02
- P2.11
- M2.11
- M2.21
- M5.01
- M6.03
- E0.01
- E0.03
- E2.11

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ADDENDUM NO. 1

- E2.21
- E5.01
- E6.01
- ED2.11
- ED2.21
- LF2.0
- IA-001
- IA-101
- IA-202

2. Specifications

- a. 224000
- b. 238416
- c. 250800
- d. 251100
- e. 259500
- f. 260943
- g. 262416

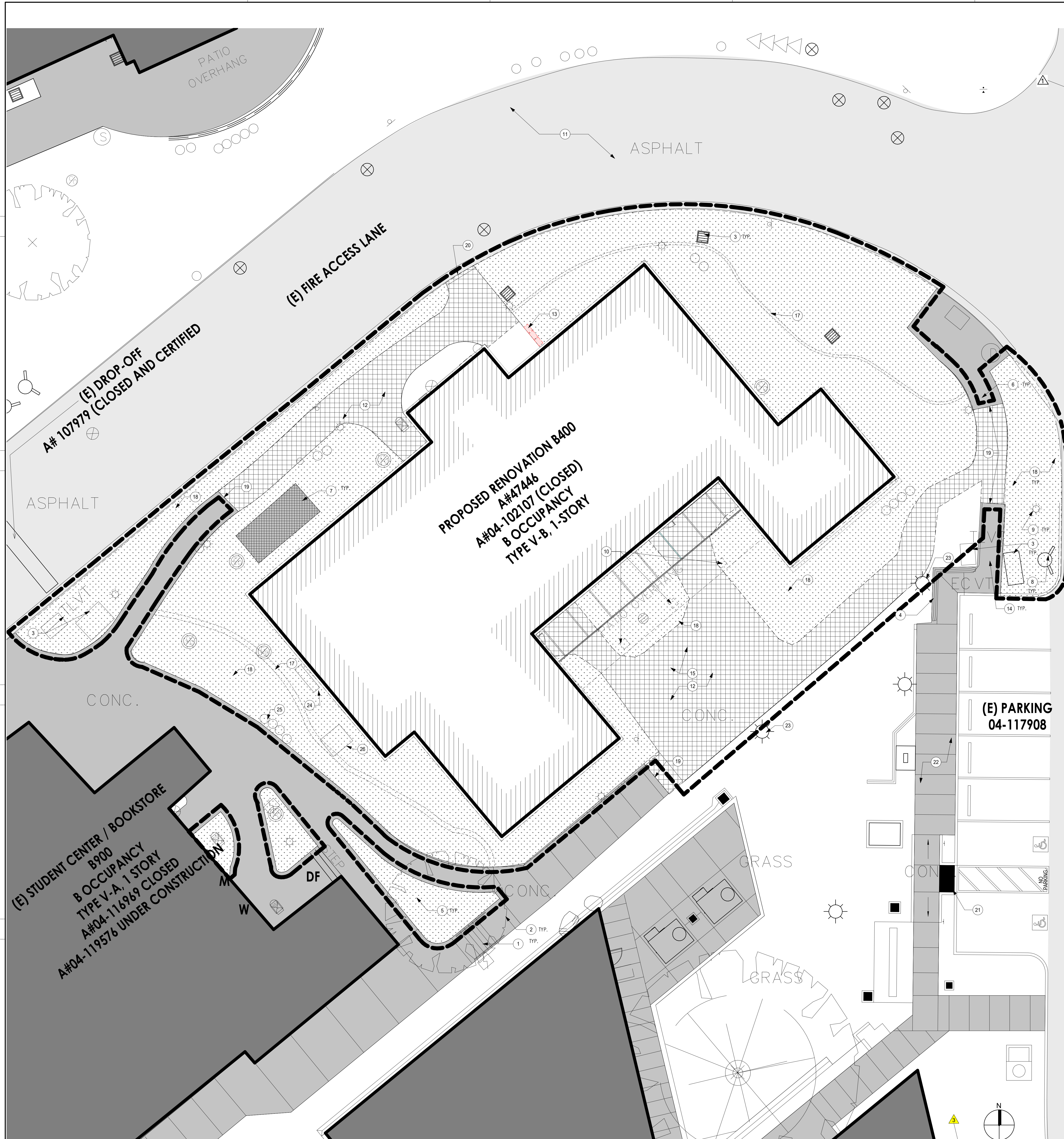
3. Additional attachments

- a. IAS Graphics Requirements
- b. IAS Point Tagging Requirements
- c. Pre-Bid RFI 1 thru 9 Responses
- d. Pre-Bid RFI PEGI 001 Response

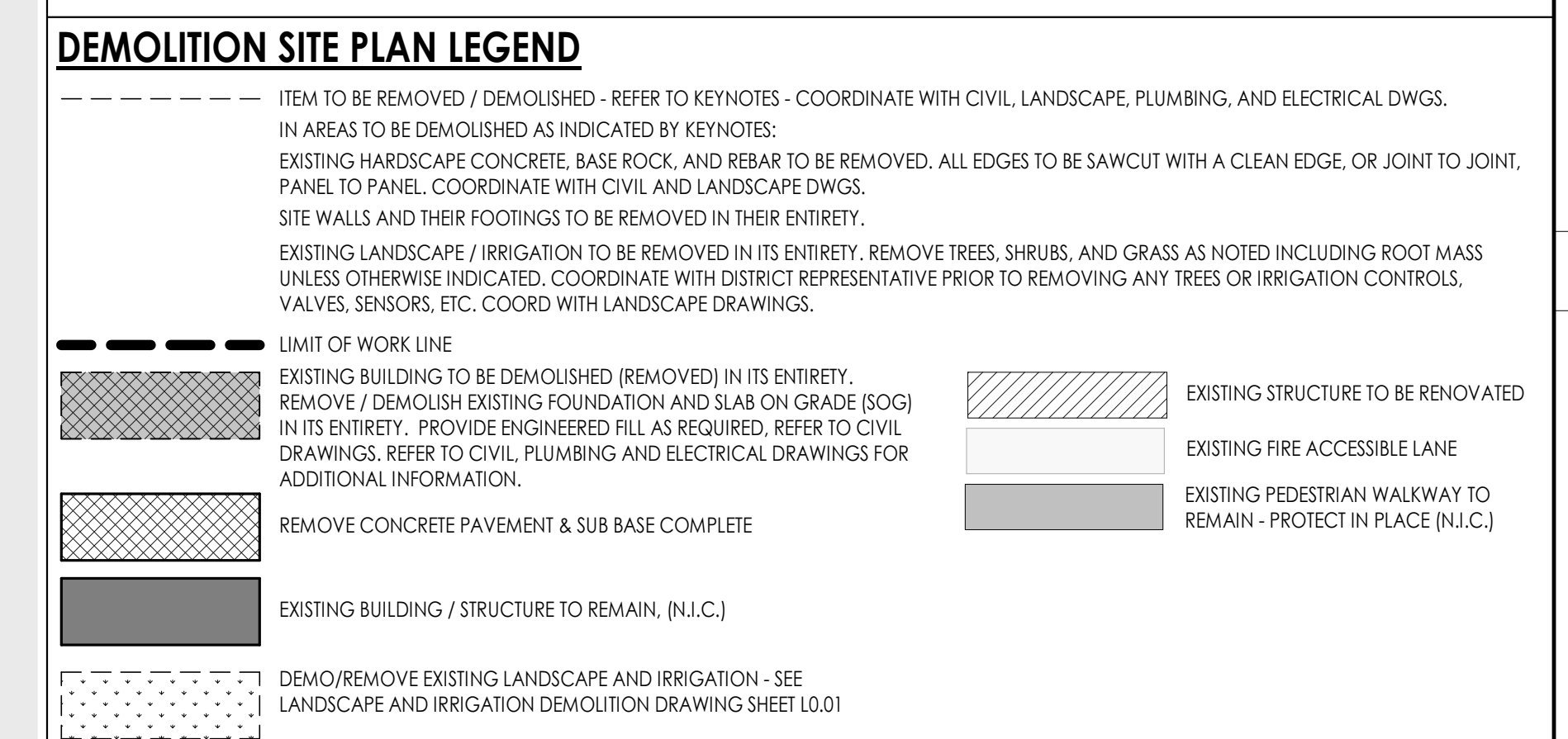
**End of Architectural  
Addendum No. 1**



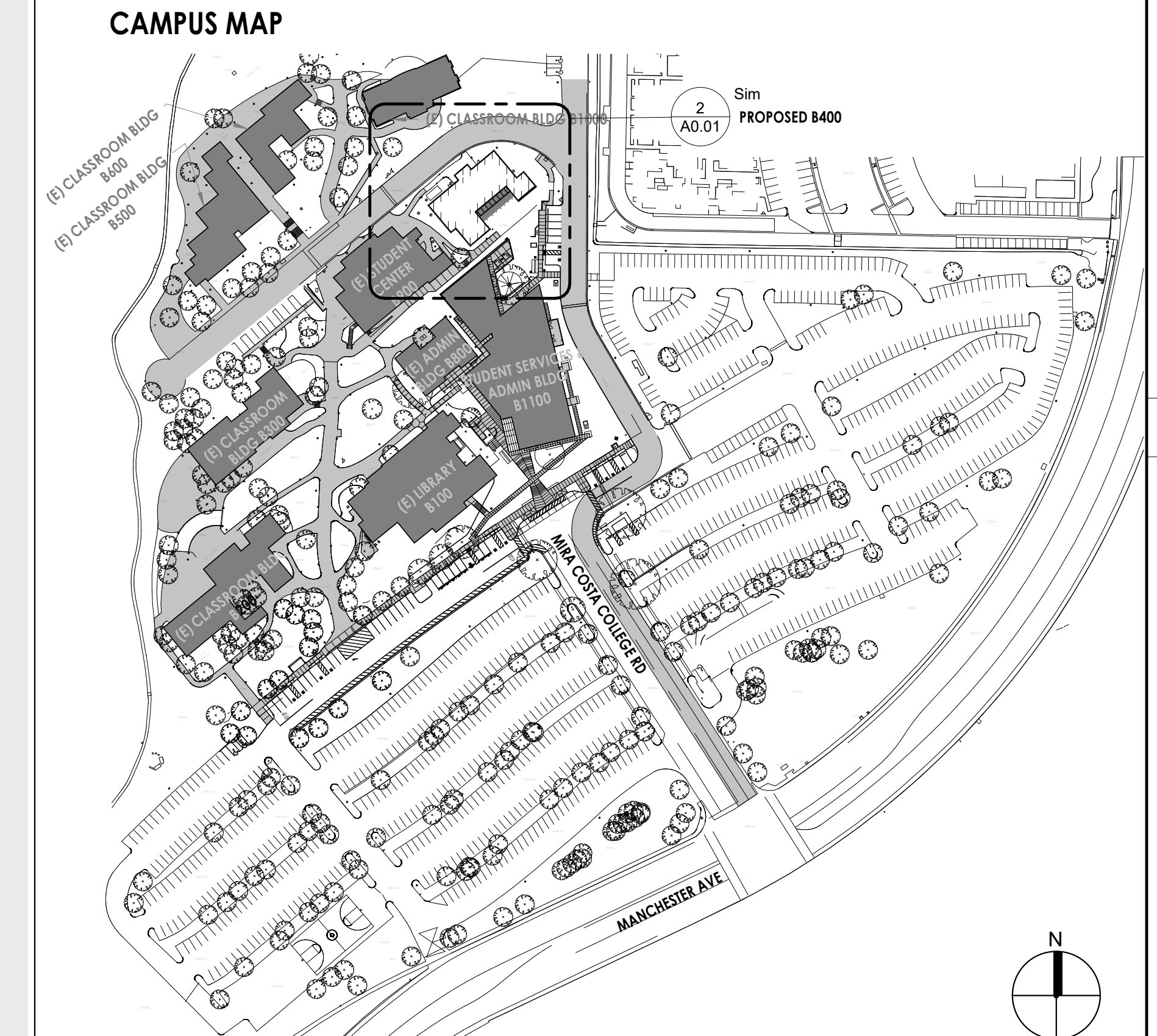
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- KEYNOTES:**
- 1 (E) STEP TO REMAIN
  - 2 (E) TREES TO REMAIN - PROTECT IN PLACE
  - 3 (E) UTILITIES / UTILITY STRUCTURE - PROTECT IN PLACE. SEE CIVIL, LANDSCAPE, MEP DWGS
  - 4 (E) SITE WALL TO REMAIN
  - 5 (E) LANDSCAPE TO REMAIN
  - 6 (E) HARDSCAPE TO REMAIN
  - 7 DEMOLISH (E) GREEN HOUSE AND FOUNDATION IN ITS ENTIRETY. CUT/CAP UTILITIES BACK TO EXISTING B400 BUILDING AND INSTALL IN A YARD BOX FOR FUTURE GREENHOUSE INSTALLATION. CAP OFF ALL EXISTING UTILITIES CONNECTED TO EXISTING GREENHOUSE. SEE ELEC. AND PLUMB. DWGS.
  - 8 (E) FIRE HYDRANT TO REMAIN
  - 9 (E) EXTERIOR LIGHT POST TO REMAIN
  - 10 (E) PATIO CANOPY, TRELLIS OVERHANG AND COLUMNS TO BE PREPARED FOR NEW REFRESH AND STAIN TO MATCH EXISTING.
  - 11 (E) FIRE ACCESS LANE TO REMAIN
  - 12 REMOVE CONC. PAVEMENT & SUB BASE COMPLETE
  - 13 REMOVE/RELOCATE EXISTING IRRIGATION BOXES - SEE LANDSCAPE DWGS.
  - 14 (E) ADA RAMP TO REMAIN - PROTECT IN PLACE
  - 15 REMOVE EXISTING SITE FURNITURE. RETURN TO DISTRICT
  - 16 (E) EXTERIOR LIGHT POST TO REMAIN
  - 17 DEMO/REMOVE (E) CONCRETE MOWSTRIP. REFER TO CIVIL AND LANDSCAPE DRAWINGS
  - 18 CLEAR AND GRUB (E) LANDSCAPE. REFER TO LANDSCAPE DEMOLITION PLAN SHEET L001 KEYNOTE #2
  - 19 SAWCUT EXISTING SLAB ON GRADE TO THE NEAREST CONTROL JOINT. SEE CIVIL DRAWINGS
  - 20 (E) CURB/GUTTER - PROTECT IN PLACE
  - 21 (E) RAMP TO REMAIN
  - 22 (E) ACCESSIBLE WALK TO REMAIN
  - 23 (E) SITE LIGHT - PROTECT IN PLACE. SEE ELEC. DWGS.
  - 24 (E) CENTRALIZED HEIRIRIGATION TANK. CLEAN OUT UNIT. REFRESH WITH (N) LIME STONE & REPLACE RUSTED ENCLOSURE LIDS - SEE ELEC. AND PLUMB. DWGS.
  - 25 (E) IRRIGATION BOXES - PROTECT IN PLACE. SEE LANDSCAPE DWGS
  - 26 (E) ELEC. INFRASTRUCTURE - PROTECT IN PLACE. SEE ELEC. DWGS.



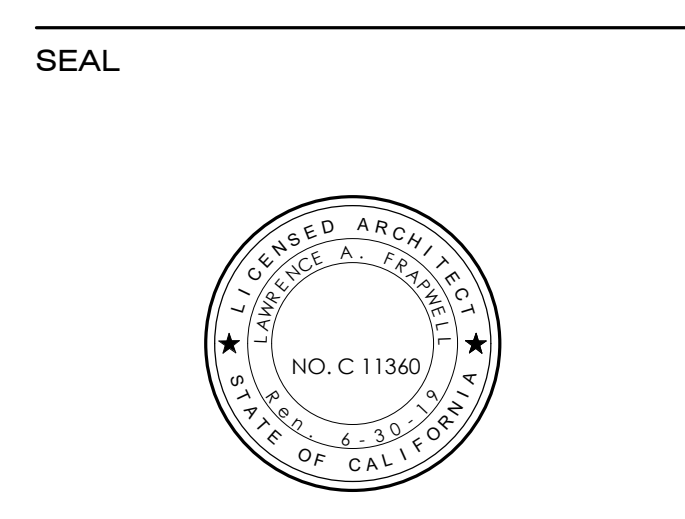
- DEMOLITION GENERAL NOTES**
1. CONSTRUCTION, ALTERATION, OR DEMOLITION SHALL COMPLY WITH CFC CHAPTER 32 "FIRE SAFETY DURING CONSTRUCTION AND DEMOLITION". COMPLIANCE WITH NEPA 241 (STANDARD FOR SAFEGUARDING CONSTRUCTION, ALTERATION, AND DEMOLITION OPERATIONS) IS REQUIRED AS REFERENCED IN CHAPTER 33.
  2. GENERAL CONTRACTOR IS REQUIRED TO REVIEW AND COMPLY WITH HAZARDOUS MATERIALS SURVEY REPORT (PROVIDED BY DISTRICT). THE INSPECTOR AND UNIVERSITY SHALL BE NOTIFIED WHEN ABATEMENT BEGINS AND ENDS. THE DISTRICT OR THE DISTRICTS REPRESENTING CONTRACTOR SHALL FOLLOW THE PROCEDURES AND REGULATIONS SET FORTH BY CALIFORNIA STATE DEPARTMENT OF INDUSTRIAL RELATIONS CONCERNING ASBESTOS REMOVAL.
  3. PATCH, REPAIR, REPAVE AND REPLANT EXISTING HARDSCAPE AND LANDSCAPE AS NEEDED AT SITE PERIMETER AREAS WHERE DEMOLITION WORK AFFECTS THE EXISTING SITE CONDITION OUTSIDE OF THE LIMIT OF WORK LINE.
  4. DEMOLITION WORK SHOWN ON THE DRAWINGS IS DIAGRAMMATIC (DEMO WORK IS ANYTHING WITHIN THE BOUNDARY SHOWN U.O.N.). ALL SITUATIONS MAY NOT BE SHOWN. DEMOLITION WORK SHALL INCLUDE DEMOLITION OF EXISTING STRUCTURES AS NOTED WITHIN THE CONSTRUCTION DOCUMENTS AS WELL AS THE DEMOLITION WORK REQUIRED TO PROVIDE A CLEAR AND OPEN AREA FOR ANY BUILDINGS, HARDSCAPE, LANDSCAPE AND ANY ALL UTILITIES AS NOTED TO BE DEMOLISHED.
  5. A REPRESENTATIVE OF DISTRICT SHALL REVIEW ALL ITEMS REMOVED AND SELECT WHICH ITEMS ARE TO BE RETURNED TO THE DISTRICT. ALL REMAINING ITEMS SHALL BE DISPOSED OF BY THE CONTRACTOR AT HIS EXPENSE. REMOVE AND DELIVER TO CLIENT ALL VIDEO SURVEILLANCE POLES, CAMERAS, WAPS, AND NETWORK GEAR.
  6. ITEMS WHICH ARE KNOWN TO BE A PART OF THE DEMOLITION SCOPE OF WORK MAY HAVE BEEN REMOVED PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR SHALL GIVE CREDIT TO DISTRICT FOR THE REMOVAL COST OF SUCH ITEMS.
  7. EXCAVATION OR FILLS FOR BUILDINGS OR STRUCTURES SHALL BE SO CONSTRUCTED OR PROTECTED THAT THEY DO NOT ENDANGER LIFE OR PROPERTY. SLOPES FOR PERMANENT FILLS SHALL NOT BE STEEPER THAN 1 UNIT VERTICAL IN 2 UNITS HORIZONTAL (50% SLOPE). CUT SLOPES FOR PERMANENT EXCAVATIONS SHALL NOT BE STEEPER THAN 1 UNIT VERTICAL IN 2 UNITS HORIZONTAL (50% SLOPE) UNLESS SUBSTANTIATING DATA JUSTIFY STEEPER CUT SLOPES OR OTHERWISE. CFC SECTION 3304.
  8. EXISTING FOOTINGS OR FOUNDATIONS WHICH MAY BE AFFECTED BY ANY EXCAVATION SHALL BE UNDERPINNED ADEQUATELY OR OTHERWISE PROTECTED AGAINST SETTLEMENT AND SHALL BE PROTECTED AGAINST LATERAL MOVEMENT. CFC SECTION 3304.2
  9. THE REQUIREMENTS FOR PROTECTION OF ADJACENT PROPERTY AND DEPTH TO WHICH PROTECTION IS REQUIRED SHALL BE AS DEFINED IN SEC. 832, CIVIL CODE. CFC SECTION 3307
  10. CONTRACTOR IS TO PROVIDE TEMPORARY PEDESTRIAN PROTECTION. THE WORK OF DEMOLISHING ANY BUILDING SHALL NOT BE COMMENCED UNTIL THE REQUIRED PEDESTRIAN PROTECTION STRUCTURES ARE IN PLACE. CFC SECTION 3302.2
  11. APPROVAL OF THE SAFETY PRECAUTIONS REQUIRED FOR BUILDINGS BEING CONSTRUCTED, ALTERED OR DEMOLISHED MAY BE REQUIRED BY THE FIRE MARSHAL IN ADDITION TO OTHER APPROVALS REQUIRED FOR SPECIFIC OPERATIONS OR PROCESSES ASSOCIATED WITH SUCH CONSTRUCTION, ALTERATION OR DEMOLITION. C.F.C. SEC. 33.12.
  12. A SUITABLE FIRE HOSE SHALL BE MAINTAINED AT THE DEMOLITION SITE. SUCH HOSE SHALL BE CONNECTED TO AN APPROVED SOURCE OF WATER (NEAREST FIRE HYDRANT) AND SHALL NOT IMPED FIRE DEPARTMENT USE OF HYDRANTS. C.F.C. CHAPTER 35, 3504.2. CONTRACTOR TO COORDINATE AND PROCURE WATER METER, AND UPON COMPLETION OF WORK OWNED TO COMPENSATE FOR WATER USAGE.
  13. DEMOLITION OPERATIONS INVOLVING CUTTING & WELDING SHALL BE IN ACCORDANCE WITH SECTION C.F.C. CHAPTER 35.
  14. COMBUSTIBLE WASTE MATERIAL, TRASH, AND RUBBISH SHALL NOT BE ACCUMULATED. SUCH MATERIAL SHALL BE REMOVED FROM THE SITE AS OFTEN AS NECESSARY TO MINIMIZE THE HAZARDS THEREFROM. "COMBUSTIBLE DEBRIS. RUBBISH AND WASTE MATERIAL SHALL NOT BE DISPOSED OF BY BURNING ON THE SITE UNLESS APPROVED." C.F.C. SEC. 1424
  15. PROVIDE QUALIFIED PERSONNEL WHILE BUILDING IS BEING DEMOLISHED WHICH IS HAZARDOUS IN NATURE. QUALIFIED PERSONNEL SHALL BE PROVIDED TO SERVE AS AN ON-SITE FIRE WATCH. THE SOLE DUTY OF FIRE WATCH PERSONNEL SHALL BE TO WATCH FOR THE OCCURRENCE OF FIRE. C.F.C. CHAPTER 33 AND 35.
  16. EGRESS ROUTES SHALL BE MAINTAINED. WHERE FIRE RESISTIVE CONSTRUCTION TEMPORARY EQUIVALENT PROVISIONS ARE REQUIRED. C.F.C. CHAPTER 33, SEC. 3311. REFER TO CIVIL DRAWINGS FOR GRADING AND SITE UTILITIES INFORMATION.
  17. CONTRACTOR IS TO PROVIDE TEMPORARY PEDESTRIAN PROTECTION.
  18. CONTRACTOR TO PROVIDE TEMPORARY CONSTRUCTION GATES AT ALL ENTRANCES TO THE PROJECT.
  19. REFER TO PLUMBING AND ELECTRICAL SITE PLANS FOR ADDITIONAL SITE UTILITIES WORK.
  20. ALL ITEMS SHOWN OR NOTED ARE EXISTING. UNLESS INDICATED OTHERWISE AS NEW.
  21. PROVIDE TEMPORARY 6' HIGH CHAIN LINK FENCE ENCLOSURE W/ LOCKABLE GATES AS REQUIRED FOR CONSTRUCTION ACCESS AT CONTRACTORS STAGING AREA AND AROUND ALL CONSTRUCTION SITES AS DICTATED BY THE PHASING SCHEDULE.
  22. WHERE REMOVAL OF CONCRETE WALKS, MOWSTRIPS, CURB, AND GUTTERS IS REQUIRED TO INSTALL UNDERGROUND UTILITIES. REMOVE THE CONCRETE WORK TO NEAREST EXPANSION OR CONTROL JOINT (SAWCUT ONLY IF REQUIRED). MOWSTRIPS, CURBS, AND GUTTERS MAY BE REMOVED IN MINIMAL LENGTHS OF 6'-0" IF DISTANCE BETWEEN EXISTING JOINTS IS 1'-0" OR MORE. REPLACE REMOVED WORK W/ REINFORCED CONCRETE TO MATCH EXISTING WORK IN PROFILE, JOINT LAYOUT, AND FINISH.
  23. COORDINATE THE REMOVAL, RELOCATION, OR MODIFICATION OF EXISTING IRRIGATION LINES WITH MIRACOSTA DISTRICT PRIOR TO ANY TRENCHING, CLEARING AND GRUBBING, OR OTHER SITE EXCAVATION REQUIRED.
  24. REPAIR EXISTING IRRIGATION SYSTEMS DAMAGED DURING THE EXECUTION OF THIS CONTRACT. REPLACE PLANT MATERIALS DAMAGED OR DECLINING IN HEALTH. SUBSTITUTING DIEBACK THAT HAVE LOST FORM AND SIZE OR THAT DIE DURING THE DEMOLITION PERIOD WITH THE SAME SPECIES OR EQUAL OR GREATER VALUE.
  25. REPAIR ASPHALT OR CONCRETE PARKING LOTS, SPEED BUMPS, AND PAINTED CROSSWALKS DAMAGED BY THE EXECUTION OF THIS CONTRACT TO ORIGINAL OR BETTER CONDITION. REPAIR CROSSWALK AND SPEED BUMP STRIPING THEIR FULL LENGTHS ACROSS ROADWAYS.
  26. PROTECT AND SAFEGUARD FROM DAMAGE ALL EXISTING FINISHES AND WORK TO REMAIN.
  27. WHERE EXISTING UTILITIES ARE INDICATED IN THE GENERAL VICINITY OF WORK. VERIFY THE EXACT LOCATION BY POT-HOLE, METAL DETECTION OR ELECTRICAL CURRENT DETECTION PRIOR TO START OF WORK. SEE CIVIL, PLUMBING, AND ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
  28. DETERMINE AND COORDINATE ACTUAL LOCATION OF ASPHALT AND CONCRETE PAVING REMOVAL OR TUNNELING REQUIRED WITH THE FINAL APPROVED ROUTING OF NEW UNDERGROUND UTILITIES. DEVIATIONS WILL RESULT IN NO ADDITIONAL EXPENSE TO THE OWNER.
  29. REFER TO LANDSCAPE DEMOLITION PLAN SHEET L001 FOR WHICH EXISTING TREE TO REMOVE AND WHICH TO REMAIN. PRETECT IN PLACE.



DEMO SITE PLAN SCALE 1/4" = 1'-0" 2

OVERALL CAMPUS SITE PLAN SCALE 1/4" = 1'-0" 1

DSA STAMP



CONSULTANTS

PROJECT TITLE  
SAN ELIJO B400  
3333 MANCHESTER AVENUE, CARDIFF, CA 92007



ISSUED		
#	DATE	DESCRIPTION
1	03/12/21	ADDENDUM 1

**PROJECT IDENTIFICATION**  
THE DRAWINGS IN THE SHEET INDEX WERE ORIGINALLY CREATED IN AUTOCAD REVIT 2018 UNLESS OTHERWISE NOTED.  
THE ORIGINAL SIZE OF THIS SHEET IS 30" X 42".  
THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY AND COPYRIGHT OF THE ARCHITECT AND SHALL NOT BE USED ON ANY OTHER PROJECT OR LOCATION EXCEPT AS DESCRIBED ON THE DRAWINGS, WITHOUT WRITTEN AGREEMENT WITH THE ARCHITECT.  
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SHEET TITLE  
**DEMOLITION SITE PLAN**

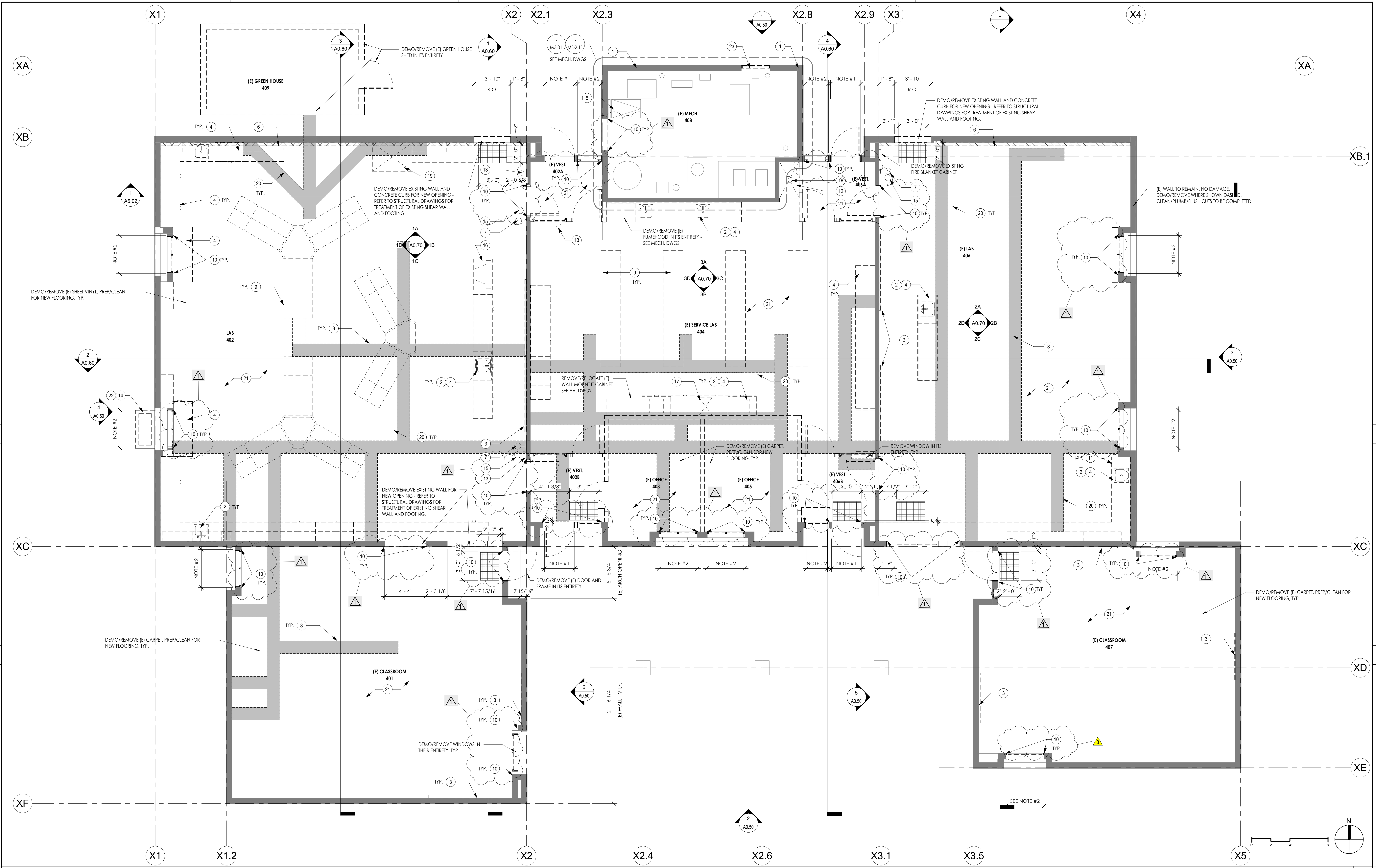
SHEET NUMBER

**A0.01**

DSA SUBMITTAL  
01/15/2021 NOT FOR CONSTRUCTION



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**FLOOR DEMOLITION PLAN** SCALE 1/4" = 1'-0" 1

**DEMOLITION GENERAL NOTES**

- PATCH AND REPAIR SURROUNDINGS AND ADJACENT WALLS AS REQUIRED AT REMOVED / DEMOLISHED DOORS, WINDOWS, WALLS AND AT AREAS OF DEMOLITION OF NEW OPENINGS. REPLACE WITH (N) DOOR AND FRAME, PATCH AND REPAIR SURROUNDINGS FINISHES AS REQUIRED, TYP.
- DEMO/REMOVE ALL EXISTING DOORS, SIDELIGHTS AND FRAMES IN ITS ENTIRETY SEE A0.10 FOR ADDITIONAL NOTES. PARTIAL DEMO/REMOVE AND REPLACE WINDOWS WILL BE REQUIRED. LIMIT DAMAGE TO INTERIOR SIDE OF GYPSUM BOARD, PATCH AND REPAIR SURROUNDINGS FINISHES AS REQUIRED, TYP.
- NOT USED
- PATCH AND PAINT SURROUNDINGS EXISTING MARKERBOARDS, WALLS, AND FLOORS WHERE CASEWORK IS BEING DEMOLISHED.
- REFER TO INTERIOR DEMOLITION ELEVATIONS FOR ADDITIONAL NOTATIONS NOT SHOWN HERE
- ALL EXISTING ITEMS ARE TO REMAIN UNLESS SPECIFICALLY NOTED WITHIN THE CONTRACT DOCUMENTS TO BE REMOVED.
- FOR DEMOLITION AND PATCHING WORK, CONTRACTOR SHALL REMOVE PORTION OR EXISTING MATERIALS AND/OR FINISHES AS NEEDED TO PROVIDE FOR THE WORK DESCRIBED WITHIN THE CONTRACT DOCUMENTS AND TO PROVIDE FOR SMOOTH TRANSITIONS BETWEEN EXISTING AND NEW MATERIALS. COORDINATE WITH ALL NEW WORK INDICATED WITHIN DRAWINGS AND SPECIFICATIONS TO VERIFY THE SCOPE AND EXTENT OF DEMOLITION WORK.
- CONTRACTOR SHALL FIELD VERIFY UNDERGROUND UTILITY LOCATIONS PRIOR TO SAW-CUTTING AND REMOVING (E) CONCRETE SLAB WHERE REQUIRED TO CONSTRUCT NEW WORK.
- VERIFY WITH THE ARCHITECT REGARDING THE REMOVAL OF ANY EXISTING ITEMS IN THE REMODELED AREA THAT ARE NOT MENTIONED OR NOTICED IN THE DOCUMENT. PREPARE FOR NEW CONSTRUCTION.
- ALL DIMENSIONS OF EXISTING DEMOLITION ITEMS ARE APPROXIMATE (CONTRACTOR TO VERIFY EXISTING FIELD CONDITIONS AND DIMENSIONS) AND IMMEDIATELY NOTIFY ARCHITECT OF ANY DISCREPANCIES.
- SEE STRUCTURAL, MECHANICAL, PLUMBING AND ELECTRICAL PLANS FOR ADDITIONAL DEMOLITION INFORMATION.

**LEGEND**

- EXISTING STUD WALL TO REMAIN
- DEMOLITION OF EXISTING STUD WALLS AND FINISHES (FULL OR PARTIAL) AS INDICATED ON PLANS AND INTERIOR ELEVATIONS.
- EXISTING DOOR TO BE DEMOLISHED
- EXISTING WINDOW TO BE DEMOLISHED
- DEMO EXISTING SLAB ON GRADE TO WALK IN ENTRY

**FLOOR PLAN KEYNOTES:**

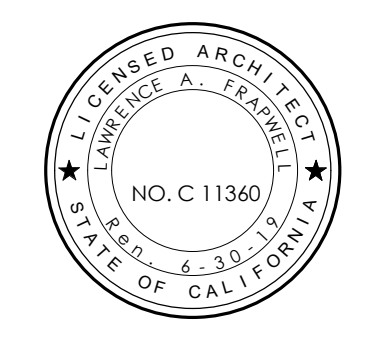
- EXISTING RAIN WATER LEADER IN WALL TO REMAIN
- DEMO/REMOVE EXISTING SINK. SEE PLUMBING DRAWINGS
- DEMO/REMOVE EXISTING WALL MOUNTED MARKERBOARD
- DEMO/REMOVE EXISTING CABINET IN ITS ENTIRETY
- EXISTING ROOF HATCH AND LADDER TO REMAIN - PROTECT IN PLACE
- DEMO/REMOVE THE EXISTING GYPSUM BOARD FOR NEW OPENING AND STRUCTURAL ENHANCEMENT ALONG INTERIOR NORTH WALL. REFER TO STRUCTURAL DRAWINGS.
- DEMO/REMOVE EXISTING EMERGENCY SHOWER AND EYEWASH IN ITS ENTIRETY - SEE PLUMBING DRAWINGS
- DEMO/REMOVE FLOOD TRENCH, REFER TO PLUMBING
- DEMO/REMOVE EXISTING TYPICAL LABORATORY SERVICE ISLAND OR STATION
- EXISTING GYP. BD IS TO BE REMOVED +/- 4" WIDE - 3 SIDES, AT ALL WINDOW/DOOR SYSTEMS BEING REMOVED/DEMOLISHED/REPLACED.
- DEMO/REMOVE EXISTING WALL AND SOFFIT ABOVE IN ITS ENTIRETY. PATCH/REPAIR AS REQUIRED
- REMOVE EXISTING CERAMIC TILES ALL WALLS
- DEMO/REMOVE EXISTING FIRE EXTINGUISHER CABINET AND MOUNTING HARDWARE
- EXISTING CENTRALIZED NEUTRALIZATION TANK. CLEAN OUT UNIT. REFRESH WITH NEW LIME STONE AND REPLACE RUSTED ENCLOSURE LIDS - SEE ELECTRICAL AND PLUMBING DRAWINGS
- DEMO/REMOVE EXISTING FLOOR SINK IN ITS ENTIRETY - SEE PLUMBING DRAWINGS
- REMOVE/STORE REMOVABLE TEACHER STATION
- REMOVE (E) DISHWASHER - SEE PLUMBING DRAWINGS
- DEMO/REMOVE (E) DELUGE SHOWER
- DEMO/REMOVE EXISTING FUME HOOD AND ASSOCIATED DUCT WORK - SEE MECHANICAL DRAWINGS
- DEMO/REMOVE EXISTING SLAB ON-GRADE FOR NEW TRENCH - SEE PLUMBING DRAWINGS
- DEMO/REMOVE (E) FLOORING. REMOVE ALL ADHESIVE MATERIAL, PREP AND PATCH SMOOTH THE CONCRETE SLAB ON GRADE FOR NEW FLOORING, TYP.
- DEMO/REMOVE (E) ABANDON FISH TANK COMPRESSOR STORAGE BOX AND PAD, PATCH HOLES IN STUCCO WHERE REFRIGERANT LINES USE TO RUN.
- DEMO/REMOVE (E) MECHANICAL LOUVER. PATCH HOLES IN STUCCO WHERE REQUIRED.

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SHEET TITLE  
**DEMOLITION FLOOR PLAN**

SHEET NUMBER

**A0.10**

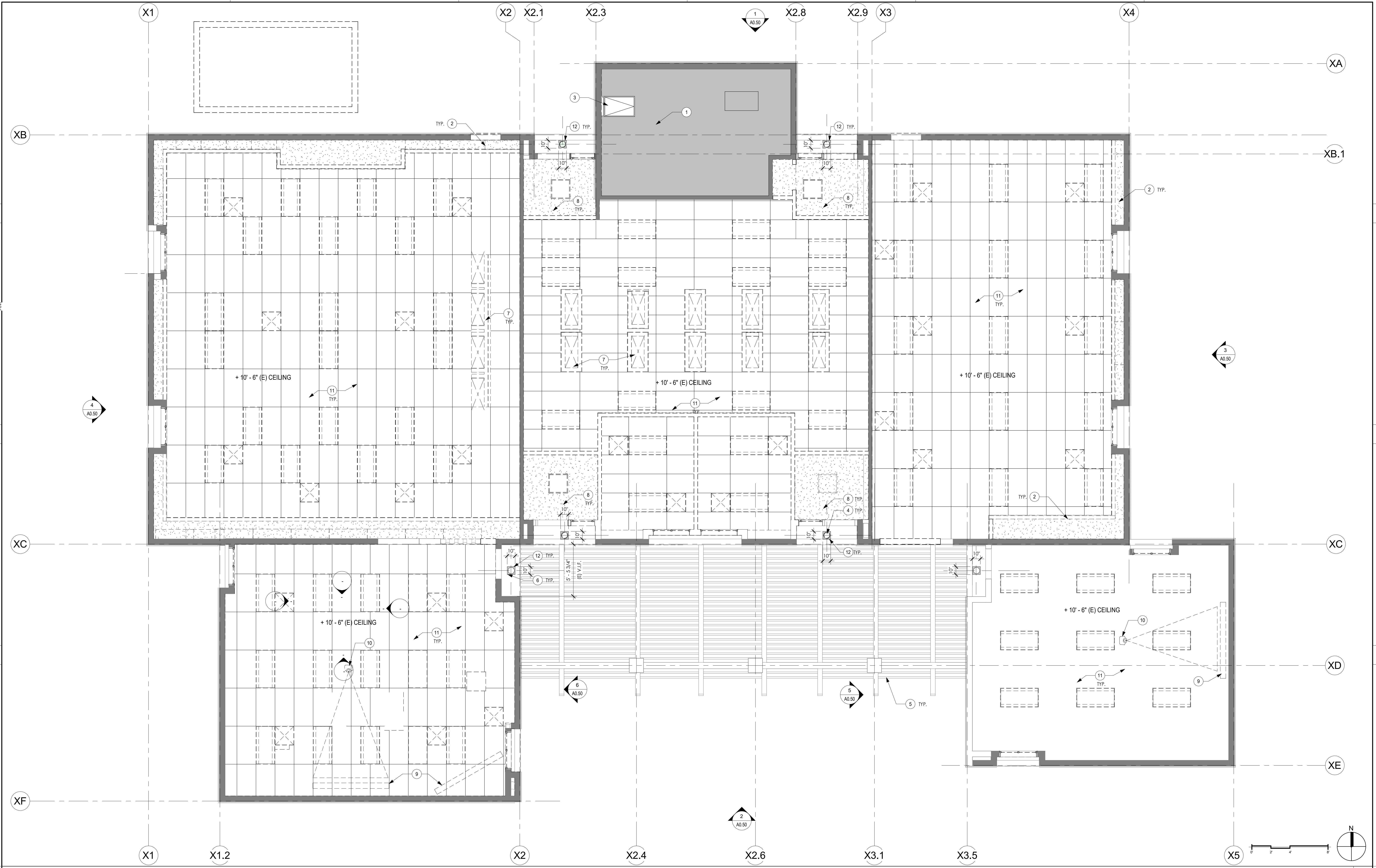
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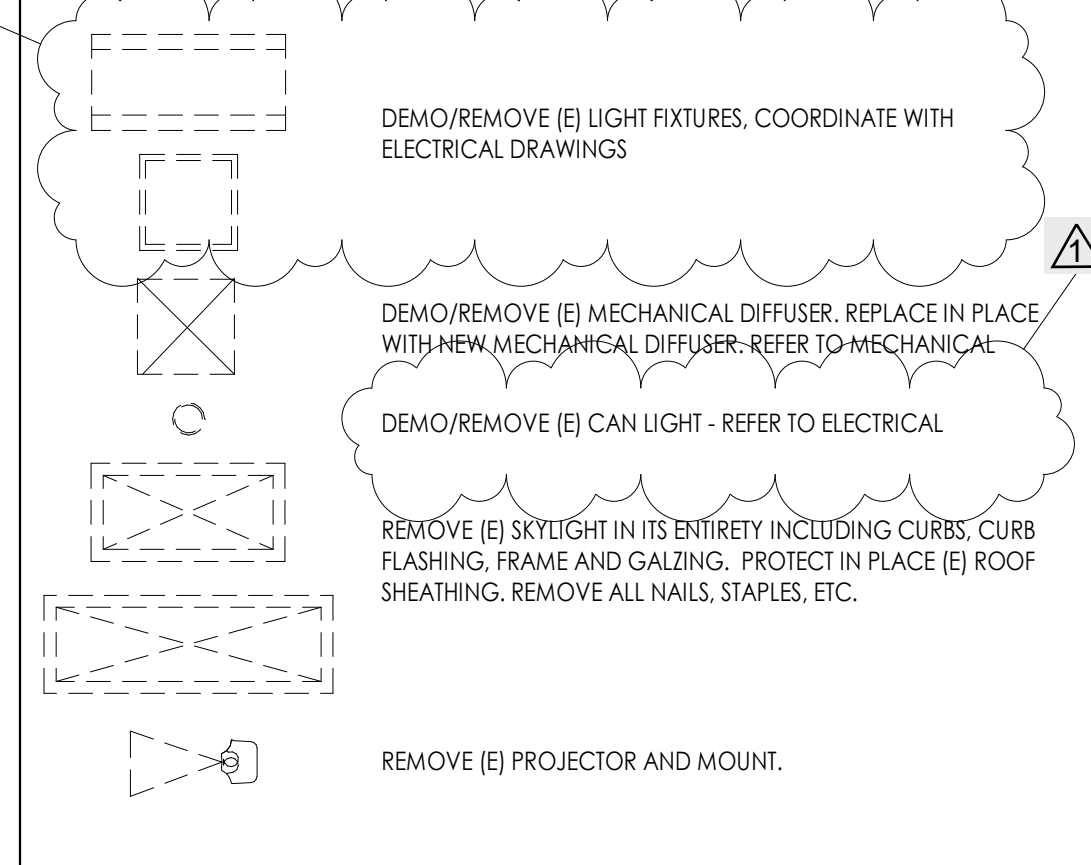


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**REFLECTED CEILING DEMOLITION PLAN** SCALE 1/4" = 1'-0" 1

**DEMOLITION RCP LEGEND**



**NOTE:** DEMO/REMOVE EXISTING LIGHTS AND ANY SUPPORTING BRACKETS, COORDINATE WITH ELECTRICAL DRAWINGS. - SEE DEMO KEYNOTE #2 ON THIS SHEET.

**RCP KEYNOTES:**

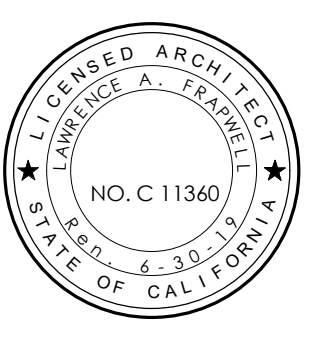
- ① EXISTING OPEN TO STRUCTURE
  - ② DEMO/REMOVE (E) SOFFIT OVER CABINET IN ITS ENTIRETY
  - ③ EXISTING MAINTENANCE ROOF HATCH TO REMAIN
  - ④ REMOVE (E) CEMENT PLASTER AROUND (E) CAN LIGHT FIXTURE. PREP AREA FOR (N) REPLACEMENT
  - ⑤ EXISTING WOOD TRELLIS - PROTECT IN PLACE
  - ⑥ DEMO/REMOVE EXISTING EXTERIOR SOFFIT - SEE STRUCTURAL PLANS
  - ⑦ REMOVE (E) SKYLIGHT IN ITS ENTIRETY.
  - ⑧ REMOVE (E) HARDLID IN ITS ENTIRETY.
  - ⑨ DEMO/REMOVE (E) PROJECTION SCREEN.
  - ⑩ REMOVE (E) PROJECTOR AND MOUNT.
  - ⑪ REMOVE (E) CEILING TILE GRID, SUPPORT WIRES AND BRACING, TYP.
  - ⑫ SAWCUT/REMOVE (E) CEMENT PLASTER, TYP.
- GENERAL NOTES:**
1. SEE STRUCTURAL, MECHANICAL, PLUMBING & ELECTRICAL PLANS FOR ADDITIONAL DEMOLITION INFORMATION.
  2. WHERE CEILINGS ARE EXISTING TO REMAIN AS REQUIRED INSIDE THE CONTRACT WORK LIMIT, PATCH & REPAIR CRACKED OR DAMAGED SURFACES PRIOR TO PAINTING.
  3. PROTECT EXISTING FINISHES DURING DEMOLITION OPERATIONS.
- NOTE:** KEYNOTES AND SYMBOLS ARE TYPICAL FOR ALL SHEETS. SOME MAY NOT APPLY TO THE WORK ON THIS DRAWING.

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**SHEET TITLE**  
**DEMOLITION REFLECTED CEILING PLAN**  
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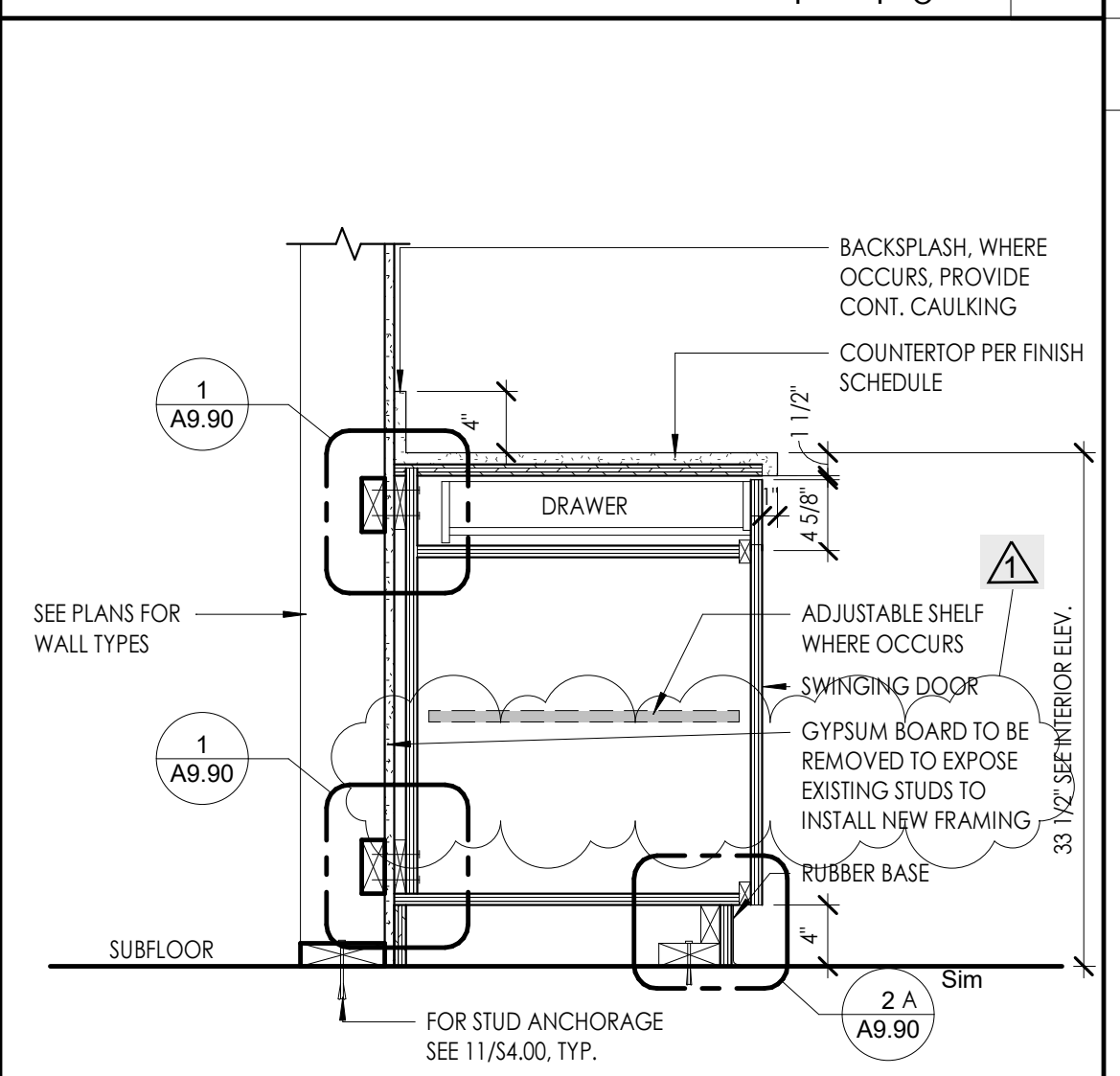
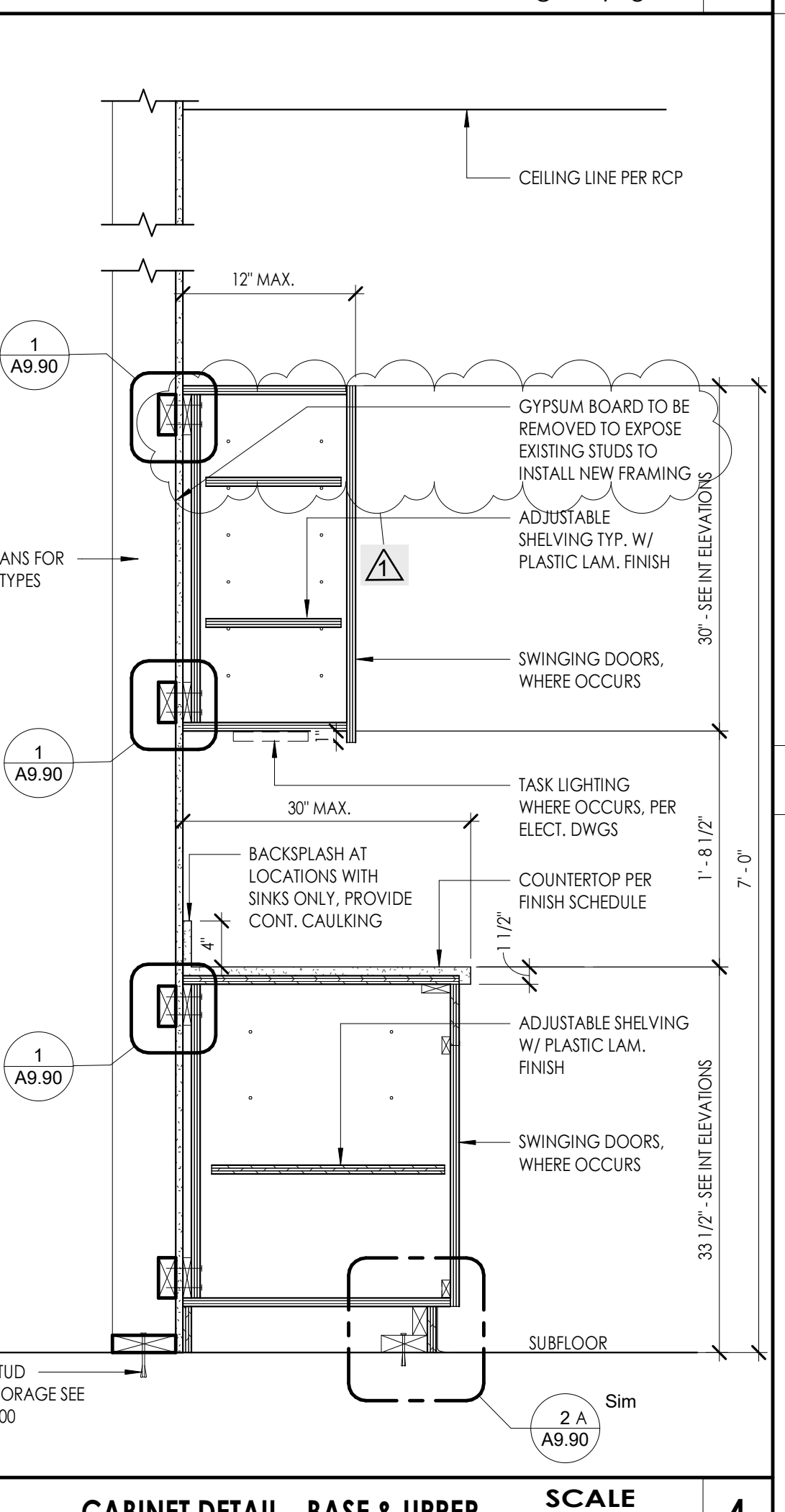
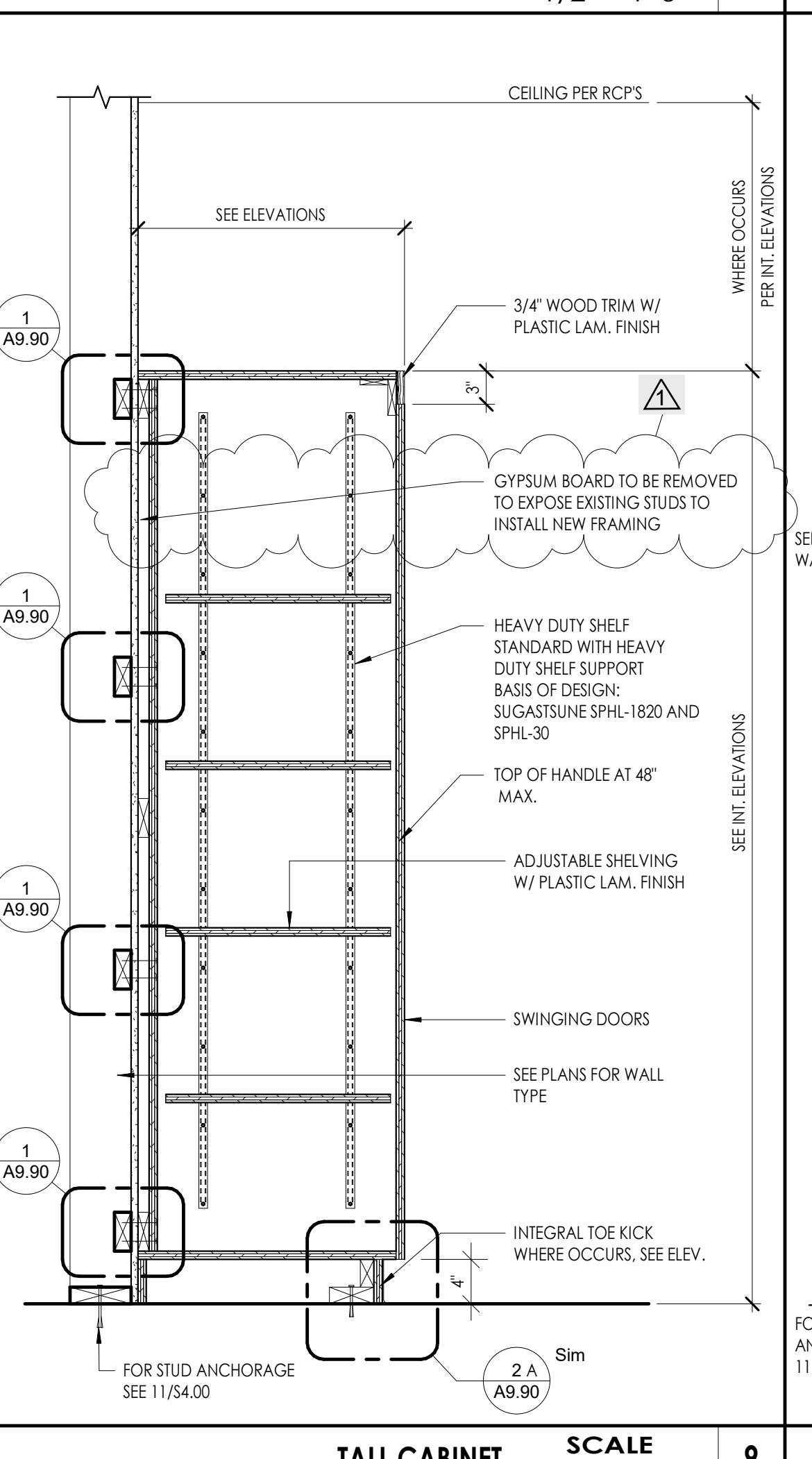
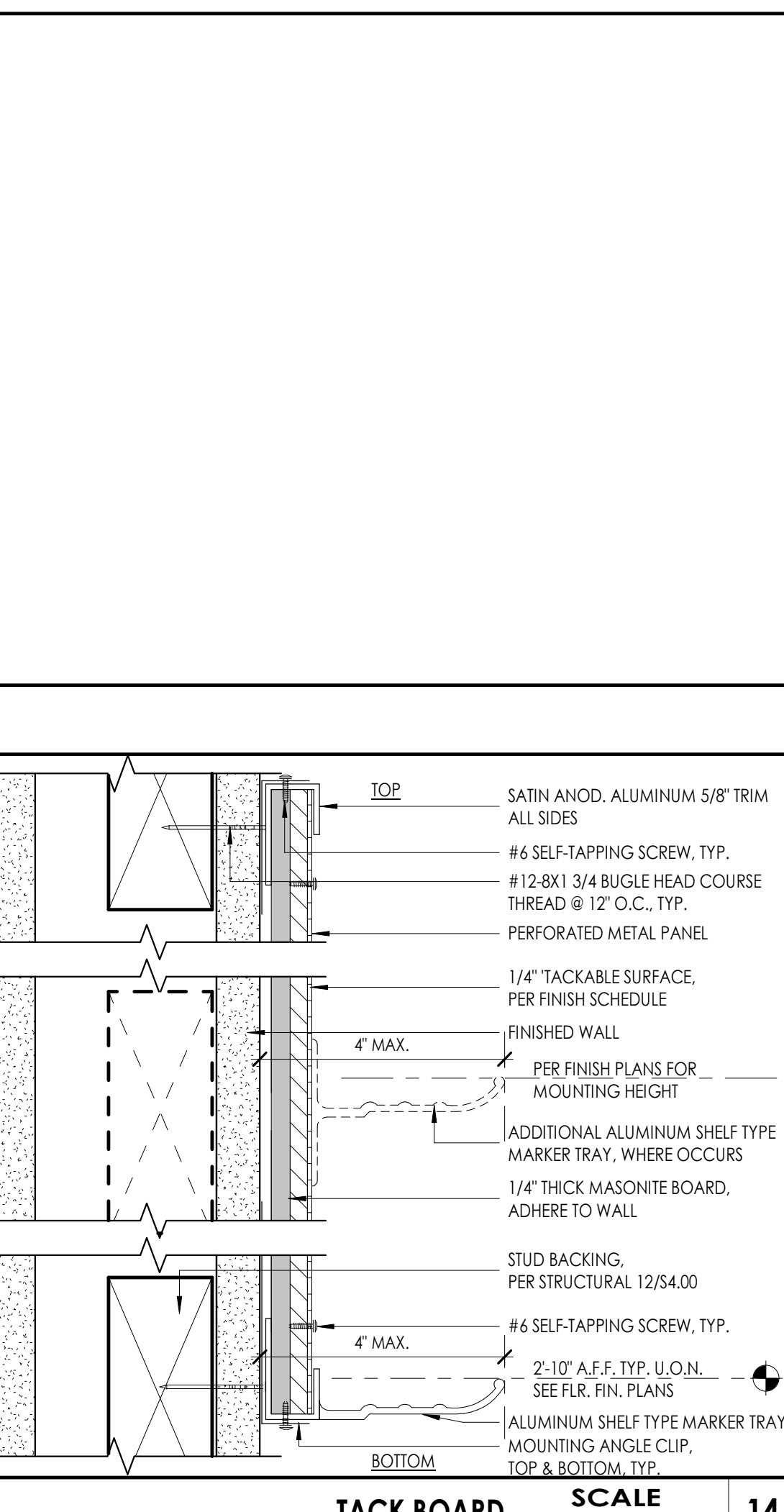
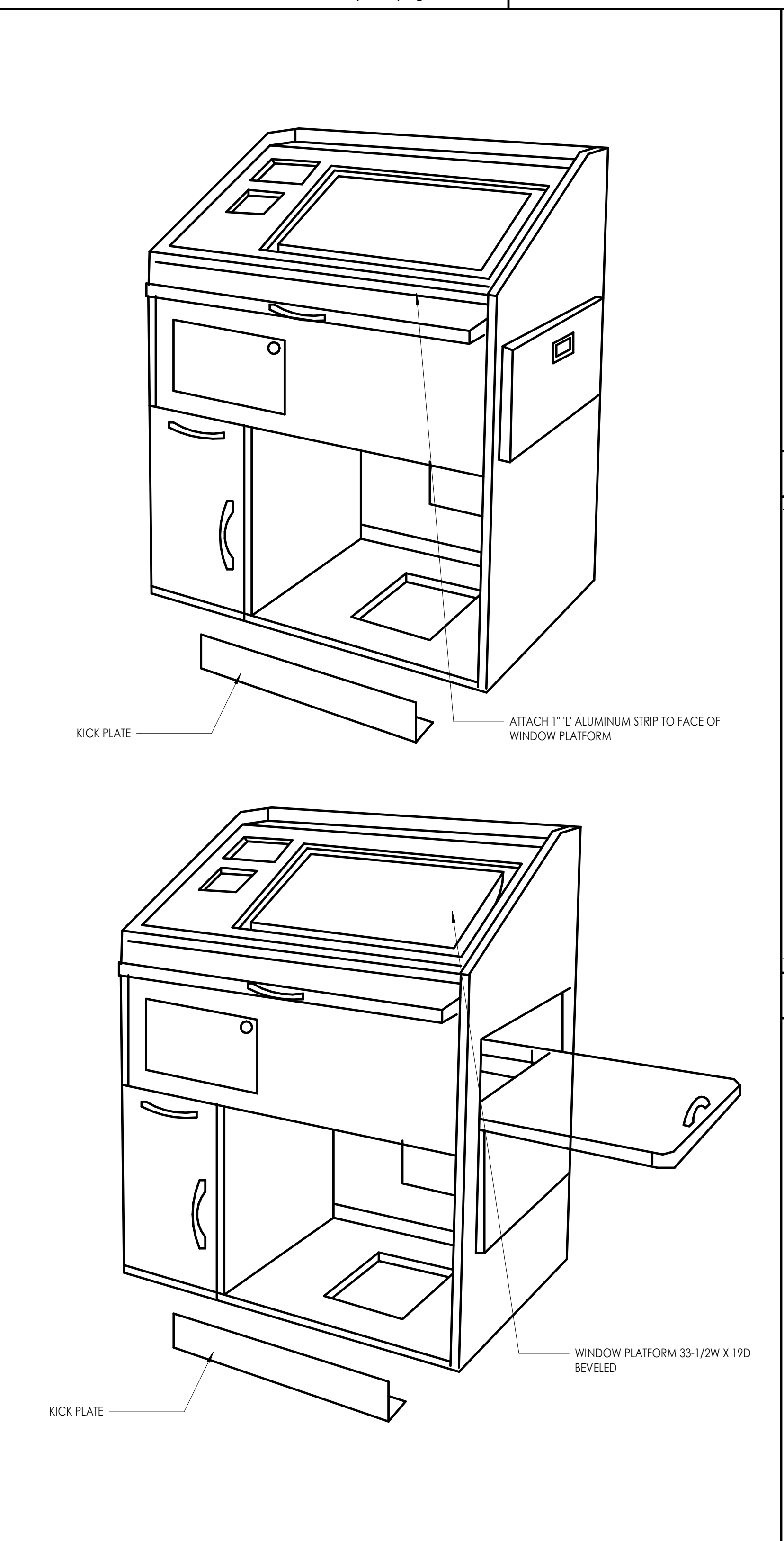
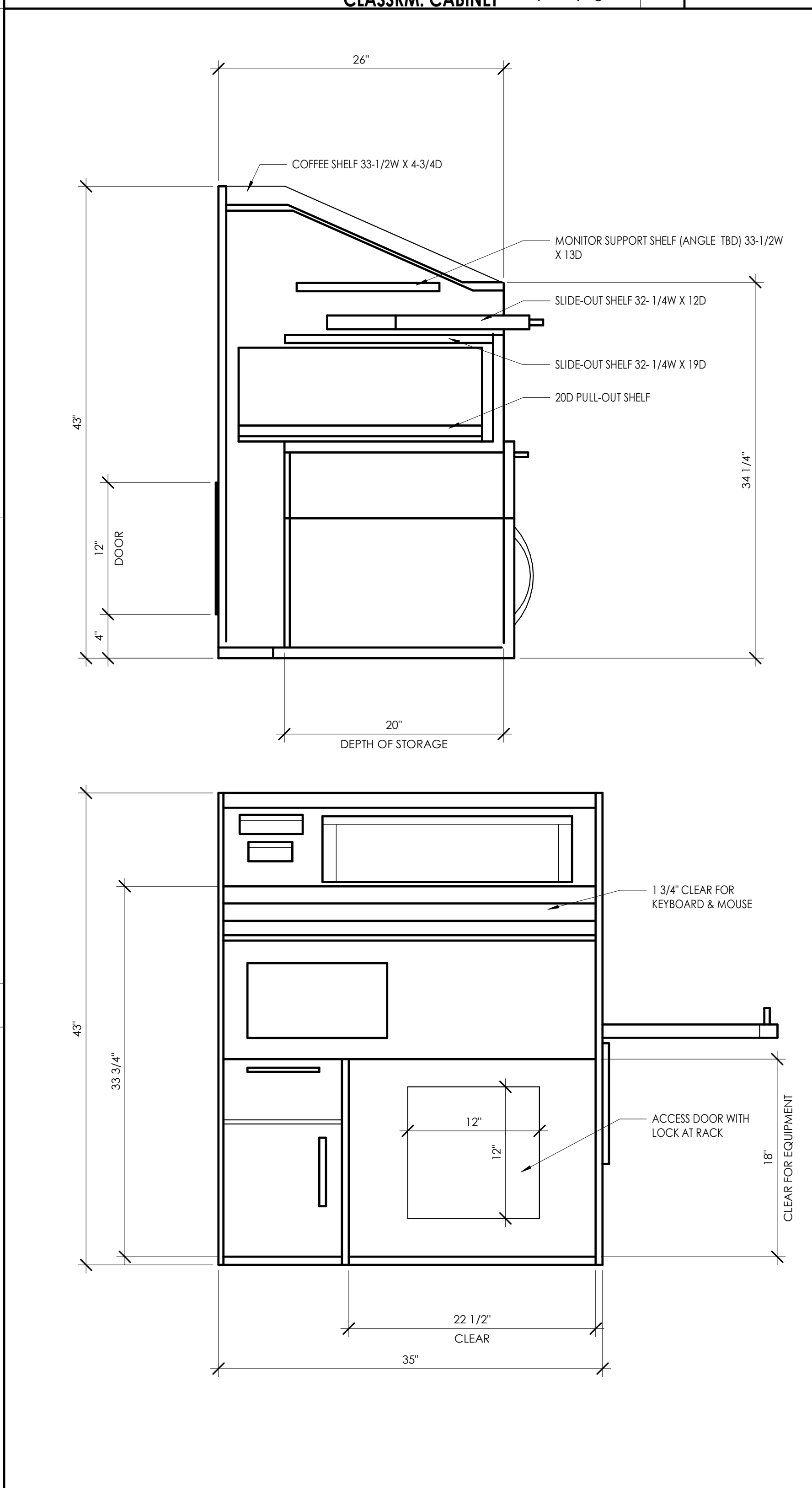
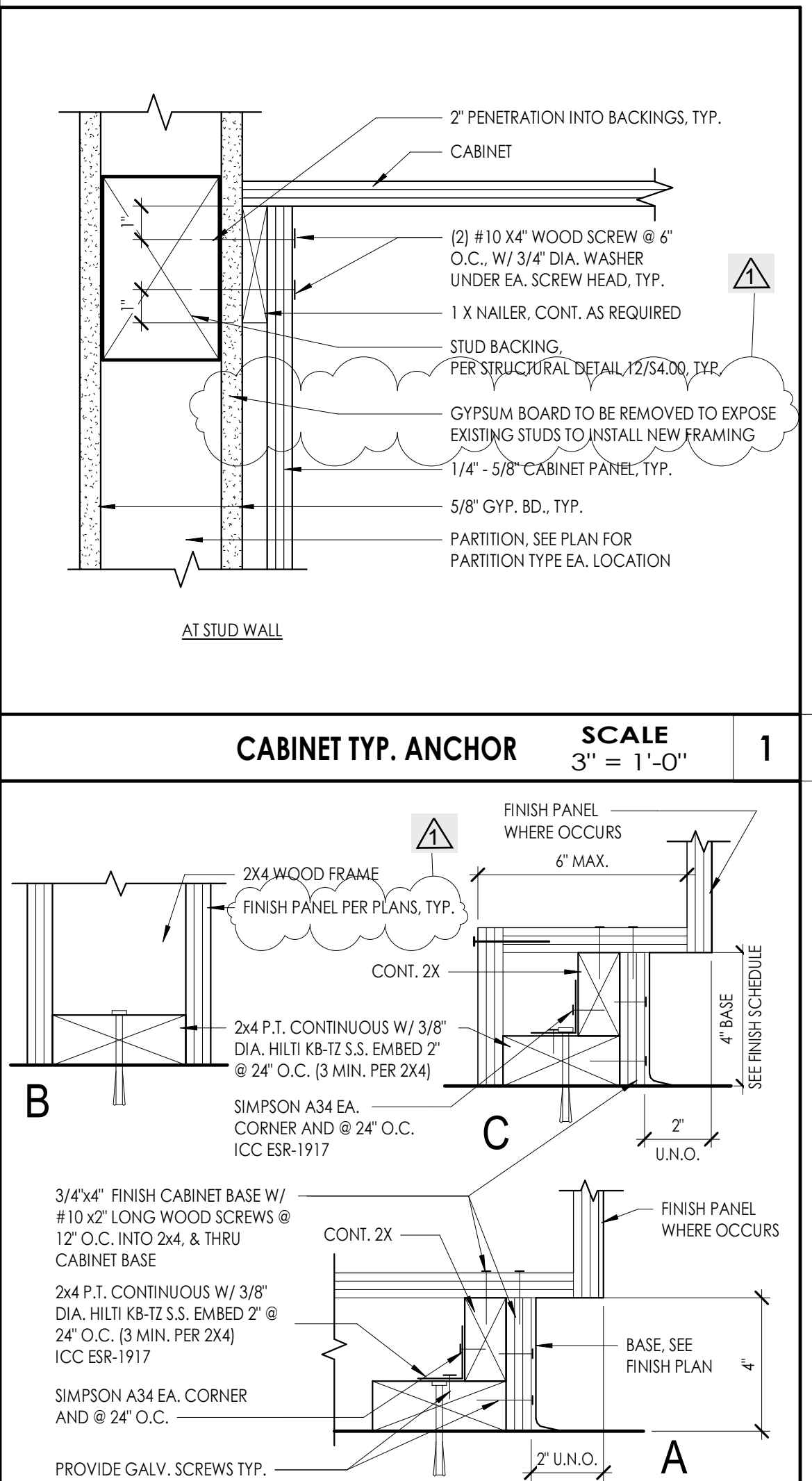
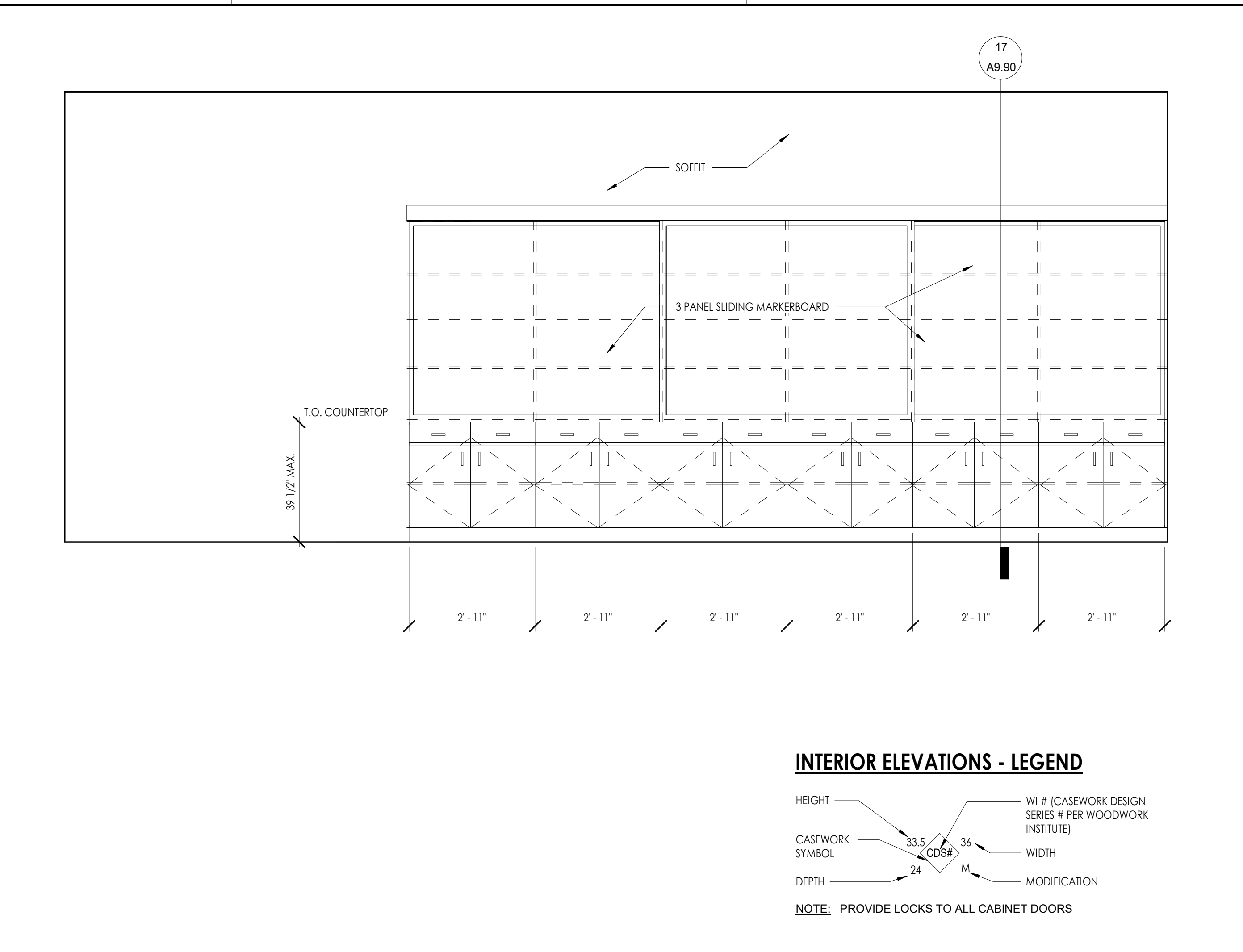
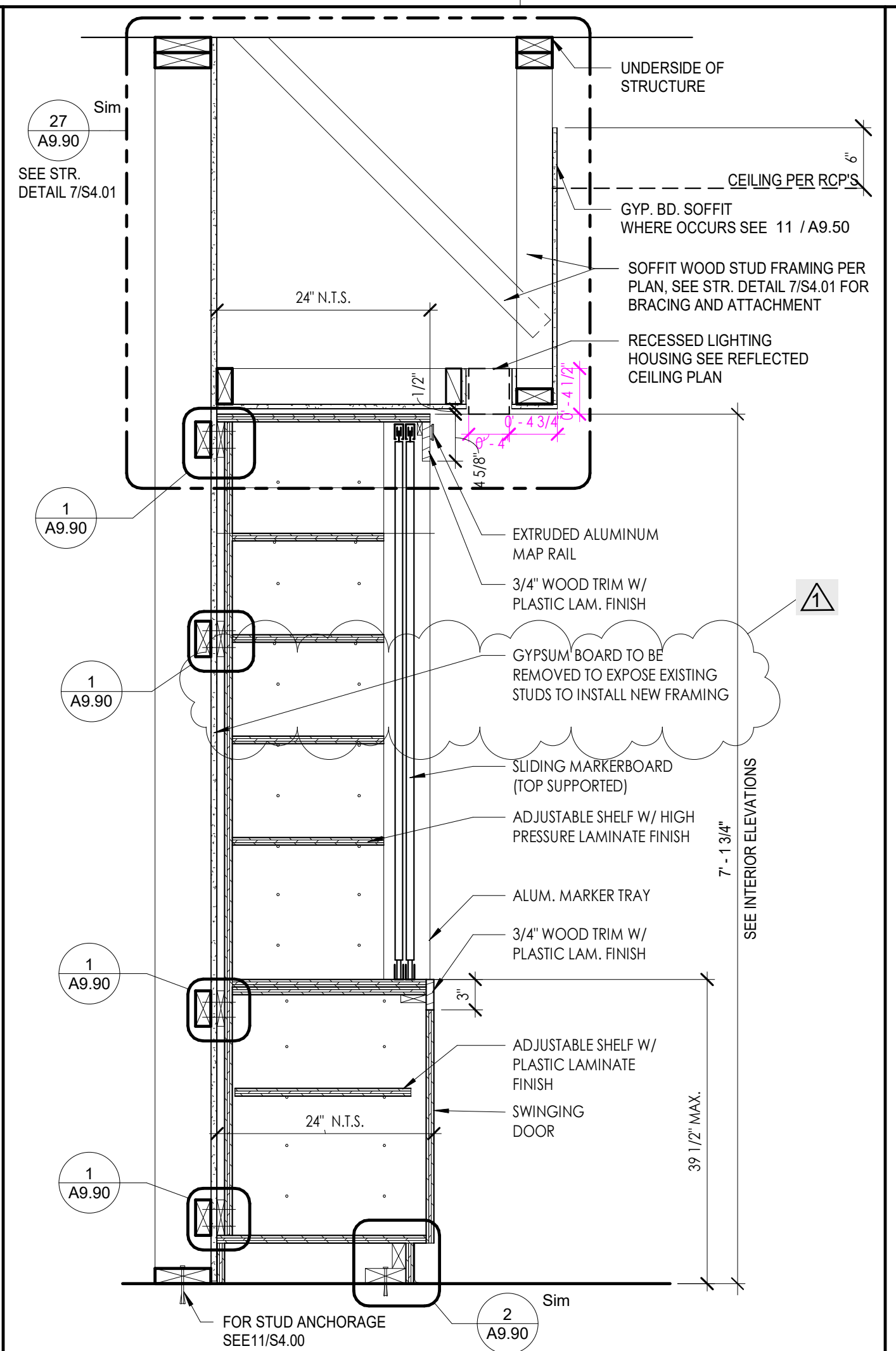
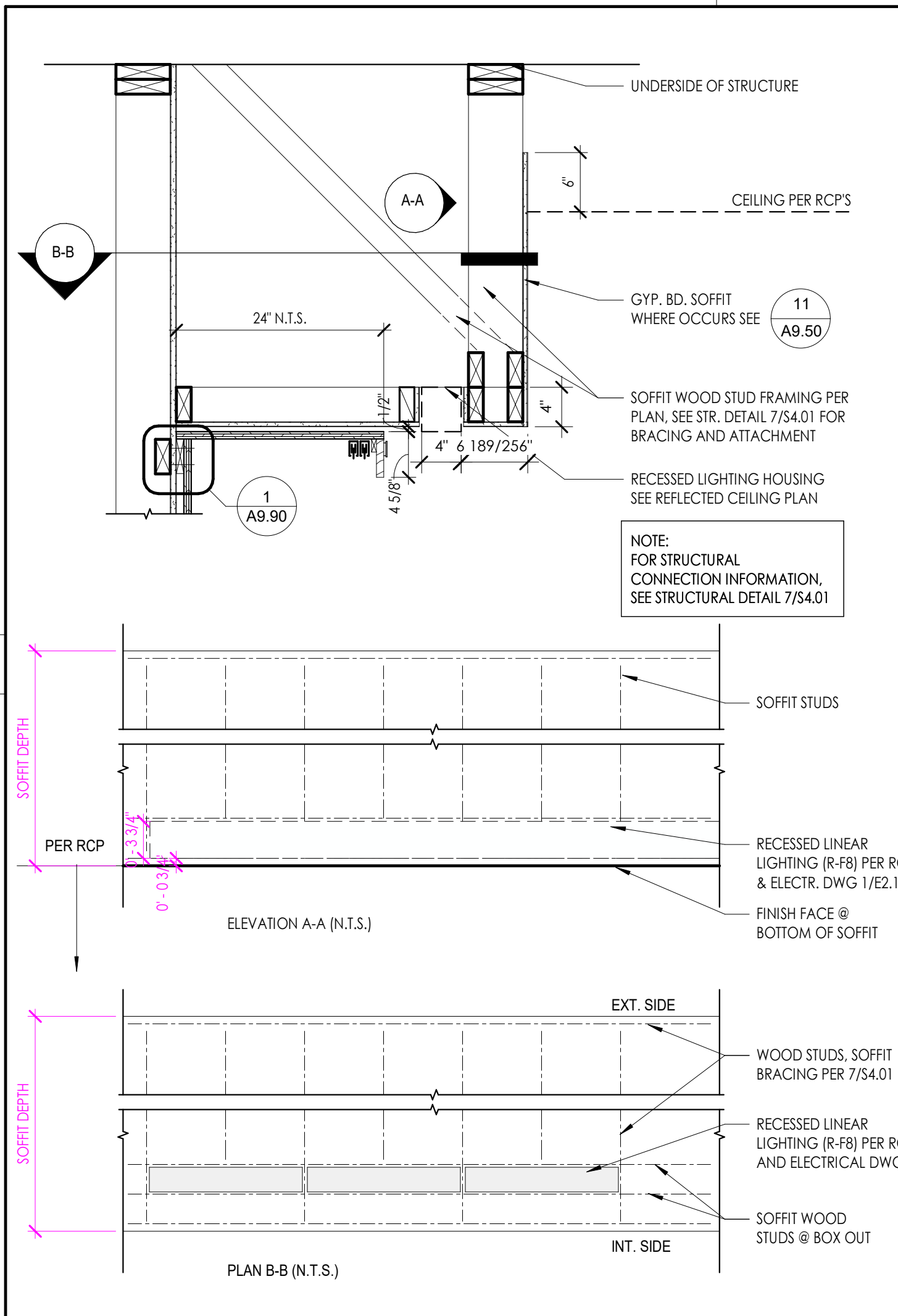








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**CASEWORK DETAILS**

SHEET NUMBER  
**A9.90**

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**PANEL: (E)LB2**  
 LOCATION: (E) MECHANICAL 407 VOLTAGE/PHASE: 120/208 WYE,3PH,4W FED FROM: LB1  
 FLOOR: FINISH FLOOR BUS AMPS: 100 A MAIN BREAKER: MLO RATING: 10 KAIC  
 MOUNTING: SURFACE

CKT	TYPE	LOAD	BKR/POLE	A	B	C	A	B	C	BKR/POLE	LOAD	TYPE	CKT		
1	N, R	REC. RM. 404.CLOCK,TV	20 A	1	480 VA		360 VA			1	20 A	LAB BENCH #2 RM. 404	R	2	
3	R	REC. RM. 404	20 A	1	540 VA			360 VA		1	20 A	LAB BENCH #2 RM. 404	R	4	
5	R	REC. RM. 404.PODIUM	20 A	1		360 VA			1200 VA	1	20 A	ANATOMAGE RM. 404	R	6	
7	R	LAB BENCH #1,RWAY RM. 404	20 A	1	720 VA		720 VA			1	20 A	LAB BENCH #3,RWAY RM. 404	R	8	
9	R	LAB BENCH #1,RWAY RM. 404	20 A	1	540 VA			540 VA		1	20 A	LAB BENCH #3,RWAY RM. 404	R	10	
11	R	BSC RM. 404	20 A	1		180 VA			1920 VA	1	20 A	AQUARIA RM. 404	R	12	
13	R	REC. RM. 405.PODIUM	20 A	1	900 VA		360 VA			1	20 A	PROJECTORS RM. 404	R	14	
15	N, R	REC. RM. 405.CLOCK	20 A	1	460 VA			1920 VA		1	20 A	REFRIGERATORS RM. 404	R	16	
17	R	LAB BENCH #3 RM. 405	20 A	1		540 VA			360 VA	1	20 A	PROJECTORS RM. 405	R	18	
19	R	LAB BENCH #3 RM. 405	20 A	1	540 VA			540 VA		1	20 A	RACEWAYS RM. 405	R	20	
21	R	LAB BENCH #2 RM. 405	20 A	1		540 VA			540 VA	1	20 A	RACEWAYS RM. 405	R	22	
23	R	LAB BENCH #2 RM. 405	20 A	1		540 VA			828 VA	2	20 A		EF-1	M	24
25	R	REC. RM. 406.08	20 A	1	540 VA			828 VA		--	--		--	26	
27	R	LAB BENCH #1 RM. 405	20 A	1	540 VA			1080 VA		1	20 A	REC. ROOF	R	28	
29	R	LAB BENCH #1 RM. 405	20 A	1		540 VA			1080 VA	1	20 A	EXISTING LOAD	--	30	
31	--	SPARE	20 A	1	0 VA			1080 VA		1	20 A	WATERFLOW BELL	--	32	
33	--	SPARE	20 A	1	0 VA			0 VA		1	20 A	SPARE	--	34	
35	--	EXISTING LOAD	20 A	2		1344 VA			0 VA	1	20 A	SPARE	--	36	
37	--		--	--	1344 VA			0 VA		1	20 A	SPARE	--	38	
39	--	SPARE	15 A	2	0 VA			1976 VA		2	30 A	FCU-1	M	40	
41	--		--	--	0 VA			1976 VA		--	--		--	42	

**LOAD TYPE KEY:**  
 N=NON CONTINUOUS M=MECH EQUIP TOTAL A: 8392 VA 70 A  
 P=POWER R=RECEPTACLE TOTAL B: 9036 VA 76 A  
 L=LIGHTING K=KITCHEN TOTAL C: 10868 VA 91 A

LOAD TYPE	CONNECTED	DEMAND FACTOR	ESTIMATED	PANEL TOTALS	
N	200 VA	100.00%	200 VA		
R	17640 VA	78.34%	13820 VA		
M	5608 VA	100.00%	5608 VA	TOTAL CONNECTED LOAD:	28296 VA 79 A
				TOTAL DEMAND LOAD:	24476 VA 68 A

**PANEL: HB**  
 LOCATION: IDF 406 VOLTAGE/PHASE: 277/480 WYE,3PH,4W FED FROM: 65 KAIC  
 FLOOR: FINISH FLOOR BUS AMPS: 225 A MAIN BREAKER: 225 A  
 MOUNTING: RECESSED

CKT	TYPE	LOAD	BKR/POLE	A	B	C	A	B	C	BKR/POLE	LOAD	TYPE	CKT	
1	L	EXTERIOR LIGHTING	20 A	1	547 VA		2715 VA			3	15 A	WSHP 1	M	2
3	L	RM. 409	20 A	1	289 VA		2715 VA			--	--		--	4
5	L	RM. 410,411,412	20 A	1		253 VA		2715 VA		--	--		--	6
7	L	RM. 401,402,403	20 A	1	289 VA		2715 VA			3	40 A	WSHP 2A	M	8
9	L	RM. 405,406,407,408	20 A	1	529 VA		2715 VA			--	--		--	10
11	L	RM. 401	20 A	1		418 VA		2715 VA		--	--		--	12
13	--	SPARE	50 A	3	0 VA		2715 VA			3	20 A	WSHP 2B	M	14
15	--		--	--	0 VA		2715 VA			--	--		--	16
17	--		--	--	0 VA		2715 VA			--	--		--	18
19	--	SPARE	15 A	3	0 VA		2160 VA			3	15 A	FLC-1	M	20
21	--		--	--	0 VA		2160 VA			--	--		--	22
23	--		--	--	0 VA		2160 VA			--	--		--	24
25	N, ...	(E)TB	125 A	3	28892...		1330 VA			3	15 A	P 1,2	M	26
27	--		--	--	30473...		1330 VA			--	--		--	28
29	--		--	--	32405...		1330 VA			--	--		--	30
31	--	SPARE	20 A	1	0 VA		0 VA			1	20 A	SPARE	--	32
33	--	SPARE	20 A	1	0 VA		0 VA			1	20 A	SPARE	--	34
35	--	SPARE	20 A	1	0 VA		0 VA			1	20 A	SPARE	--	36
37	--	SPARE	20 A	1	0 VA		0 VA			1	20 A	SPARE	--	38
39	--	SPARE	20 A	1	0 VA		0 VA			1	20 A	SPARE	--	40
41	--	SPARE	20 A	1	0 VA		670 VA			1	20 A	GREENHOUSE LIGHTING	L	42

**LOAD TYPE KEY:**  
 N=NON CONTINUOUS M=MECH EQUIP TOTAL A: 41362 VA 149 A  
 P=POWER R=RECEPTACLE TOTAL B: 42925 VA 156 A  
 L=LIGHTING K=KITCHEN TOTAL C: 45380 VA 165 A

LOAD TYPE	CONNECTED	DEMAND FACTOR	ESTIMATED	PANEL TOTALS	
L	2995 VA	125.00%	3744 VA		
N	7720 VA	100.00%	7720 VA		
R	53540 VA	59.34%	31770 VA	TOTAL CONNECTED LOAD:	129667 VA 156 A
M	59614 VA	100.00%	59614 VA	TOTAL DEMAND LOAD:	108646 VA 131 A

**PANEL: LB1**  
 LOCATION: IDF 406 VOLTAGE/PHASE: 120/208 WYE,3PH,4W FED FROM: TB  
 FLOOR: FINISH FLOOR BUS AMPS: 250 A MAIN BREAKER: MLO RATING: 250 KAIC  
 MOUNTING: RECESSED

CKT	TYPE	LOAD	BKR/POLE	A	B	C	A	B	C	BKR/POLE	LOAD	TYPE	CKT	
1	--	BLDG. EXTERIOR	20 A	1	950 VA		1675 VA			2	35 A	WSHP 3A	M	2
3	N	WATER HEATER	20 A	1	100 VA		1675 VA			--	--		--	4
5	N	BOILER	20 A	1		1680 VA			1675 VA	2	35 A	WSHP 3B	M	6
7	N	IRRIGATION CONTROLS	20 A	1	100 VA		1675 VA			--	--		--	8
9	N, R	REC. RM. 409.CLOCK	20 A	1	640 VA			1882 VA		2	35 A	WSHP 5	M	10
11	R	REC. RM. 409	20 A	1		360 VA			1882 VA	--	--		--	12
13	R	R OFFICE 411	20 A	1	720 VA		1800 VA			2	30 A	WSHP 4A	M	14
15	R	LAB BENCH #1,RWAY RM. 409	20 A	1	540 VA			1800 VA		--	--		--	16
17	R	LAB BENCH #1,RWAY RM. 409	20 A	1		540 VA			1800 VA	2	30 A	WSHP 4B	M	18
19	R	LAB BENCH #3,RWAY RM. 409	20 A	1	720 VA		1800 VA			--	--		--	20
21	R	LAB BENCH #3,RWAY RM. 409	20 A	1		540 VA			540 VA	1	20 A	REC. RM. 401,402	R	22
23	R	LAB BENCH #2 RM. 409	20 A	1		540 VA			360 VA	1	20 A	REC. RM. 401,402	R	24
25	R	LAB BENCH #2 RM. 409	20 A	1	540 VA		100 VA			1	20 A	EMERGENCY PHONE	N	26
27	R	PROJECTORS RM. 409	20 A	1		360 VA			1920 VA	1	20 A	AUTOCLEASE RM. 403	R	28
29	R	REC. RM. 410-12	20 A	1		540 VA			1920 VA	1	20 A	UC. GLASS WASHER RM. 403	R	30
31	N, R	REC. RM. 410,11,CLOCK RM. ...	20 A	1	460 VA		180 VA			1	20 A	(E)REC. RM. 404	R	32
33	R	REC. RM. 410-12,TV	20 A	1		540 VA			1920 VA	1	20 A	FREEZER RM. 403	R	34
35	R	DESKS RM. 411	20 A	1		1200 VA			1920 VA	1	20 A	REFRIGERATOR RM. 403	R	36
37	R	DESKS RM. 412	20 A	1	1200 VA		1080 VA			1	20 A	CART CHARGING RM. 403	R	38
39	R	(E)REC. RM. 409	20 A	1	180 VA			1800 VA		1	20 A	FUME HOOD RM. 403	R	40
41	R	REC. RM. 408	20 A	1		720 VA			720 VA	1	20 A	REC. RM. 403,BENCH	R	42
43	N	ECLYPSE CONTROLLER	20 A	1	100 VA		820 VA			1	20 A	REC. RM. 403,BENCH,CLOCK	N, R	44
45	R	IT CABINET	20 A	1		1000 VA			540 VA	1	20 A	REC. COURTYARD	R	46
47	R	IT CABINET	30 A	2		2000 VA			540 VA	1	20 A	REC. COURTYARD	R	48
49	--		--	--	2000 VA		1080 VA			1	20 A	REC. RM. 404 INCUBATOR	R	50
51	N	FAPS,AMP CABINETS	20 A	1	960 VA		1920 VA			1	20 A	ICE MACHINE RM. 403	R	52
53	N	FACP,VECP CABINETS	20 A	1		960 VA			0 VA	1	20 A	SPARE	--	54
55	N	BMS PANEL	20 A	1	480 VA			0 VA		1	20 A	SPARE	--	56
57	N	JACE CONTROLLER	20 A	1	480 VA			0 VA		1	20 A	SPARE	--	58
59	N	SECURITY PANEL	20 A	1		960 VA			0 VA	1	20 A	SPARE	--	60
61	N	WSHP 1-3 CTRLS.	20 A	1	500 VA			0 VA		1	20 A	SPARE	--	62
63	N	WSHP 4-5 CTRLS.	20 A	1		300 VA			0 VA	1	20 A	SPARE	--	64
65	N	I/O CONTROL MODULE	20 A	1		500 VA			0 VA	1	20 A	SPARE	--	66
67	M	ROLL UP DOOR	20 A	1	1440 VA			0 VA		1	20 A	SPARE	--	68
69	R	REC. RM. 409.PODIUM	20 A	1	540 VA			0 VA		1	20 A	SPARE	--	70
71	--	SPARE	20 A	1	0 VA			0 VA		1	20 A	SPARE	--	72
73	--	SPARE	20 A	1	0 VA			0 VA		1	20 A	SPARE	--	74
75	--	SPARE	20 A	1	0 VA			0 VA		1	20 A	SPARE	--	76
77	--	SPARE	20 A	1	0 VA			0 VA		1	20 A	SPARE	--	78
79	N, ...	(E)LB2	100 A	3	8392 VA		1080 VA			1	20 A	REC. GREENHOUSE SHELVING	R	80
81	--		--	--	9036 VA			1280 VA		1	20 A	REC. GREENHOUSE SHELVING	R	82
83	--		--	--	10868...			720 VA		1	20 A	REC. GREENHOUSE	R	84

**LOAD TYPE KEY:**  
 N=NON CONTINUOUS M=MECH EQUIP TOTAL A: 28892 VA 241 A  
 P=POWER R=RECEPTACLE TOTAL B: 30473 VA 256 A  
 L=LIGHTING K=KITCHEN TOTAL C: 32405 VA 272 A

LOAD TYPE	CONNECTED	DEMAND FACTOR	ESTIMATED	PANEL TOTALS	
N	7720 VA	100.00%	7720 VA		
R	53540 VA	59.34%	31770 VA		
M	24712 VA	100.00%	24712 VA	TOTAL CONNECTED LOAD:	91770 VA 255 A
				TOTAL DEMAND LOAD:	70000 VA 194 A

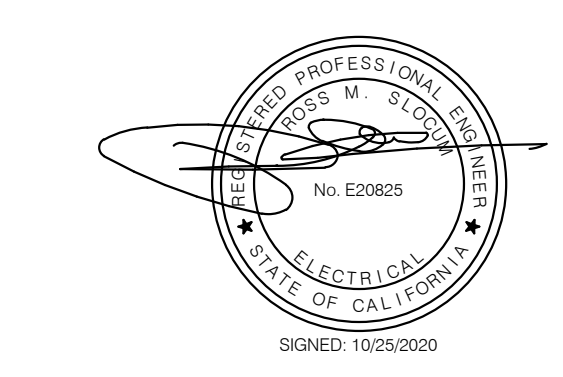
- GENERAL NOTES**
- CONTRACTOR TO UTILIZE BRANCH CIRCUITS SERVING ELECTRICAL DEVICES REMOVED AS PART OF THE DEMOLITION PHASE. CONFIRM IN FIELD EXACT CIRCUIT NUMBERS TO BE UTILIZED.
  - PANELBOARDS SHOWN ARE EXISTING UNLESS OTHERWISE NOTED.
  - CONTRACTOR TO PROVIDE UPDATED PANEL DIRECTORIES UPON COMPLETION OF NEW WORK.

- NOTES**
- PROVIDE NEW PANELBOARD AND CIRCUIT BREAKERS AS NOTED. CONTRACTOR TO UPDATE PANEL SCHEDULE DIRECTORY UPON COMPLETION OF WORK.
  - CIRCUIT BREAKER RENDERED AS SPARE AS A RESULT OF NEW WORK. UPDATE PANELBOARD CIRCUIT DIRECTORY ACCORDINGLY.
  - UTILIZE EXISTING 20A 1-POLE CIRCUIT BREAKER FOR NEW LOAD. UPDATE PANELBOARD CIRCUIT DIRECTORY ACCORDINGLY.
  - REPLACE EXISTING (2)20A 1-POLE BREAKERS. PROVIDE NEW 20A,2-POLE CIRCUIT BREAKER. MATCH KAIC RATING OF EXISTING PANELBOARD.
  - REPLACE EXISTING (2)20A 1-POLE BREAKERS. PROVIDE NEW 25A,2-POLE CIRCUIT BREAKER. MATCH KAIC RATING OF EXISTING PANELBOARD.

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**SECTION 22 40 00**

**PLUMBING FIXTURES**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A. Section Includes:
  - 1. Water closets.
  - 2. Water closet Flushometer valves and tanks.
  - 3. Toilet seats.
  - 4. Urinals
  - 5. Urinal Flushometer Valves
  - 6. Service sinks.
  - 7. Laminar-flow, faucet-spout outlets.
  - 8. Lavatory and Sink Supply Fittings.
  - 9. Lavatory and Sink Waste Fittings.
  - 10. Grout.
  - 11. Supports.

**1.03 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all fixtures.
  - 2. Include rated capacities, operating characteristics, electrical characteristics (where applicable), and furnished specialties and accessories.
- B. Sustainable Design Submittals:
  - 1. Product Data: For water consumption.
- C. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

**1.04 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For fixtures, faucets, flushometer valves and electronic sensors to include in operation and maintenance manuals.

**1.05 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than five of each type.
  - 2. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
  - 3. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

**PART 2 - PRODUCTS**

**2.01 Plumbing Fixtures**

- A. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Section 11B-213.3.
- B. Effective March 1, 2017, all single user-toilet facilities shall be identified as Gender Neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.2.6.3. No pictogram, text or braille is required on the symbol. If tactile jamb signage is provided, the signage shall comply with the appropriate technical requirements of CBC Section 11B-703. Examples of appropriate designations are “ALL-GENDER RESTROOM,” “RESTROOM” or “UNISEX RESTROOM.” DSA BU 17-01.
- C. Accessible plumbing fixtures shall comply with all the requirements in CBC Division 6.
- D. Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per CBC Section 11B-604.3.1.
- E. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.
- F. Accessible fixture controls shall comply with CBC Sections 11B-602.3 for drinking fountains, 11B-604.6 for water closets, 11B-604.9.5 for children’s water closets, 11B-605.4 for urinals, 11B-606.4 for lavatories and sinks, 11B-607.5 for bathtubs, 11B-608.5 for showers, and 11B-611.3 for washing machines and clothes dryers.

**2.02 WALL-MOUNTED WATER CLOSETS**

- A. Water Closets: Wall mounted, top spud.
  - 1. Manufacturer: Kohler “Kingston” model K-4325 or approved equal.
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following; American Standard, Sloan Valve or Zurn Industries.



3. Bowl:
  - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
  - b. Material: Vitreous china.
  - c. Type: Siphon jet.
  - d. Style: Flushometer valve.
  - e. Height: Standard.
  - f. Rim Contour: Elongated.
  - g. Water Consumption: 1.28 gal. per flush.
  - h. Spud Size and Location: NPS 1-1/2; top.
4. Flushometer Valve: See below.
5. Toilet Seat: See below.
6. Support: See below.
7. Water-Closet Mounting Height: Standard or Accessible or per Architectural drawings.

B. Water Closets: Wall mounted, back spud.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Standard.
  - b. Kohler Co.
  - c. TOTO USA, INC.
  - d. Zurn Industries, LLC.
2. Bowl:
  - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
  - b. Material: Vitreous china.
  - c. Type: Siphon jet.
  - d. Style: Flushometer valve.
  - e. Height: Standard.
  - f. Rim Contour: Elongated.
  - g. Water Consumption: 1.28 gal. per flush.
  - h. Spud Size and Location: NPS 1-1/2; back.
3. Flushometer Valve: See below.
4. Toilet Seat: See below.
5. Support: See below.
6. Water-Closet Mounting Height: Standard or Accessible or per Architectural drawings.

**2.03 WATER CLOSET FLUSHOMETER VALVES**

A. Electronic Flushometer Valves:

1. Manufacturer: Sloan "Royal" model 111-1.28-SF-ESS-TMO-HW or approved equal.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following;  
American Standard, Sloan Valve or Zurn Industries.
3. Standard: ASSE 1037.
4. Type: Diaphragm.
5. Minimum Pressure Rating: 125 psig.

6. Features: Include integral check stop, backflow-prevention device and True Mechanical override switch.
7. Material: Brass body with corrosion-resistant components.
8. Exposed Flushometer-Valve Finish: Chrome plated.
9. Panel Finish: Chrome plated or stainless steel.
10. Style: Exposed.
11. Actuator: Solenoid complying with UL 1951, and listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
12. Trip Mechanism: Hard-wired electronic sensor complying with UL 1951, and listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
13. Consumption: 1.28 gal. per flush.
14. Minimum Inlet: NPS 1.
15. Minimum Outlet: NPS 1-1/4.

## 2.04 TOILET SEATS

### A. Toilet Seats:

1. Manufacturer: Olsonite model 95SSCT or approved equal.
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following; Bemis Manufacturing, Church Seats or American Standard.
3. Standard: IAPMO/ANSI Z124.5.
4. Material: Plastic.
5. Type: Commercial, Heavy duty.
6. Shape: Elongated rim, open front.
7. Hinge: Self-sustaining, check-raising.
8. Hinge Material: Noncorroding metal, stainless steel.
9. Seat Cover: Not required.
10. Color: White.

## 2.05 WALL-HUNG URINALS

### A. Urinals: Wall hung, back outlet, washout, accessible.

1. **Manufactures:** Kohler “Brandon” model K-4991-ET or approved equal.
2. Fixture:
  - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
  - b. Material: Vitreous china.
  - c. Type: Washout with extended shields.
  - d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
  - e. Water Consumption: Low.
  - f. Spud Size and Location: NPS 3/4, top.
  - g. Outlet Size and Location: NPS 2, back.
  - h. Color: White.
3. Flushometer Valve: See below
4. Waste Fitting:



- a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
  - b. Size: NPS 2.
5. Support: Type I Urinal Carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights..
  6. Urinal Mounting Height: Standard or accessible per Architectural drawings.

## 2.06 URINAL FLUSHOMETER VALVES

### A. Electronic flushometer valves:

1. Manufactures: Manufacturer: Sloan “Royal” model 186-0.125-DBP-SF-ESS-TMO-HW or approved equal.
2. Standard: ASSE 1037.
3. Type: Diaphragm
4. Minimum Pressure Rating: 125 psig.
5. Features: Include integral check stop and backflow-prevention device and true mechanical override switch.
6. Material: Brass body with corrosion-resistant components.
7. Exposed Flushometer-Valve Finish: Chrome plated.
8. Panel Finish: Chrome plated or stainless steel.
9. Style: Exposed.
10. Actuator: Solenoid complying with UL 1951; listed and labeled as defined in CEC, by a qualified testing agency; and marked for intended location and application.
11. Trip Mechanism: Hard-wired electronic sensor complying with UL 1951; listed and labeled as defined in CEC, by a qualified testing agency; and marked for intended location and application.
12. Consumption: 0.125 gal. per flush.
13. Minimum Inlet: NPS 3/4.
14. Minimum Outlet: NPS 1-1/4.

## 2.07 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES

### A. Lavatory: Rectangular, Round or Oval, self-rimming, vitreous china, counter or undercounter mounted.

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. American Standard.
  - b. Crane Plumbing, L.L.C.
  - c. Gerber Plumbing Fixtures LLC.
  - d. Kohler Co.
2. Fixture:
  - a. Standard: ASME A112.19.2/CSA B45.1.

- b. Type: Self-rimming for above-counter mounting.
- c. Nominal Size: Rectangular, 20 by 17 inches.
- d. Faucet-Hole Punching: One hole.
- e. Faucet-Hole Location: Top.
- f. Color: White.
- g. Mounting Material: Sealant.

- 3. Faucet: "Solid-Brass, Automatically Operated Lavatory Faucets" Article.

**2.08 SERVICE SINKS**

- A. Service Sinks: Enameled, cast iron, trap standard mounted.
  - 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. American Standard.
    - b. Commercial Enameling Company.
    - c. Gerber Plumbing Fixtures LLC.
    - d. Kohler Co.
  - 2. Fixture:
    - a. Standard: ASME A112.19.1/CSA B45.2.
    - b. Type: Service sink with back.
    - c. Back: No holes on fixture.
    - d. Color: White.
    - e. Mounting: NPS 3 P-trap standard with grid strainer inlet, cleanout, and floor flange.
    - f. Rim Guard: On front and sides.
  - 3. Faucet: Refer to Fixture Schedule on drawing P002.
  - 4. Support: Type II sink carrier.
  - 5. Lavatory Mounting Height: Refer to Architectural drawings for fixture heights.
- B. Service Sinks: Enameled, cast iron, floor mounted.
  - 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. American Standard.
    - b. Commercial Enameling Company.
    - c. Gerber Plumbing Fixtures LLC.
    - d. Kohler Co.
  - 2. Fixture:
    - a. Standard: ASME A112.19.1/CSA B45.2.
    - b. Style: With front apron and raised back.
    - c. Nominal Size: 28 by 28 inches.
    - d. Color: White.
    - e. Drain: Grid with NPS 2 or NPS 3 outlet.



f. Rim Guard: Coated wire.

3. Faucet: REFER TO DSA APPROVED CONTRACT DOCUMENTS.

## **2.09 LAMINAR-FLOW, FAUCET-SPOUT OUTLETS**

- A. NSF Standard: Comply with NSF 372 for faucet-spout-outlet materials that will be in contact with potable water.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. AM Conservation Group, Inc.
  - 2. Chronomite Laboratories, Inc.
  - 3. NEOPERL, Inc.
  - 4. T&S Brass and Bronze Works, Inc.
- C. Description: Chrome-plated-brass, faucet-spout outlet that produces non-aerating, laminar stream. Include external or internal thread that mates with faucet outlet for attachment to faucets where indicated and flow-rate range that includes flow of faucet.

## **2.10 LAVATORY AND SINK SUPPLY FITTINGS**

- A. NSF Standard: Comply with NSF 372 for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Loose key.
- F. Risers:
  - 1. Lavatories: NPS 3/8Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces, ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.
  - 2. Sinks: NPS 1/2Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces, ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

## **2.11 LAVATORY AND SINK WASTE FITTINGS**

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/4 or NPS 1-1/2offset and straight tailpiece.
- C. Traps:

1. Lavatories: NPS 1-1/2 by 1-1/4.
2. Sinks: NPS 1-1/2.
3. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inchthick brass tube to wall and chrome-plated, brass or steel wall flange.
4. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch thick stainless-steel tube to wall; and stainless-steel wall flange.

D. Continuous Waste:

1. Size: NPS 1-1/2" or NPS 2".
2. Material: Chrome-plated, 0.032-inchthick brass tube.

**2.12 GROUT**

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

**2.13 SUPPORTS**

A. Water Closet Carrier:

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. Zurn Industries, LLC.
2. Standard: ASME A112.6.1M.
3. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

B. Type I & II Urinal Carrier:

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. Jay R. Smith Mfg. Co.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. WATTS.
  - e. Zurn Industries, LLC.
2. Standard: ASME A112.6.1M.



C. Type I & II Sink Carrier:

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. Jay R. Smith Mfg. Co.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. WATTS.
  - e. Zurn Industries, LLC.
2. Standard: ASME A112.6.1M.

D. Type I, II & III Lavatory Carrier:

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. Jay R. Smith Mfg. Co.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. WATTS.
  - e. Zurn Industries, LLC.
2. Standard: ASME A112.6.1M.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.
- B. Examine walls, floors and counters for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.02 INSTALLATION**

- A. Water-Closet Installation:
  1. Install level and plumb according to roughing-in drawings.
  2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
  3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.
- B. Water-Closet Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
  2. Use carrier supports with waste-fitting assembly and seal.
  3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
  4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.
- C. Water-Closet Flushometer-Valve Installation:
1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
  2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
  3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
  4. Install actuators in locations that are easy for people with disabilities to reach.
- D. Install toilet seats on water closets.
- E. Urinal Installation:
1. Install urinals level and plumb according to roughing-in drawings.
  2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
  3. Install wall-hung, bottom-outlet urinals with tubular waste piping attached to supports.
  4. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.
  5. Install trap-seal liquid in urinals.
- F. Urinal Support Installation:
1. Install supports, affixed to building substrate, for wall-hung urinals.
  2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
  3. Use carriers without waste fitting for urinals with tubular waste piping.
  4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.
- G. Urinal Flushometer-Valve Installation:
1. Install flushometer-valve water-supply fitting on each supply to each urinal.
  2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
  3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.
- H. Install lavatories, sinks and showers level and plumb according to roughing-in drawings.
- I. Install supports, affixed to building substrate, for wall-mounted lavatories and sinks.
- J. Install accessible wall-mounted lavatories and sinks at accessible mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.
- K. Set floor-mounted sinks, shower receptors or shower basins in leveling bed of cement grout.
- L. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- M. Assemble shower components according to manufacturers' written instructions.
- N. Install water-supply piping with stop on each supply to each fixture faucet.



1. Exception: Use ball or gate valves if supply stops are not specified with fixture or integral with fixture. Comply with valve requirements specified in Section 220523 "General Duty Valves for Plumbing Piping."
  2. Install stops in locations where they can be easily reached for operation.
- O. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- P. Seal joints between fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
- Q. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

### **3.03 CONNECTIONS**

- A. Connect fixtures with water supplies, stops, risers, traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. and Vent Piping."
- E. Where installing piping adjacent to fixtures, allow space for service and maintenance.

### **3.04 ADJUSTING**

- A. Operate and adjust fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

### **3.05 CLEANING AND PROTECTION**

- A. After completing installation of fixtures, inspect and repair damaged finishes.
- B. Clean fixtures, faucets, flush valves and fittings with manufacturers' recommended cleaning methods and materials.
- C. Install protective covering for installed fixtures and fittings.
- D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

**SECTION 23 81 46**

**WATER-SOURCE UNITARY HEAT PUMPS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes unitary heat pumps with refrigerant-to-water heat exchangers, refrigeration circuits, and refrigerant compressor(s).

**1.02 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each water-source unitary heat pump.
- C. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- D. Shop Drawings:
- E. Include plans, elevations, sections, and mounting and attachment details.
- F. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- G. Include diagrams for power, signal, and control wiring.

**1.03 INFORMATIONAL SUBMITTALS**

- A. Seismic Qualification Certificates: For water-source unitary heat pumps, accessories, and components, from manufacturer.
- B. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- C. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Product Certificates: For each type of water-source unitary heat pump, signed by product manufacturer.
- F. Field quality-control reports.



- G. Sample Warranty: For manufacturer's warranty.

**1.04 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For water-source unitary heat pumps to include in emergency, operation, and maintenance manuals.

**1.05 WARRANTY**

- A. Special Warranty: Manufacturer agrees to repair or replace components of water-source unitary heat pumps that fail in materials or workmanship within specified warranty period.
- B. Failures include, but are not limited to, refrigeration components.
- C. Warranty Period: Four years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.01 PERFORMANCE REQUIREMENTS**

- A. ASHRAE Compliance:
- B. ASHRAE 15.
- C. Comply with CEC.
- D. Comply with safety requirements in UL 484 for assembly of free-delivery, water-source heat pumps.

**2.02 WATER-SOURCE UNITARY HEAT PUMPS, 6 TONS AND SMALLER**

- A. Manufacturer's:
  - 1. TRANE(Basis of Design)
  - 2. ClimateMaster,
  - 3. or approved equal.
- B. Description: Packaged water-source unitary heat pump with temperature controls; factory assembled, piped, wired, tested, and rated according to ASHRAE/ARI/ISO-13256-1.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- D. Cabinet and Chassis: Galvanized-steel casing with the following features:
- E. Access panel for access and maintenance of internal components.
- F. Knockouts for electrical and piping connections.

- G. Cabinet Insulation: Glass-fiber liner, minimum 1/2-inch-thick, complying with UL 181, ASTM C1071, and ASTM G21.
- H. Water Circuits:
- I. Refrigerant-to-Water Heat Exchangers:
  - 1. All units shall contain an HFC-410A sealed refrigerant circuit including a high efficiency scroll or rotary compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, reversing valve, coaxial (tube in tube) refrigerant to water heat exchanger, and safety controls including a high pressure switch, low pressure (loss of charge) switch, water coil low temperature sensor, and air coil low temperature sensor. Access fittings shall be factory installed on high- and low-pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. Units that cannot be reset at the thermostat shall not be acceptable.
  - 2. The compressor shall have a dual level vibration isolation system. The compressor will be mounted on specially engineered sound-tested EPDM vibration isolation grommets or springs to a large heavy gauge compressor mounting plate, which is then isolated from the cabinet base with rubber grommets for maximized vibration attenuation. Compressor shall have thermal overload protection. Compressor shall be located in an insulated compartment away from air stream to minimize sound transmission.
  - 3. Refrigerant to air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled copper tube construction rated to withstand 625 PSIG (4309 kPa) refrigerant working pressure. Refrigerant to water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 625 PSIG (4309 kPa) working refrigerant pressure and 500 PSIG (3445 kPa) working water pressure. The refrigerant to water heat exchanger shall be “electro-coated” with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1000 hours salt spray protection per ASTM B117-97 on all external steel and copper tubing. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 160 in-lbs (184 kg-cm) direct (ASTM D2794-93).
- J. Filter-Dryer: Factory installed to clean and dehydrate the refrigerant circuit.
- K. Charging Connections: Service fittings on suction and liquid for charging and testing on each circuit.
- L. Reversing Valve: Four-way, solenoid-activated valve designed to be fail-safe in heating position with replaceable magnetic coil.
- M. Compressor:
  - 1. Scroll.
  - 2. Installed on vibration isolators and mounted on a structural steel base plate and full-length channel stiffeners.
  - 3. Exterior of compressor shall be wrapped with a high-density sound-attenuating blanket and housed in an acoustically treated enclosure.
  - 4. Factory-Installed Safeties:
  - 5. Antirecycle timer.



6. High-pressure cutout.
  7. Low-pressure cutout or loss of charge switch.
  8. Internal thermal-overload protection.
  9. Freezestat to stop compressor if water-loop temperature in refrigerant-to-water heat exchanger falls below 35 deg F.
- N. Water-coil, low-temperature switch.
- O. Refrigerant Piping Materials: ASTM B743 copper tube with wrought-copper fittings and brazed joints.
- P. Pipe Insulation: Refrigerant minimum 3/8-inch- thick, flexible elastomeric insulation on piping exposed to airflow through the unit. Maximum 25/50 flame-spread/smoke-developed indexes according to ASTM E84.
- Q. Refrigerant Metering Device: Thermal-expansion valve.
- R. Controls: Control equipment and sequence of operation are specified in Division 25
- S. Controls:
1. Basic Unit Control Modes and Devices:
  2. Unit shutdown on high or low refrigerant pressures.
  3. Unit shutdown on low water temperature.
  4. Low- and high-voltage protection.
  5. Overcurrent protection for compressor.
  6. Random time delay, three to 10 seconds, start on power-up.
  7. Time delay override for servicing.
  8. Control voltage transformer.
  9. Water-coil freeze protection (selectable for water or antifreeze).
  10. Automatic intelligent reset. Unit shall automatically reset five minutes after trip if the fault has cleared. Should a fault reoccur three times sequentially, lockout requiring manual reset occurs.
  11. Ability to defeat time delays for servicing.
  12. Digital display to indicate high pressure, low pressure, low voltage, and high voltage.
  13. The low-pressure switch shall not be monitored for the first 90 seconds after a compressor start command to prevent nuisance safety trips.
  14. Remote fault-type indication at thermostat.
  15. Selectable 24-V dc or pilot duty dry contact alarm output.
  16. 24-V dc output to cycle a motorized water valve with compressor contactor.
  17. Service test mode for troubleshooting and service.
  18. Unit-performance sentinel warns when heat pump is running inefficiently.
  19. Compressor soft start.
- T. Thermostat:
1. Wall-Mounted Thermostat:
  2. Deg F indication.
  3. Wall-mounted temperature sensor.
  4. Duct-mounted temperature sensor
  5. Unoccupied period override push button.
  6. Digital display to indicate fault condition at heat pump.
  7. Data entry and access port.
  8. Input data include room temperature and humidity set points for occupied and

unoccupied periods.

9. Output data include room temperature and humidity, supply-air temperature, entering-water temperature, operating mode, and status.

U. Terminal Controller:

1. Scheduled operation for occupied and unoccupied periods on seven-day clock with minimum of four programmable periods per day.
2. Two-hour unoccupied override period.
3. Remote-control panel to contain programmable timer and digital display for fault condition.
4. Compressor-disable relay to stop compressor operation for demand limiting or switch to unoccupied operation.
5. Automatic restart after five minutes if fault clears. Lockout after three attempts to restart following fault. Indicate fault for service technician.
6. Backup for volatile memory.
7. DDC interface requirements as further described in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."
8. Interface relay for scheduled operation.
9. Interface relay to provide indication of fault at central workstation.
10. Provide BAC-net interface for central DDC workstation for the following functions:
11. Set-point adjustment.
12. Start/stop and operating status of heat-pump unit.
13. Data inquiry to include supply-air and room-air temperature and humidity and entering-water temperature.
14. Occupied and unoccupied schedules.

- V. Electrical Connection: Single electrical connection with fused disconnect.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping and electric installations for water-source unitary heat pumps to verify actual locations of piping connections and electrical conduits before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.02 INSTALLATION**

- A. Equipment Mounting:
  1. Install water-source, unitary heat pumps on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
  2. Comply with requirements for vibration-isolation and seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."



3. Comply with requirements for vibration-isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."
4. Suspend water-source, unitary heat pumps from structure with all-thread hanger rods and spring hangers with vertical-limit stop. Hanger rods and attachments to structure are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
5. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls or as required in Section 230923 "Direct Digital Control (DDC) System for HVAC."

**B. CONNECTIONS**

1. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:
2. Connect supply and return hydronic piping to heat pump with hose kits.
3. Install electrical devices furnished by manufacturer but not specified to be factory mounted.
4. Install piping adjacent to machine to allow space for service and maintenance.

**3.03 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following field tests and inspections:
  1. After installing water to water heat pumps and after electrical circuitry has been energized, test units for compliance with requirements.
  2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
  3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Heat pumps will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

**3.04 STARTUP SERVICE**

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions.
- C. Inspect for visible damage to unit casing.
- D. Inspect for visible damage to compressor and coils.
- E. Inspect internal insulation.
- F. Verify that labels are clearly visible.

- G. Verify that clearances have been provided for servicing.
- H. Verify that controls are connected and operable.
- I. Adjust vibration isolators.
- J. Start unit according to manufacturer's written instructions.
- K. Complete startup sheets and attach copy with Contractor's startup report.
- L. Record superheat and subcooling during start-up.
- M. Inspect and record performance of interlocks and protective devices; verify sequences.
- N. Operate unit for an initial period as recommended or required by manufacturer.
- O. Verify thermostat calibration.
- P. Inspect controls for correct sequencing of heating, refrigeration, and normal and emergency shutdown.

**3.05 ADJUSTING**

- A. Adjust initial temperature set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- C. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to **two** visits to Project during other-than-normal occupancy hours for this purpose.

**3.06 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water-source unitary heat pumps.

END OF SECTION

**SECTION 25 08 00**

**FAULT DETECTION AND DIAGNOSTICS (FDD)**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This specification identifies the requirements for incorporating embedded Fault Detection and Diagnostics (FD&D) software across the IAS control system network. The purpose is to provide a consistent, standardized methodology for analyzing the historical trend database data points to identify and address faults or deficiencies associated with DDC automation systems. The purpose of the analytic software application is to analyze energy, and equipment operational data to identify faults and opportunities for improved performance and reduced energy use in the operation of building systems.
- B. Fault Detection and Diagnostics (FD&D) analytic software application is to provide verification that energy conservation measures (ECM's) are executing as expected through the analysis of energy usage at the point of use, identification of faults showing where control sequences are not functioning as prescribed, and identification of opportunities for improved performance in the operation of building systems.
- C. Related Sections include the Following:
  - 1. Section 250000 – Integrated Automation System (IAS) for HVAC
  - 2. Section 250600 – Network Scheduling Software for HVAC
  - 3. Section 251400 – IAS Network Controllers for HVAC
  - 4. Section 251500 – IAS Software and Programming Tools for HVAC
  - 5. Guideline B – IAS Point Tagging Requirements

**1.2 DEFINITIONS**

- A. API Application Program Interface
- B. CSV Comma Separated Value
- C. EDI Electronic Data Exchange
- D. DDC Facility Management and Control System
- E. M&V Measurement and Verification
- F. REST Representational State Transfer
- G. SaaS Software as a Service
- H. SQL Standard Query Language
- I. XML Extensible Markup Language

**1.3 QUALITY ASSURANCE**

- A. Installing Company Qualifications
  - 1. Experience in completing a minimum of three local projects of similar size with the type of FD&D system specified for this project within the last five years.

**1.4 SUBMITTALS**

- A. Preconstruction Submittals
  - 1. FD&D Graphics Submittal: A copy of each of the FD&D graphics developed for the Graphic User Interface including a flowchart (site map) indicating how the graphics are to be linked to one another for system navigation. The graphics are intended to be 80% - 90% complete at this stage with the only remaining



changes to be based on review comments from the A/E design team and/or Owner.

2. Shop Drawings: Shall include the following:
    - a. Product data.
  3. FD&D Sequence of Operations: A complete written Sequence of Operation describing each fault rule and its programming.
- B. Construction Submittals
1. Point Validation Log: Log of tests conducted verifying 100% of the input and output points of the FD&D system operation. Contractor shall sign log indicating all issues have been addressed and system is ready for owner witness testing.
  2. Standard Reports: Provide all standard reports including all time data and duration of all faults for a minimum of 72hours.
- C. Closeout Submittals
1. Training Manuals
  2. O&M Data

## 1.5 SOFTWARE LICENSE AGREEMENT

- A. It is the Owner's express goal to implement an open system that will allow products from various suppliers to be integrated into a unified system in order to provide flexibility for expansion, maintenance, and service of the system. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). In addition, the Owner shall receive ownership of all job specific configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use with the FD&D system. Any and all required IDs and passwords for access to any component or software program shall be provided to the Owner.

## PART 2 - MATERIALS

### 2.1 MANUFACTURERS

- A. The fault detection and diagnostics software shall be based on SkySpark from SkyFoundry, fully integrated into the DGLux graphical user interface using Skyspark's REST-based API which the DGLux software can use. SkySpark is listed as a sole-source product in the District's design and construction standards. Alternate products will not be considered acceptable.
1. SkySpark by SkyFoundry is a FD&D software where "rules" are created using text-based source code that automatically run against collected data. The software comes with a large library of pre-programmed analytic functions and mathematical algorithms. It employs semantic tagging, pattern recognition, functional rules processing and other techniques.

### 2.2 PLATFORM REQUIREMENTS

- A. The software application shall provide the following features and capabilities as a minimum:
1. GUI Integration – The software front end shall be integrated and operated through the specified DGLux 5 user interface software. FD&D software which require a separate user interface or log-in are not acceptable. Also, It shall not be acceptable to provide stand-alone instances of the SkySpark software.
  2. Operating Systems - The analytic software application shall operate on current versions of Windows and Linux operating systems.

3. Time series database - The analytic software application shall utilize a database technology designed for the efficient storage and analysis of large volumes of time series data. It shall not employ a relational database structure but shall instead use tagging to model and describe data and shall support the use of the open source tagging standard. The FD&D software application shall use tagging to model and describe data and shall support the use of the open source tagging standard Project Haystack. Refer to Guideline B.
  4. Data Import - The analytic software application shall accept and normalize data from a variety of sources including SQL compatible data bases, CSV format files, XML format files or web services, and other EDI techniques. Once imported the software shall provide a unified data format to enable analytics algorithms to identify patterns across those different data sets. The software shall import data directly from the DDC SQL historian server.
  5. Open interfaces - The analytic software application shall provide open, REST-based API's to enable integration with third party software applications. The open APIs shall enable data to be entered/imported into the database, exported from the database, posting of analytic queries and output of analytic results. APIs shall be fully documented and available as part of the standard product.
  6. Hosted –The Skyspark is currently hosted offsite by Ecovox. Due to offsite hosting, the bidding IAS contractor will not have direct access to the hosting server. Contact Ecovox for details – (805)540-2044. Provider shall include 60 months of software subscription for additional points within the costs of their proposal.
- B. Weather Data Service - The analytic software application shall include a built in subscription to a worldwide weather service providing weather data for all major metropolitan areas. Weather service shall provide an update frequency of at least every 3 hours.
1. Weather data shall include:
    - a. Current temperature
    - b. High temperature for the day
    - c. Low temperature for the day
    - d. Sunrise and sunset times
    - e. Relative Humidity
    - f. Degree days (heating and cooling with adjustable balance point value)
  2. The weather service shall include a three day forecast and provide historical weather data extending back at least 1 year.
- C. Email notification - The analytic software application shall provide automatic notification of detected issues via email.
1. Email notification services shall as a minimum provide:
    - a. Immediate notification of detected issues
    - b. Daily digest or summary of detected issues
    - c. The ability to delineate which issue notifications are sent to which recipients down to the level of specifying individual issues are sent to individual recipients.

### **2.3 HARDWARE REQUIREMENTS**

- A. The FD&D software shall reside on an offsite server hosted by Ecovox. *Due to offsite hosting, the bidding IAS contractor will not have direct access to the hosting server. Contact Ecovox for details – (805)540-2044. Provider shall include 60 months of software subscription for additional points within the costs of their proposal.*

## 2.4 ANALYTIC RULES

- A. Standard Analytic Functions - The analytic software application shall provide a library of standard analytic functions. The following standard analytical functions shall be developed and applied to all integrated systems at MiraCosta College:
  - 1. Equipment Operation
    - a. Simultaneous Heating and Cooling
    - b. Short Cycling of Equipment
    - c. Degradation of Heating or Cooling Performance
    - d. Non-Optimal Economizer Operation
    - e. Non-Functioning Sensors
    - f. Setpoints Overridden
    - g. Equipment not Operating with Schedules
    - h. Leaking Valves
  - 2. Energy Performance and M&V
    - a. Deviation of Energy Intensity from Baselines or Goals
    - b. Weather Normalization of Energy Use
    - c. Energy Savings Compared to Baseline
- B. Custom Rule Development – Boiler System
  - 1. The following rules shall be applied to all heating hot water plants:
    - a. Hot Water DP Setpoint Not Met
    - b. Boiler Status Doesn't Match Command
    - c. Hot Water Leaving Temp Setpoint Not Met
    - d. Pump Speed Override
    - e. Pump Speed Doesn't Match Command
    - f. Pump Off When Commanded On
    - g. Pump On When Commanded Off
    - h. HHW Broken Valves and sensors
    - i. HHW Outdoor air temperature set-point optimization
    - j. HHW equipment-short cycling
- C. Custom Rule Development – Closed Circuit Cooling Tower Plants
  - 1. The following rules shall be applied to all air cooled chilled water plants:
    - a. Condenser Water DP Setpoint Not Met
    - b. Condenser Water Leaving Temp Setpoint Not Met
    - c. CW Pump Issue - Speed Too High
    - d. Pump Speed above 90% 30 min
    - e. Primary CHW Flow Sensor Failure
    - f. Condenser Water Entering Temp Sensor Failure
    - g. Condenser Water Flow Sensor Failure
    - h. Condenser Water leaving Temp Sensor Failure
    - i. Cooling Tower Status Doesn't Match Command
    - j. Constant VFD Speed
    - k. Chilled Water DP Setpoint Not Met
    - l. Pump Speed Override
    - m. Pump Speed Doesn't Match Command
    - n. Pump Off When Commanded On
    - o. Pump On When Commanded Off
    - p. CW GPM/Ton Low



- q. CW GPM(Ton High)
  - r. CW low Delta T
  - s. Cooling Tower issue - Peak Demand
  - t. CW Plant Efficiency
  - u. CW Supply temp set-point optimization
  - v. CW abnormal pump current
  - w. CW broken valves and sensors
  - x. CW equipment short-cycling
- D. Custom Rule Development –Water Source Heat Pumps
- 1. The following rules shall be applied to all fan coils:
    - a. Analog Damper Control Oscillation
    - b. Low Temp Drop Across Cooling Coil
    - c. Cooling Capacity Not Met
    - d. DAT Hunting
    - e. Condenser Water Valve Out of Range
    - f. Zone Air Temp Sensor Failure
    - g. Supply Air Temp Too Warm
    - h. Supply Fan Off When Commanded On
    - i. Supply Fan On When Unoccupied
    - j. Supply Fan On When Commanded Off
    - k. CW Valve Doesn't Match Command
    - l. Condenser Water Valve leak
    - m. Terminal Broken sensors
    - n. Terminal Poor scheduling
    - o. Terminal Poor Temperature Set Points

## 2.5 REPORTING

- A. Standard Views of Analytic Results - The analytic software application shall include standard views to present analytic results, which shall be automatically generated when issues are found by analytic rules.
- B. These views shall include as a minimum:
  - 1. All rule violations across a portfolio of sites, all rules violations per site, including time, date and duration of all violations.
  - 2. The ability to assign cost relationships to rule logic to provide cost per violation.
  - 3. Standard filters to enable the user to easily look at rule violations by site, data, violation type for any selected date or date range.
  - 4. Automatic calculation and presentation of Key Performance Indicators. It shall be possible to define custom KPIs as needed.
- C. Custom Views of Analytic Results
  - 1. The analytic software application shall allow for the creation of custom reports and data views. Any standard system view shall be able to be saved as a custom report including its configuration criteria, e.g., time range, sites, rule violations or other configuration options as applicable to the standard system view.
  - 2. Custom reports shall be able to be created by making queries against the database and saving the query as a saved report. Saved reports shall be able to be executed by typical system users with a single mouse click.
  - 3. Exporting - The system shall allow for the export of any and all report views and shall support export in CSV, Excel, XML and HTML format. Export of report

views shall be a feature available to the typical operator and be able to be accomplished with 2-3 mouse clicks.

### **PART 3 - EXECUTION**

#### **3.1 WIRING**

- A. All electrical control wiring and power wiring to the FD&D, computers and network components shall be the responsibility of the FD&D contractor.
- B. The contractor shall furnish all power wiring to FD&D controllers.
- C. All wiring shall be in accordance with the National Electrical Code and any applicable local codes. All FD&D wiring shall be installed in the conduit types allowed by the National Electrical Code or applicable local codes. Where FD&D CS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

#### **3.2 WARRANTY**

- A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.
- B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by the contractor at no expense to the Owner.

#### **3.3 WARRANTY ACCESS**

- A. The Owner shall grant to the contractor, reasonable access to the FD&D system during the warranty period. The owner shall allow the contractor to access the FD&D system from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

#### **3.4 SOFTWARE LICENSE**

- A. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s).
- B. The owner, or his appointed agent, shall receive ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project. Any and all required Ids and passwords for access to any component or software program shall be provided to the owner.

#### **3.5 ACCEPTANCE TESTING**

- A. Upon completion of the installation, the contractor shall load all system software and start-up the system. The contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
- B. The contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the FD&D system operation.
- C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in the presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

- D. System Acceptance: Satisfactory completion is when the contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

### **3.6 OPERATOR INSTRUCTION, TRAINING**

- A. During system commissioning and at such time acceptable performance of the FD&D system hardware and software has been established the contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done in series with the required DDC system training and shall be performed by a competent representative familiar with the system hardware, software and accessories.
- B. The contractor shall provide 12 hours of instruction to the owner's designated personnel on the operation of the FD&D and describe its intended use with respect to the programmed functions specified. Operator orientation of the FD&D system shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation.
- C. The training shall be in two sessions as follows:
  - 1. Initial Training: One day session (8 hours) after system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior to training so that the owners' personnel can start to familiarize themselves with the system before classroom instruction begins.
  - 2. First Follow-Up Training: One half-day (4 hours total) approximately two weeks after initial training, and before Formal Acceptance. These sessions will deal with more advanced topics and answer questions.

**END OF SECTION 25 08 00**



**SECTION 25 11 00**

**IAS INSTRUMENTATION AND CONTROL DEVICES FOR HVAC**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Specifications:
  - 1. Section 250000 – Integrated Automation Systems (IAS) For HVAC
  - 2. Section 251400 – IAS Network Controllers for HVAC
  - 3. Section 251500 – IAS Software and Programming Tools for HVAC

**1.2 SUMMARY**

- A. Contractor shall supply and install the components listed in this section, and those identified on the project drawings, in adequate quantities as required to meet the sequence of operation and the design/performance intent of the MEP systems as they pertain to the IAS and the functional operation of the project as a whole.
- B. Provide products compliant with the following sections for all devices specified and as indicated on the project drawings. If substitutions are necessary or warranted, follow the substitution submittal procedure defined in the project specifications. This section shall address the product requirements for the following components.
  - 1. Wiring
  - 2. Control Valves & Actuators
  - 3. Temperature Sensors
  - 4. Occupancy Sensors
  - 5. Differential Pressure Sensors
  - 6. Current Sensing Relays
  - 7. Current Transformers
  - 8. Water Service Meter
  - 9. *Magnetic Flow Meter for Water Service*
  - 10. Control Relays
  - 11. Electrical Power Meters
  - 12. Natural Gas Meters
  - 13. Water Level Sensors
  - 14. Vibration Switches
  - 15. Zone Presence Sensor
- C. Provide the following electrical work as work of this Section, complying with requirements of Division 26 Sections.
  - 1. Control wiring between field-installed controls, indicating devices, and unit control panels.
  - 2. Interlock wiring between electrically interlocked devices, sensors, and between a hand or auto position of motor starters as indicated for all mechanical and controls.
  - 3. Wiring associated with annunciator and alarm panels (remote alarm panels) and connections to their associated field devices.
  - 4. All other necessary wiring for a fully complete and functional control system as specified.
- D. Refer to other Division 20 and Division 23 Sections for installation of instrument wells,

valve bodies, and dampers in mechanical systems.

### 1.3 SUBMITTALS

- A. General: Submit under provisions of Division 01. Provide a complete and comprehensive submittal package. Partial submittals shall not be accepted. Upon completion submit all compliance data and project record documents.
- B. Preconstruction Submittals.
  - 1. Control Devices Product Data: Submit manufacturer's technical product data for each control device, panel, and accessory furnished, indicating dimensions, capacities, performance and electrical characteristics, and material finishes.
    - a. Provide a list of devices in schedule form on 8½ x 11 sheets. The schedule shall be organized by columns to define all new devices to be installed as part of the IAS system installation including the location, system served, controlling unit, model number, performance data, size, range, accuracy, span, operating pressure, etc.
      - 1) Control Valves & Actuators
      - 2) Temperature Sensors
      - 3) Occupancy Sensors
      - 4) Differential Pressure Sensors
      - 5) Current Sensing Relays
      - 6) Current Transformers
      - 7) Water Service Meter
      - 8) *Magnetic Flow Meter for Water Service*
      - 9) Control Relays
      - 10) Electrical Power Meters
      - 11) Natural Gas Meters
      - 12) Water Level Sensors
      - 13) Vibration Switches
      - 14) Zone Presence Sensor
    - b. Submit detailed cut sheets indicating the features, accessories and sub-assemblies of the following, or similar, as required:
    - c. All ancillary devices including temperature sensors, flow sensors, and the like, including thermal wells where necessary
    - d. Pressure gauges, thermometers and indicating devices where shown on the drawings
    - e. Transformers required for control devices
    - f. Relays
    - g. Electrical enclosures and back-plates
    - h. Wire for DLN, FAC LAN, and all sensors and actuators
    - i. FAC LAN Hub(s), Switches, and Routers
    - j. DLN Repeaters
    - k. Gateway and interface devices
      - 1) Schedule of control dampers including leakage and flow characteristics.
      - 2) Schedule of control valves including pressure drop, Cv, leakage, and flow characteristics.

### 1.4 REFERENCED STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within all references.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. All control devices shall be electronic using DDC control unless specified on the drawings.
- C. Provide electronic and electric control products in sizes and capacities indicated, consisting of valves, dampers, controllers, sensors, and other components as required for complete installation. Except as otherwise indicated, provide manufacturer's standard materials and components as published in their product information; designed and constructed as recommended by manufacturer, and as required for application indicated.

**2.2 MATERIALS AND EQUIPMENT**

- A. Communication Wiring: All wiring shall be in accordance with the latest edition of the National Electrical Code and Division 26. Communication wiring shall be provided in a customized color jacketing material. Material color shall be as submitted and approved by Owner. Each end of the wire, originating and terminating end shall have a unique label identifying the purpose of the wire. An example of the required submittal and the application is provided below:

Purpose	Function	Color
Primary Communications DLN	Field Device Communication	Red / Pink
Spare Primary Communication DLN	Field Device Communication	Yellow
Secondary Communications DLN	Equipment Integration	Orange
Spare Secondary Communication DLN	Equipment Integration	Purple
FACLAN	Enterprise Network	Dark Blue
Spare FACLAN	Enterprise Network	Green
Analog Points	I/O Wiring	White
Digital Points	I/O Wiring	White / Black Stripe
Emergency Power	Control power	Yellow / Black Stripe
24VAC	Control power	Gray

- B. Device Level Network (DLN): Contractor shall supply all communication wiring between JACE Controllers, Routers, Gateways, AAC's, ASC's, RIO's and local and remote



peripherals Integrate with existing communication infrastructure as illustrated on the design drawings.

- C. Local Supervisory Facility LAN (FAC LAN): For any portions of the FAC LAN required under this Section of the Specification, Contractor shall follow the requirements of Division 26 specifications. Network shall be run with no splices and separate from any wiring over thirty (30) volts.
- D. Primary (Master) and Secondary (Slave or Spare) Controller DLNs: Communication wiring shall be individually 100 percent shielded per manufacturer's recommendations for distances installed, with overall PVC cover, Class 2, plenum-rated. DLN wiring shall be run with no splices and separate from any wiring over thirty (30) volts. Shield shall be terminated and wiring shall be grounded as recommended by building controller manufacturer.
- E. Signal Wiring: Contractor shall run all signal wiring in accordance with the latest edition of the National Electrical Code and Division 26.
- F. Signal wiring to all field devices, including, but not limited to, all sensors, transducers, transmitters, switches, etc. shall be twisted, 100 percent shielded pair, with PVC cover. Signal wiring shall be run with no splices and separate from any wiring above thirty (30) volts.
- G. Signal wiring shield shall be grounded at controller end only unless otherwise recommended by the controller manufacturer.
- H. Low Voltage Analog Output Wiring: Contractor shall run all low voltage control wiring in accordance with the latest edition of the National Electrical Code and Division 26.
- I. Low voltage control wiring shall be twisted pair, 100 percent shielded, with PVC cover, Class 2 plenum-rated. Low voltage control wiring shall be run with no splices and separated from any wiring above thirty (30) volts.
- J. Control Panels: Refer to section 25 14 00.

### **2.3 STANDARD SERVICE CONTROL VALVES**

- A. General:
  - 1. Provide factory fabricated control valves of type, body material and pressure class indicated.
  - 2. Where type or body material is not indicated, provide selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature in piping system.
  - 3. Provide valve size in accordance with scheduled or specified maximum pressure drop across control valve.
  - 4. Control valves shall be equipped with heavy-duty actuators, and with proper close-off rating for each individual application.
  - 5. Minimum close-off rating shall be as scheduled and adequate for each application, and shall generally be considered at dead head rating of the pump.
- B. Globe Valves:
  - 1. Application: Two position and modulating control valves up to 8" for chilled water, heating hot water, and condenser water applications. Modulating control valves for air handling unit chilled and hot water coils
  - 2. Valve Sizing: 3-6 psig pressure drop at design flow rate.
  - 3. Single Seated (Two-way) Valves: Valves shall have equal-percentage

characteristic for typical heat exchanger service and linear characteristic for building loop connections to campus systems unless otherwise scheduled on the drawings. Valves shall have cage-type trim, providing seating and guiding surfaces for plug on 'top-and-bottom' guided plugs.

- C. Double Seated (Three-way) Valves: Valves shall have linear characteristics. Valves shall be balanced-plug type, with cage-type trim providing seating and guiding surfaces on top-and-bottom' guided plugs.
1. Temperature Rating: 25 degrees F minimum, 250 degrees F maximum
  2. Body: Bronze, screwed, 250 psi maximum working pressure for ½ inch to 2 inch; Cast iron, flanged, 125 psi maximum working pressure for 2-1/2 inches and larger.
  3. Valve Trim: Bronze; Stem: Polished stainless steel
  4. Packing: Spring Loaded Teflon or Synthetic Elastomer U-cups, self-adjusting
  5. Plug: Brass, bronze or stainless steel, Seat: Brass
  6. Disc: Replaceable composition or stainless steel filled PTFE
  7. Ambient Operating Temperature Limits: -10 to 150 degrees F (-12.2 to 66 degrees C)
  8. Acceptable Manufacturers: Subject to compliance with requirements, approved manufacturers are as follows:
    - a. Johnson Controls
    - b. Honeywell
    - c. Warren
    - d. Belimo
    - e. Approved equal
- D. Ball Valves:
1. Application: Modulating control valves up to 2" for terminal unit and fan coil unit heating hot water and chilled water valves.
  2. Body: Brass or bronze; one-, two-, or three-piece design; threaded ends
  3. Seat: Reinforced Teflon
  4. Ball: Stainless steel
  5. Port: Standard or 'V' style
  6. Stem: Stainless steel, blow-out proof design, extended to match thickness of insulation
  7. Cold Service Pressure: 600 psi WOG
  8. Acceptable Manufacturers: Subject to compliance with requirements, approved manufacturers are as follows:
    - a. Johnson Controls
    - b. Honeywell
    - c. Warren
    - d. Belimo
    - e. Approved equal
- E. Butterfly Type: To be used for two-position control and modulating applications above 8" only, unless prior approval is obtained from Owner.
1. Body: Extended neck epoxy coated cast or ductile iron with full lug pattern, ANSI Class 125 or 250 bolt pattern to match specified flanges
  2. Seat: EPDM, except in loop bypass applications where seat shall be metal to metal
  3. Disc: Bronze or stainless steel, pinned or mechanically locked to shaft
  4. Bearings: Bronze or stainless steel
  5. Shaft: 416 stainless steel
  6. Cold Service Pressure: 175 psi
  7. Close Off: Bubble-tight shutoff to 150 psi
  8. Operation: Valve and actuator operation shall be smooth both seating and unseating. Should more than 2 psi deadband be required to seat/unseat the

- valve, valve shall be replaced at no cost to the Owner.
9. Acceptable Manufacturers: Subject to compliance with requirements, approved manufacturers are as follows:
- a. Keystone
  - b. Honeywell
  - c. Bray Series 31
  - d. Dezurik BGS
  - e. Approved equal

## 2.4 ACTUATORS

- A. General: Size actuators and linkages to operate their appropriate dampers or valves with sufficient reserve torque or force to provide smooth modulating action or 2-position action as specified. Select spring-return actuators with manual override to provide positive shut-off of devices as they are applied. Manual override shall allow the user to disengage the valve/damper from the actuators motor for manual operation. Large valve actuators shall provide fly wheel for manual operation.
- B. Actuators General Requirements:
1. Ambient Operating Temperature Limits: -10 to 150 degrees F (-12.2 to 66 degrees C).
- C. Two Position Electric Actuators: Line voltage (120 volt, 24 volt) with spring return. Provide end switches as required.
- D. Electronic Actuators: Provide actuators with spring return for two-position (24 volt), 0-5 VDC, 0-10 VDC, 2-10VDC, 4-20 mA, as required. Actuators shall travel full stroke in less than 90 seconds. Actuators shall be designed for a minimum of 60,000 full cycles at full torque and be UL 873 listed. Provide stroke indicator. Actuators shall have positive positioning circuit. Where two actuators are required in parallel or in sequence provide an auxiliary actuator driver. Actuators shall have current limiting motor protection. Actuators shall have manual override where indicated. Modulating actuators for valves shall have minimum range of 40 to 1.
- E. Close-Off Pressure: Provide the minimum torque required, and spring return for failsafe positioning (unless otherwise specifically indicated) sized for required close-off pressure. Required close-off pressure for two-way water valve applications shall be the shutoff head of associated pump. Required close-off rating of air damper applications shall be shutoff pressure of associated fan, plus 10 percent.
- F. Manufacturer shall provide a 2 year unconditional warranty from date of substantial completion.
- G. Sound levels for VAV actuators shall not exceed 45 dB.
- H. Electronic overload protection shall protect actuator motor from damage. If damper jams actuator shall not burn-out. Internal end switch actuators are not acceptable.
- I. Subject to compliance with requirements, approved manufacturers are as follows:
- a. Distech
  - b. Belimo
  - c. Johnson Controls
  - d. Honeywell
  - e. Approved equal
- J. Electric Control Valve Actuator General Requirements



1. Gear Train: Motor output shall be directed to a self-locking gear drive mechanism. Gears shall be rated for torque input exceeding motor locked rotor torque.
  2. Wiring: Power and control wiring shall be wired to a terminal strip in the actuator enclosure.
  3. Failsafe Positioning: Actuators shall be spring return type for failsafe positioning.
  4. Enclosure: Actuator enclosure shall be a NEMA 4 epoxy coated metal enclosure, and shall have a minimum of two threaded conduit entries.
  5. Limit Switches: Travel limit switches shall be UL approved. Switches shall limit actuator in both open and closed positions.
  6. Mechanical Travel Stops: The actuator shall include mechanical travel stops of stainless steel construction to limit actuator to specific degrees of rotation.
  7. Manual Override: Actuators shall have manual actuator override to allow operation of the valve when power is off. For valves 4 inches and smaller the override may be a removable wrench or lever or geared handwheel type. For larger valves, the override shall be a fixed geared handwheel type. An automatic power cut-off switch shall be provided to disconnect power from the motor when the handwheel is engaged for manual operation.
  8. Valve Position Indicator: A valve position indicator with arrow and open and closed position marks shall be provided to indicate valve position.
  9. Torque Limit Switches: Provide torque limit switches to interrupt motor power when torque limit is exceeded in either direction of rotation.
  10. Position Controller: For valves used for modulating control, provide an electronic positioner capable of accepting 4-20 mA, 0-10 VDC, 2-10 VDC, and 135 Ohm potentiometer.
  11. Ambient Conditions: Actuator shall be designed for operation from –140 to 150 degrees F ambient with 0 to 100 percent relative humidity.
  12. Field selectable direction with field adjustable zero span.
- K. Electric Control Valves Actuators 4 inches and larger:
1. The valve actuator shall consist of a permanent split capacitor, reversible type electric motor which drives a compound epicycle gear. The electric actuator shall have visual mechanical position indication, readable from a distance of 25 feet, showing output shaft and valve position. Unit shall be mounting directly to the valves without brackets and adapters, or readily adapted to suit all other types of quarter-turn valves.
  2. The actuator shall have an integral terminal strip, which, through conduit entries, will ensure simple wiring to power supplies. Cable entries shall have UL recommended gland stops within the NPT hole to prevent glands from being screwed in too far and damaging cable.
  3. The actuator shall be constructed to withstand high shock and vibrations without operations failure. The actuator cover shall have captive bolts to eliminate loss of bolts when removing the cover from the base. One copy of the wiring diagram shall be provided with the actuator.
  4. The actuator shall have a self-locking gear train which is permanently lubricated at the factory. The gearing shall be run on ball and needle bearings. Actuators with 620 in-lb or more output torque shall have two adjustable factory calibrated mechanical torque limit switches of the single-pole, double-throw type. The motor shall be fitted with thermal overload protection. Motor rotor shaft shall run in ball bearings at each end of motor.
  5. For intermittent on/off service, the actuator shall be rated at a 20% duty cycle (i.e., 12 minutes extended duty in every hour, or alternatively; one complete cycle every 2 minutes). For more frequent cycling and modulating service, an actuator shall be rated for continuous duty. The actuator rated for continuous duty shall be capable of operating 100% of the time at an ambient temperature of 105°F.
  6. The actuator shall have an integral self-locking gear train. Motor brakes shall not be required to maintain desired valve position. Levers or latches shall not be

- required to engage or disengage the manual override. Mechanical travel stops, adjustable to 15° in each direction of 90° rotation shall be standard, as well as two adjustable travel limit switches with electrically isolated contacts. Additional adjustable switches shall be available as an option.
7. Single Phase Motor: The motor shall have Class B insulation capable of withstanding locked-rotor for 25 seconds without overheating. Wiring shall also be Class B insulation. An auto-reset thermal cut-out protector shall be embedded in the motor windings to limit heat rise to 175°F in a 105°F ambient. All motors shall be capable of being replaced by simply disconnecting the wires and then removing mounting bolts. Disassembly of gears shall not be required to remove the motor.
  8. Motor: Suitable for 120 or 240 volt single-phase power supply. Insulation shall be NEMA Class F or better. Motors shall have inherent overload protection.
  9. Materials of Construction: The electric actuator shall have a pressure die-cast, hard anodized aluminum base and cover. The compound gear shall be made of die-cast, hard anodized aluminum or steel. An alloy steel worm gear shall be provided for manual override and torque limiting. Bearings for gears shall be of the ball and needle type; bronze bearings shall be used on the shafting parts.
  10. Torque: Size for minimum 150% of required duty.
  11. Potentiometer for providing continuous feedback of actuator position at the controller (for valves specified position feedback).

## 2.5 GENERAL FIELD DEVICES

- A. Provide field devices for input and output of digital (binary) and analog signals into controllers (RIO, AACs, ASCs). Provide signal conditioning for all field devices as recommended by field device manufacturers and as required for proper operation in the system.
- B. It shall be the Contractor's responsibility to assure that all field devices are compatible with controller hardware and software.
- C. Field devices specified herein are generally 'two-wire' type transmitters, with power for the device to be supplied from the respective controller. If the controller provided is not equipped to provide this power, is not designed to work with 'two-wire' type transmitters, if field device is to serve as input to more than one controller, or where the length of wire to the controller will unacceptably affect the accuracy, the Contractor shall provide 'four-wire' type transmitters and necessary regulated DC power supply or 120 VAC power supply, as required.
- D. For field devices specified hereinafter that require signal conditioners, signal boosters, signal repeaters, or other devices for proper interface to controllers, Contractor shall furnish and install proper device, including 120V power as required. Such devices shall have accuracy and repeatability equal to, or better than, the accuracy and repeatability listed for respective field devices.
- E. Accuracy: As stated in this Section, accuracy shall include combined effects of nonlinearity, non-repeatability and hysteresis.
- F. Temperature transmitters shall be sized and constructed to be compatible with the medium to be monitored. Transmitters shall be equipped with a linearization circuit to compensate for non-linearity of the sensor and bridge to provide a true linear output signal.
- G. Sensors used in energy or process calculations shall be accurate to  $\pm 0.10^{\circ}\text{C}$  over the process temperature range. Submit a manufacturer's calibration report indicating that the

calibration certification is traceable to the National Bureau of Standards (NBS) Calibration Report Nos. 209527/222173.

- H. The following accuracy's are required and include errors associated with the sensor, lead wire and A to D conversion.

Point Type	Accuracy
Outside Air	0.2 °C
Chilled/Hot Water	0.2 °C
Room Temperature	0.2 °C
Duct Temperature	0.2 °C
Sensors Used in Energy	
Water (BTU) or Process	+/-1%
Calculations	

## 2.6 TEMPERATURE SENSORS (TS)

- A. Sensor range: When matched with A/D converter of AAC/ASC, or SD, sensor range shall provide a resolution of no worse than 0.3 degrees F (0.16 degrees C) (unless noted otherwise). Where thermistors are used, the stability shall be better than 0.25 degrees F over five (5) years.
- B. Matched Sensors: The following applications shall require matched sensors:
1. Hydronic Temperature Difference Calculations: Provide matched supply and return temperature sensors where the pair is used for calculating temperature difference for use in load calculations or sequencing such as across chillers and plants. Sensing element shall be platinum RTD guaranteeing an accuracy of +/- 0.5 percent of span plus 0.1 degrees C.
- C. Room Temperature Sensor: Shall be an element contained within a ventilated cover, suitable for wall mounting, unless noted otherwise. Provide insulated base. The following sensing elements are acceptable:
1. Acceptable Manufacturers
    - a. Distech Allure UNITOUCH is listed as a sole source product in the District's design and construction standards. Alternate products will not be considered.
  2. Sensing element shall be thermistor (10K Ohm, Type II), +/- 0.1 degrees F accuracy at calibration point (10,000 Ohms @ 77 °F).
  3. Sensing element shall be mounted in a plastic enclosure
  4. Operating Temperature Range: -40 to 302 °F (-40 to 150 °C)
  5. Operating Humidity Range: 0 to 90% RH non-condensing
  6. Provide setpoint adjustment. The setpoint adjustment shall be a warmer/cooler indication that shall be scalable or limited via the IAS.
  7. Provide an occupancy override button on the room sensor enclosure. This shall be a momentary contact closure.
  8. Provide current temperature setpoint and measurement indication via a backlit LCD or LED readout.
  9. Provide unit/zone heating and cooling status via the backlit LCD or LED readout.
  10. Submit sensor to Architect for aesthetic and finish approval prior to installation.
  11. Provide an electrical junction box behind RTS and route all thermostat/low voltage cable within walls in rigid conduit.
- D. Standard Single-Point Duct Temperature Sensor: Shall consist of sensing element, junction box for wiring connections and gasket to prevent air leakage or vibration noise. Temperature range as required for resolution indicated. Sensor probe shall be 316



stainless steel.

1. Sensing element shall be thermistor (10K Ohm, Type II), +/- 0.1 degrees F accuracy at calibration point (10,000 Ohms @ 77 °F).
  2. Sensing element shall be encased in 4" or 8" stainless steel probe
  3. Operating Temperature Range: -40 to 302 °F (-40 to 150 °C)
  4. Operating Humidity Range: 0 to 90% RH non-condensing
  5. Sensor stability +/- 0.13 °C Duct mount sensors shall mount in a hand box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement. A neoprene grommet (sealtite fitting and mounting plate) shall be used on the sensor assembly to prevent air leaks.
  6. For outdoor air duct applications, use a weatherproof mounting box with weatherproof cover and gasket.
- E. Standard Averaging Duct Temperature Sensor: Shall consist of an averaging element, junction box for wiring connections and gasket to prevent air leakage. Provide sensor lengths and quantities to result in one lineal foot of sensing element for each three square feet of cooling coil/duct face area, or as recommended by manufacturer. Temperature range as required for resolution indicated.
1. Sensing element shall be thermistor (10K Ohm, Type II), +/- 0.2 degrees F accuracy at calibration point (10,000 Ohms @ 77 °F).
  2. Sensing element shall be encased in 8' (4 sensing points), 12' (4 sensing points) or 24' (9 sensing points) long bendable copper sheath
  3. Operating Temperature Range: -40 to 302 °F (-40 to 150 °C)
  4. Operating Humidity Range: 0 to 90% RH non-condensing
  5. Sensor stability +/- 0.13 °C
  6. Provide capillary supports at the sides of the duct / coil to support sensing elements
  7. Averaging Sensor shall traverse the width of the duct.
- F. Liquid immersion temperature sensor shall include brass thermowell, sensor and connection head for wiring connections. Temperature range shall be as required for resolution of 0.15 degrees F.
1. Sensing element (chilled water/glycol systems) shall be platinum RTD +/- 0.2 degrees C measured at 0 degrees C.
  2. Thermowells
    - a. When thermowells are required, the sensor and well shall be supplied as a complete assembly including well head and greenfield fitting, except where wells are to be installed under separate contract.
    - b. Thermowells shall be pressure rated and constructed in accordance with the system working pressure.
    - c. Thermowells and sensors shall be mounted in a threadolet or 12.7 mm NPT saddle and allow easy access to the sensor for repair or replacement.
    - d. Thermowells shall be constructed of the following materials:
      - 1) Chilled and Hot Water; brass.
      - 2) Steam; 316 stainless steel.
      - 3) Brine (salt solutions): marine grade stainless steel.
- G. Outside Air Sensors shall consist of a sensor, sun shield, utility box, and watertight gasket to prevent water seepage. Temperature range shall be as require for resolution indicated in this Section.
1. Sensing element shall be thermistor (10K Ohm, Type II), +/- 0.2 degrees F accuracy at 0 to 70 °F.
  2. Sensing element shall be encased in a weather proof enclosure which shall be designed to withstand the environmental conditions it will be exposed.
  3. Provide a solar shield
  4. Operating Temperature Range: -40 to 302 °F (-40 to 150 °C)

5. Operating Humidity Range: 0 to 90% RH non-condensing
6. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate surrounding the sensor element.
7. Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.

## **2.7 INDOOR OCCUPANCY SENSORS**

- A. *Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.*
1. *Sensitivity Adjustment: Separate for each sensing technology.*
  2. *Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.*
  3. *Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.*

## **2.8 DIFFERENTIAL PRESSURE TRANSMITTERS (DP)**

- A. General DP performance requirements
1. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage and to hold calibrated accuracy when subject to a momentary 40% over-range input.
  2. Pressure transmitters shall provide the option to transmit a 0 to 5V dc, 0 to 10V dc, or 4 to 20 mA output signal.
  3. Differential pressure transmitters used for flow measurement shall be sized to the flow sensing device and shall be supplied with shutoff and bleed valves in the high and low sensing pick-up lines (3 valve manifolds).
  4. Provide a minimum of a NEMA 1 housing for the transmitter. Locate transmitters in accessible local control panels wherever possible. Provide tubing with rubber or neoprene grommet from panel to expose room conditions when necessary.
  5. Low air pressure, differential pressure transmitters used for room pressurization control (i.e. laboratories, OR's clean rooms, etc.) shall be equipped with a LED display indicating the transmitter output signal.
  6. Duct sensing pressure applications where the velocity exceeds 1500 fpm shall utilize a static pressure traverse probes.
- B. Liquid, Steam and Gas :
1. General: Two-wire smart DP cell type transmitter, 4-20 mA or 1-5 VDC linear output, adjustable span and zero, stainless steel wetted parts.
  2. Ambient Limits: -40 to 175 degrees F (-40 to 121 degrees C), 0 to 100% RH.
  3. Process Limits: -40 to 400 degrees F (-40 to 205 degrees C).
  4. Accuracy: Less than 0.1 percent.
  5. Output Damping: Time constant user selectable from 0 to 36 seconds.
  6. Non-interactive zero and span adjustments adjustable from the outside cover.
  7. Vibration Effect: Less than +/- 0.1 percent of upper range limit from 15 to 2000 Hz in any axis relative to pipe mounted process conditions.
  8. Electrical Enclosure: NEMA 4, 4X, 7, 9.
  9. Approvals: FM, CSA.
  10. Acceptable Manufacturers:
    - a. Setra
    - b. Honeywell
    - c. Approved equal

**2.9 CURRENT SENSING RELAYS (CSR)**

- A. Current Sensing switch shall be self-powered with solid-state circuitry and a dry contact output. Current sensing switch shall accept over current up to twice its trip range. Clamp-On Design Current Operated Switch (for Constant Speed Motor Status Indication):
  - 1. Range: 2.5 to 135 amps
  - 2. Trip Point: Adjustable
  - 3. Switch: Solid state, normally open, 1.0A @ 30VAC/DC
  - 4. Lower Frequency Limit: 6 Hz
  - 5. Trip Indication: LED
  - 6. Approvals: UL, CSA
  - 7. Max. Cable Size: 350 MCM
  - 8. Acceptable Manufacturers:
    - a. Veris Industries H-908
    - b. Approved equal
  
- B. Clamp-on Wire Through Current Switch (CS/CR) (for Constant Speed Motors): Same as CS with 24v command relay rated at 5A @ 240 VAC resistive, 3A @ 240 VAC inductive, load control contact power shall be induced from monitored conductor (minimum conductor current required to energize relay 5A, max. rating of 135A).
  - 1. Acceptable Manufacturers:
    - a. Veris Industries, Inc. Model # H938
    - b. RE Technologies RCS 1150
    - c. Approved equal
  - 2. Where used for single-phase devices, provide the CS/CR in a self-contained unit in a housing similar with override switch to Kele RIBX.
  - 3. Clamp-On Design Current Operated Switch for Variable Speed Motor Status Indication:
    - 4. Range: 3.5 to 135 Amps
    - 5. Trip Point: Self-calibrating based on VA memory associated with frequency to detect loss of belt with subsequent increase of control output to 60 Hz
    - 6. Switch: Solid state, normally open, 0.1A @ 30VAC/DC
    - 7. Frequency Range: 35 to 75 Hz
    - 8. Trip Indication: LED
    - 9. Approvals: UL, CSA
    - 10. Max. Cable Size: 350 MCM
    - 11. Acceptable Manufacturers:
      - a. Veris Industries, Inc. H-904
      - b. Approved equal
  
- C. Clamp-On Wire Through Current Switch (CS/CR) (for Variable Speed Motors): Same as CS with 24v command relay rated at 5A @ 240 VAC resistive, 3A @ 240 VAC inductive, load control contact power shall be induced from monitored conductor (minimum conductor current required to energize relay 5A, max. rating of 135A).
  - 1. Acceptable manufacturers:
    - a. Veris Industries, Inc., Model # H934
    - b. Approved equal

**2.10 CURRENT TRANSFORMERS (CT)**

- A. The current transformers shall be designed to be installed or removed without dismantling the primary bus or cables.
- B. The core and windings shall be completely encased in a UL approved thermoplastic rated 94VA. No metal parts shall be exposed other than the terminals.
- C. The current transformers shall meet the following specifications:



1. Frequency Limits: 50 to 400 Hz
2. Insulation: 0.6 KV Class, 10 KV BIL
3. Accuracy:  $\pm .2\%$  at 5.0 to 25.0 VA accuracy class with U.P.F. burden
4. Range <1-10 Amps minimum, 20-200 amps> maximum
5. Trip Point adjustable
6. Output 0-5 VDC
7. Provide a disconnect switch for each current transformer
8. Protection: 250 A max current
9. Acceptable Manufacturers:
  - a. Ohio, Semitronics Technologies Inc.
  - b. Triad Technologies
  - c. EMON
  - d. Hawkeye
  - e. Approved equal

## **2.11 DOMESTIC WATER SERVICE METER**

### **A. General Requirements:**

1. Refer to plumbing plans and Division 22 specifications.

## **2.12 MAGNETIC FLOW METER FOR WATER SERVICE**

### **A. General Requirements:**

1. Sensor shall be a magnetic flow meter, which utilizes Faraday's Law to measure volumetric fluid flow through a pipe.
2. The flow meter shall consist of two (2) elements, the sensor and the electronics. The sensor shall generate a measuring signal proportional to the flow velocity in the pipe. The electronics shall convert this EMF into a standard current output.
3. Electronic replacement shall not affect meter accuracy (electronic units are not matched with specific sensors).
  - a. Provide a four-wire, externally powered, magnetic type flow transmitter with adjustable span and zero, integrally mounted to flow tube
  - b. Output: 4-20 mA
  - c. Flow Tube: Stainless steel
  - d. Electrical Enclosure: NEMA 4, 7
  - e. Approvals: UL or CSA
  - f. Stability: 0.1 percent of rate over six (6) months
  - g. Process Connection: Carbon steel, ANSI 150 LB, size as required

### **B. Meter Accuracy:**

1. Under the reference conditions of a 68 degrees F media temperature, a 68 degrees F ambient temperature, a  $\pm 1$  percent nominal power supply voltage, 10 diameters up stream and 5 down of straight piping and a fully developed flow profile; the meter must meet the following requirements:
  - a. Plus or minus 0.8 percent of reading accuracy in the flow range of 1.65 - 33 ft/sec  $\pm (0.66/\text{Velocity actual feet per second} + 0.4)$  percent of reading accuracy in the flow range of 0 - 1.65 feet per second.
  - b. Meter repeatability shall be  $\pm 0.1$  percent of rate at velocities > 1.65 feet per second.

### **C. Calibration: The sensor must be calibrated on an internationally accredited (i.e. NAMAS) flow rig with accuracy better than 0.1 percent. Calibration shall be traceable to National Institute of Standard and Technology.**

### **D. Electronics:**

1. The sensor shall contain a SENSOR-PROM, storing calibration and factory

- default settings, i.e. the identification of the sensor and size
2. An ISO 9001 approved company shall manufacture the sensor and electronics
  3. As standard, the electronics must be installable directly on the sensor or installable (remote) up to 1500 feet from the sensor as a maximum
  4. With local electronics installation, the electronics shall be able to withstand three (3) feet water submersion for up to 30 minutes
  5. The electronics shall be compatible with the following power specifications:
    - a. 15/230 VAC +10 percent to 15 percent 50-60 Hz
    - b. The power consumption must be 10 Watts or less independent of meter size
  6. The meter electronics shall be able to produce simultaneous scalable current and frequency/pulse output. The frequency output shall be linearly proportional to flow rate and scalable from 0-10 kHz. The pulse output shall be scalable from 50 to 5000 milliseconds duration, suitable for an electromechanical totalizer in engineering units
  7. The electronics must have an internal totalizer for summation of flow
  8. The output of the electronics must be individually, galvanically isolated with an isolation voltage of more than 500 V
  9. Provide NEMA 4X enclosure with display for units mounted outdoors.

**E. Output:**

1. The current signal must be 4-20 mA proportional to the flow velocity
2. The output current signal must accommodate 20 percent over range without loss in linearity
3. The electronics shall have an alphanumeric LCD display showing actual flow and totalized flow in engineering units
4. The display and keyboard must be rotatable so that the display can be viewed regardless of sensor orientation

**F. Error Detection:**

1. The electronics must be able to detect the flowing error conditions:
  - a. Signal connection between electronics and sensor interrupted
  - b. Loss of current to the coil circuit
  - c. Load on the current output
  - d. Defective electronics
  - e. Defective sensor
  - f. Empty pipe
2. The electronics must have an Error Log where all error conditions occurring within a period of 180 days are stored

**G. Electronic Replacement Programming:**

1. The electronics must be immediately replaceable without the need of cable disconnection or renewed configuration programming
2. When the supply voltage is applied, the electronics must self configure and display flow without keyboard contact (no programming required)
3. The electronics must be provided with an automatic zero flow setting
4. The electronics shall be programmable with respect to:
  - a. User display options and menu
  - b. Setting data
  - c. Configuration of outputs
  - d. Zero 'cut-off' from 0 percent to 9.9 percent of maximum flow
5. For ease of programming, the electronics shall be programmable away from the meter using the meter Sensor-Prom and a 9 V battery
6. The electronics shall be suitable for operation in an ambient temperature range of -4 degrees F to 120 degrees F

**H. Acceptable Manufacturers:**

1. Onicon FT-31GG Series Inline Electromagnetic Flow Meters

2. *Approved equal*

**2.13 ELECTRIC CONTROL COMPONENTS**

- A. Limit Switches (LS): Limit switches shall be UL listed, SPDT or DPDT type, with adjustable trim arm. Limit switches shall be as manufactured by Square D, Allen Bradley or approved equal.
- B. Control Relays General:
  - 1. Relays other than those associated with digital output cards shall be general purpose, enclosed plug-in type with 8-pin octal plug and protected by a heat and shock resistant duct cover. Number of contacts and operational function shall be as required.
  - 2. Solid State Relays (SSR): Input/output isolation shall be greater than  $10E9$  ohms with a breakdown voltage of 1500V root mean square or greater at 60 Hz. The contact life shall be  $10 \times 10 E6$  operations or greater. The ambient temperature range of SSRs shall be -20 to +140°F. Input impedance shall not be less than 500 ohms. Relays shall be rated for the application. Operating and release time shall be for 100 milliseconds or less. Transient suppression shall be provided as an integral part of the relay.
  - 3. Contactors: Contactors shall be of the single coil, electrically operated, mechanically held type. Positive locking shall be obtained without the use of hooks, latches, or semi-permanent magnets. Contractor shall be double-break-silver-to-silver type protected by arcing contacts. The number of contacts and rating shall be selected for the application. Operating and release times shall be 100 milliseconds or less. Contactors shall be equipped with coil transient suppression devices.
  - 4. Control Relays: All control relays shall be UL listed, with contacts rated for the application, and mounted in minimum NEMA 1 enclosure for indoor locations, NEMA 4 for outdoor locations.
  - 5. Control relays for use on electrical systems of 120 volts or less shall have, as a minimum, the following:
    - 6. AC coil pull-in voltage range of +10 percent, -15 percent or nominal voltage.
    - 7. Coil sealed volt-amperes (VA) not greater than four (4) VA.
    - 8. Silver cadmium Form C (SPDT) contacts in a dustproof enclosure, with 8 or 11 pin type plug.
    - 9. Pilot light indication of power-to-coil and coil retainer clips.
    - 10. Coil rated for 50 and 60 Hz service.
- C. Acceptable Manufacturers:
  - 1. Potter Brumfield, Model KRPA
  - 2. *Approved equal*
- D. Material: Gold Flash
- E. Rating 10 amps at 120-277 VAC
- F. Provide HOA switch except in smoke control applications.
- G. Relays used for across-the-line control (start/stop) of 120V motors, 1/4 horsepower, and 1/3 horsepower, shall be rated to break minimum 10 Amps inductive load. Relays shall be IDEC or approved equal.
- H. Relays used for stop/start control shall have low voltage coils (30 VAC or less), and shall be provided with transient and surge suppression devices at the controller interface.



- I. General Purpose Power Contactors: NEMA ICS 2, AC general-purpose magnetic contactor. ANSI/NEMA ICS 6, NEMA 1 enclosure. Manufacturer shall be Square 'D', Cutler-Hammer, Westinghouse, or approved equal.
- J. Control Transformers: Furnish and install control transformers as required. Control transformers shall be machine tool type, and shall be US and CSA listed. Primary and secondary sides shall have replaceable fuses in accordance with the CEC. Transformer shall be properly sized for application, and mounted in minimum NEMA 1 enclosure.
- K. Transformers shall be manufactured by <Westinghouse, Square 'D', Jefferson, or approved equal>.
- L. Electric Selector Switch (SS): Switch shall be maintained contact, NEMA ICS 2, oil-tight selector switch with contact arrangement, as required. Contacts shall be rated for minimum 120 VAC operation. Switch shall be 800T type, as manufactured by Allen-Bradley or approved equal.

## 2.14 ELECTRICAL POWER METERS

- A. Advanced Digital Electrical meters shall meet the following requirements:
  - 1. Meter accuracy specifications shall comply with ANSI C12.20 Class 0.2% to 0.5% accuracy at 25°C.
  - 2. Meter shall be UL certified.
  - 3. Meter accuracy shall be + 0.5% for power measurements.
  - 4. Capability to measure and record 15 minute interval data.
  - 5. Capable of monitoring of: phase voltages, phase currents, power consumption, power factor, harmonics, power quality and kVAR.
  - 6. Meter shall be capable of either BACnet or MODBUS communication
- B. Wall Mounted Power Meters
  - 1. The meter shall be UL listed and CE marked.
  - 2. Power meter shall be designed for Multifunction Electrical Measurement on 3 phase power systems.
  - 3. Meter shall support 3 element wye, 2.5 element wye, 2 element delta, 4 wire delta systems.
  - 4. The meter shall accept universal voltage input.
  - 5. Surge withstand shall conform to IEEE C37.90.1.
  - 6. The power meter shall meet IEC 62053-22 Class 2 reactive power and energy accuracy specifications.
  - 7. The power meter shall meet both ANSI C12.20 .5% and IEC 62053-22 Class .5S real power and energy accuracy specifications.
  - 8. The meter shall be user programmable for voltage range to any PT ratio.
  - 9. Meter shall accept a burden of up to .36VA per phase, Max at 600V, 0.014VA at 120 Volts.
  - 10. Meter shall be capable of BACnet communication
  - 11. The meter shall be located in a dedicated NEMA wall panel, installed flush to the wall, with a clear hinged cover allowing remote display viewing.
  - 12. The power meter shall perform the following measurements:
    - a. Accumulated Real Energy (kWh) for each phase and total of all phases
    - b. Accumulated Reactive Energy (kVARh) and Apparent Energy (kVAh) totals for all phases
    - c. Net Present Demand for Real (kW), Reactive (kVAR) and Apparent (kVA) Power over a user-specified interval (block or sliding window)
    - d. Maximum (Peak) Real (kW), Reactive (kVAR) and Apparent (kVA) Demand Intervals
    - e. Instantaneous Real (kW), Reactive (kVAR) and Apparent Power (kVA), by phase and in total

- f. Current (amps) for each phase and average of all phases
- g. Phase-to-phase voltage for each phase and average of all phase pairs
- h. Phase-to-neutral voltage for each phase pair and average of all phases
- i. Power factor for each phase and average of all phases
- j. AC frequency
- 13. Acceptable Manufacturers:
  - a. Veris Industries.
  - b. Approved equal
- C. Current and Potential Transformers
  - 1. Current Transformers shall conform to the following requirements:
    - a. Insulation Class: All 600 volt and below current transformers shall be rated 10 KV BIL. Current transformers for 2400 and 4160 volt service shall be rated to 25 KV BIL.
    - b. Frequency: Nominal 60 Hz
    - c. Burden: Burden Class shall be selected for the load
    - d. Phase Angle Range: 0 to 60 degrees
    - e. Provide a multi-ratio current transformer with a top range equal to or greater than the actual load. Select a ratio for each current transformer that matches the minimum and maximum power load.
    - f. Install Potential Transformers sized for the installed service voltage. Provide a disconnect switch (fuses) or a means to isolate the meter base from the voltage source without service shut-down.
    - g. Provide a disconnecting wiring block between the current transformer and the meter. A shorting mechanism shall be built into the wiring block to allow the current transformer wiring to be changed without removing power to the transformer. The wiring block shall be located where they are accessible without the necessity of disconnecting power to the transformers. For multi-ratio current transformers, provide a shorting block from each tap to the common lead.
- D. Miscellaneous
  - 1. Within one year after acceptance of Work, verify operation and recalibrate each meter in accordance with the manufacturer's written instructions.
  - 2. The installation contractor shall affix labels to each meter, using a labeling nomenclature supplied by the Owner's Representative. Label information shall correspond to meters indicated on the block diagram.

## **2.15 NATURAL GAS METERS**

- A. General Requirements
  - 1. Refer to plumbing plans and Division 22 specifications.

## **2.16 WATER SUBMERSIBLE LEVEL SENSOR**

- A. Water level sensors shall be hermetically sealed, vibration resistant
- B. Output: 4-20 MA
- C. Accuracy: +/-0.25%
- D. Stem and float material: stainless steel
- E. Allowable temperature range: -40°F to 392°F
- F. Allowable pressure: 100psig

- G. Required Accessories:
  - 1. Submersible Level Transmitter Aneroid Bellows
  - 2. Junction Box for Aneroid Bellows and terminal strip
  - 3. Battery or power supply for 4-20ma output
- H. Install switch at recommended low water level height per manufacturer recommendation
- I. Acceptable Manufacturers:
  - 1. Pro-sense SLT
  - 2. Approved equal

**2.17 VIBRATION SWITCH**

- A. Spring loaded, magnetically coupled, requiring no external power supply
- B. Relay rated for output to external dry contact
- C. Adjustable trip setting
- D. Install switch at recommended low water level height per manufacturer recommendation
  - 1. Acceptable Manufacturers:
    - a. Marley
    - b. Approved equal

**2.14 ZONE PRESENSE SENSOR**

- A. Frequency 24.125 GHz  $\pm$  50 MHz (K-Band)
- B. Detection Method
  - 1. Initial Detection: Doppler Shift Radar
  - 2. Selectable Additional Detection:
  - 3. Human Presence Radar™ (HPR™)
- C. Detection Pattern Selectable, wide or narrow
- D. Detection Angle
  - 1. Adjustable, 21° to 90°
  - 2.  $\pm$ 25° left/right
- E. Movement Direction
  - 1. Switch selectable, unidirectional or bidirectional
- F. Range Adjustable (range pot.)
- G. Maximum Mounting Height 15' (4.5m)
- H. Power Requirements 12V to 24V AC or DC  $\pm$  10%



- I. Power Consumption 3.5W maximum
- J. Mounting
  - 1. Flush Mounted Optional
  - 2. Universal Mounting
- K. Temperature -22°F to 158°F (-30°C to 70°C)
- L. Color Flat black
- M. Weight <1 lb. (0.45kg)
- N. Size- 6 1/2"(w) x 1 7/8"(h) x 2 3/4"(d)
- O. Install sensor at recommended height per manufacturer recommendation
  - 1. Acceptable Manufacturers:
    - a. Triatek
    - b. Hotron
    - c. Approved equal

## **2.15 NAMEPLATES**

- A. Provide engraved phenolic or micarta nameplates for all field devices furnished. Nameplates shall be 1/8 inch thick, black, with white center core, and shall be minimum 1 inch x 3 inch, with minimum ¼ inch high block lettering. Nameplates for devices smaller than 1 inch x 3 inch shall be attached to adjacent surface.
- B. Each nameplate shall identify the function for each device.

## **2.18 TESTING EQUIPMENT**

- A. Contractor shall test and calibrate all signaling circuits of all field devices to ascertain that required digital and accurate analog signals are transmitted, received, and displayed at system operator terminals, and make all repairs and recalibrations required to complete test. Contractor shall be responsible for test equipment required to perform these tests and calibrations. Test equipment used for testing and calibration of field devices shall be at least twice as accurate as respective field device (e.g., if field device is +/- 0.5 percent accurate, test equipment shall be +/- 0.25 percent accurate over same range).

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Examine areas and conditions under which control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Owner.

### **3.2 INSTALLATION OF CONTROL SYSTEMS**

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

- B. Installation shall be in accordance with manufacturer's published recommendations.
- C. General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on drawings. Install electrical components and use electrical products complying with requirements of the latest edition of the National Electrical Code and all local codes.
- D. Control Valves: Install so that actuators, wiring, and tubing connections are accessible for maintenance. Where possible, install with valve stem axis vertical, with operator side up. Where vertical stem position is not possible or would result in poor access, valves may be installed with stem horizontal. Do not install valves with stem below horizontal, or down.
- E. Averaging Temperature Sensors: Cover no more than three square feet per linear foot of sensor length except where indicated. Generally, where flow is sufficiently homogeneous/adequately mixed at sensing location, consult Engineer for requirements.
- F. Airflow Measuring Stations: Install per manufacturer's recommendations in an unobstructed straight length of duct (except those installations specifically designed for installation in fan inlet). For installations in fan inlets, provide on both inlets of double inlet fans and provide inlet cone adapter as recommended by AFM station manufacturer.
- G. Fluid Flow Sensors: Install per manufacturer's recommendations in an unobstructed straight length of pipe.
- H. Relative Humidity Sensors: Provide element guard as recommended by manufacturer for high velocity installations. For high limit sensors, position remote enough to allow full moisture absorption into the air stream before reaching the sensor.
- I. Water Differential Pressure Transmitters: Provide valve bypass arrangement to protect against over pressure damaging the transmitter.
- J. Pipe Surface Mount Temperature Sensors: Install with thermally conductive paste at pipe contact point. Where sensor is to be installed on an insulated pipe Contractor shall neatly cut insulation install sensor, repair or replace insulation and vapor barrier and adequately seal vapor barrier.
- K. Flow Switches: Where possible, install in a straight run of pipe at least 15 diameters in length to minimize false indications.
- L. Current Switches for Motor Status Monitoring: Adjust so that setpoint is below minimum operating current and above motor no load current.
- M. Supply Duct Pressure Transmitters:
  - 1. General: Install pressure tips with at least four (4) 'round equivalent' duct diameters of straight duct with no takeoffs upstream. Install static pressure tips securely fastened with tip facing upstream in accordance with manufacturer's installation instructions. Locate the transmitter at an accessible location to facilitate calibration.
  - 2. VAV System 'Down-Duct' Transmitters: Locate pressure tips approximately 2/3 of the hydraulic distance to the most remote terminal in the air system or as directed by the engineer and/or owner's representative. Refer to IAS and mechanical drawings for more detail.
- N. Cutting and Patching Insulation: Repair insulation to maintain integrity of insulation and vapor barrier jacket. Use hydraulic insulating cement to fill voids and finish with material

matching or compatible with adjacent jacket material.

O. Wiring:

1. Install control wiring and electrical work in accordance with National Electrical codes. In addition to the requirements specified herein, the wiring installation shall meet the requirements of EIA/TIA Standard 568, Commercial Building Standard for telecommunication pathways and spaces.
2. Wiring Inside Rigid Conduit: Within walls, in exposed areas, and areas exposed to weather. Minimum conduit size 3/4".
3. Plenum Rated Wiring: Concealed areas above ceilings. Coordinate with electrical contractor. Support final connection wiring in accordance to National Electric Code and at every four feet. Diagonal installation shall not be accepted. Provide sleeves for wall penetrations.

P. Water Level Switch

1. Coordinate recommended low level alarm height and recommended mounting with cooling tower manufacturer.
2. Do not alter cooling tower without express consent of owner. Work shall not alter or void any warranty.

**END OF SECTION 25 11 00**

**SECTION 25 95 00**

**INTEGRATED AUTOMATION CONTROL SEQUENCES FOR HVAC**

**PART 1 GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes control sequences for HVAC systems, subsystems, and equipment.

**1.3 DEFINITIONS**

- A. CAV: Constant Air Volume.
- B. DDC: Direct-Digital Controls.
- C. VAV: Variable Air Volume.
- D. VFD: Variable Frequency Drive
- E. CHW: Chilled Water
- F. CW: Condenser Water
- G. HHW: Heating Hot Water

**1.4 SUBMITTALS**

- A. Sequence of Operations
  - 1. Provide a final sequence of operations based on the design intent described herein. Sequences shall include all software interlocks, alarms, safeties, and delays.

**1.5 GENERAL**

- A. Equipment start stop and Software Interlocks
  - 1. Mechanical equipment shall be operated, controlled and monitored by the DDC system using the input/output (I/O) shown on the drawings. The operation of the equipment shall be subject to the operational modes, conditions and logic described in this Section. A time delay shall be initiated on system command for equipment start to allow status feedback devices to actuate. At the expiration of the time delay, absence of the run status input signal, which indicates a failure to start or to continue to run, shall cause the system to alarm and start standby units as required. The system shall not restart until commanded to “return to normal”. Alarms assigned to analog inputs shall be delayed on equipment startup to allow sufficient time for equipment capacity to bring the process variable values within the normal range. Variable capacity fans



shall always start in an “unloaded” condition.

2. HAND-OFF-AUTO switches shall be monitored to generate a critical alarm (an alarm that must be acknowledged) when the switch is indexed out of the “AUTO” position.
3. Supply air, return air and exhaust air fans serving the same spaces shall be interlocked by means of software.
4. Whenever equipment is put into operation automatically, the DDC control loops shall be activated. When equipment is not operating, control loops shall be deactivated and end elements shall go to their normally open or normally closed positions as shown on the contract drawings unless otherwise specified.

B. Equipment Staging and Rotation

1. Parallel devices shall be lead/lag rotated to maintain even wear.
2. Two runtime points shall be defined for each device:
  - a. Lifetime Runtime: The cumulative runtime of the device since device start-up. This point shall not be readily resettable by operators.
  - b. Staging Runtime: An operator resettable runtime point that stores cumulative runtime since the last operator reset.
3. Lead/lag devices: Unless otherwise noted, parallel staged devices (such as CHW pumps and cooling towers) shall be lead/lag alternated when more than one is off or more than one is on so that the device with the most operating hours as determined by Staging Runtime is made the last stage device and the one with the least number of hours is made the lead stage device.
4. Exceptions to Lead/lag and Lead/standby rotation
  - a. Operators with appropriate access level shall be able to manually command staging order via software points, but not overriding the In Alarm or Hand Operation logic below.
5. Alarming Devices: If the lead device has a fault condition, a Level 2 alarm shall be generated and a response shall be triggered as defined below.

C. Alarm conditions shall be as follows:

1. Fans and Pumps
  - a. Status point not matching its on/off point for 3 seconds after a time delay of 15 seconds when device is commanded on
2. Boilers
  - a. Shutdown alarm condition either through network or hardwired alarm contact, or
  - b. HW isolation valve feedback indicates valve is not open 90 seconds after device is commanded open, or
  - c. If its leaving water temperature remains 15°F below setpoint for 15 minutes
3. Upon identification of a fault condition:
4. For pumps:
  - a. The next commanded OFF device in the staging order, Device “B”, shall be commanded ON while alarming Device “A” remains commanded ON.
  - b. If Device B fails to prove status (i.e. it also goes into alarm), it shall remain commanded on and the preceding step shall be repeated until the quantity of devices called for by the lead/lag logic have proven on.
  - c. When either the required number of devices proves on or all devices are commanded on, set alarming devices to the last positions in the lead/lag staging order sequenced reverse chronologically (i.e. the device that alarmed most recently is sent to last position).
  - d. Staging order of non-alarming devices shall follow the even wear logic. A device in alarm can only automatically move up in the staging order if another device goes into alarm.
    - 1) Devices in alarm shall run if so called for by the lead/lag staging order and present stage.

D. Control of Damper, Valve, and Fan Speed

1. The DDC system shall apply P, PI or PID control by modulating analog outputs to the

actuators in the proper direction to control temperature, humidity, pressure, flow and other process variables as specified.

2. All control and alarm setpoints shall be adjustable by the operator. Initial setting of all control and alarm setpoints shall be performed by the DDC system Contractor.

E. DDC System Failure

1. If Remote Control Panels (RCPs or ACPs) should fail, the operating equipment controlled by that panel shall continue to function, based on the last command.

1.6 **WATER SOURCE HEAT PUMP (WSHP) UNIT CONTROL**

- A. Scheduling: The water source heat pump system will be enabled based on a time-of-day (TOD) schedule and system demand as indicated by zone thermostat or as programmed by the building operator. System operation shall be allowed at all times.
- B. Modes of Operation: Occupancy for systems serving zones scheduled through the 25 Live scheduling software shall be overridden by the network scheduling software for HVAC.
1. Occupied Mode: During Occupied Mode, enable operation of heat pump units and the condenser water plant and open the WSHP isolation valve. The reversing valve and DX compressors shall be staged as required to maintain the space temperature heating and cooling setpoints (adj.). The supply fan shall run continuously.
  2. Unoccupied Mode: During Unoccupied Mode, disable operation of heat pump units and the condenser water plant and close the WSHP isolation valve. The WSHP shall cycle on to maintain the unoccupied space temperature setback heating and cooling setpoints (adj.). When a wall sensor override button is depressed during unoccupied period, operate the system in occupied mode for one hour (adj.). The supply fan serving the bio prep space (WSHP 1) shall operate continuously during unoccupied mode.
  3. *Occupied-Standby Mode (WSHP 2A,2B,3A,3B,4A,4B,5)- When zone is scheduled to be occupied through the 25 Live scheduling software and all rooms served by zone are unoccupied for more than 5 minutes as indicated by occupancy sensor, the zone shall enter Occupied-Standby mode. During Occupied-Standby mode,*
    - a. *The IAS system shall set up the operating cooling setpoint by 2 degree F (adjustable) and setback the heating setpoint by 2 degree F (adjustable).*
    - b. *The supply fan shall shut off when the space temperature is between the active heating and cooling setpoints.*
  4. Optimal Start Warm-up Mode: Base the warm-up start time on an optimal start strategy calculated using outdoor air temperature and average zone temperature. If the average zone temperature is less than 69°F (adjustable), initiate the warm-up mode and set the Warm-up Mode Low Temperature Setpoint to 70°F (adjustable). Enable the water loop pumps, the boilers, and the boiler pumps. Once water loop is proved, enable the heat pump unit(s), as required, to operate in heating mode. Disable fluid coolers during warm-up mode. Terminate warm-up mode when the average zone temperature rises above the Warm-up Mode Low Temperature Setpoint.
  5. Demand Shed: Upon receipt of a demand shed signal, all non-critical zones shall reset their heating setpoint down by 4°F and their cooling setpoint up by 4°F. The demand shed mode shall be manually enabled or disabled by an operator button on the graphical user interface as well as by an automatic campus signal.
- C. DX Cycle Control: Incorporate compressor minimum on time, compressor minimum off time, and compressor on/off delays for periods recommended by the WSHP manufacturer.
- D. Operator Station Display: Indicate the following on operator workstation display terminal (minimum requirements):
1. System graphic(s) – provide one graphic for each WSHP.
    - a. WSHP mode.
    - b. 25Live Occupancy Command

- c. Reversing valve position.
- d. WSHP fan command
- e. WSHP fan status.
- f. Mixed air temperature
- g. Supply air temperature.
- h. Room temperature and setpoints.
- i. Occupancy sensor status (where provided)
- j. All alarms.

## 1.7 CONDENSER WATER PLANT CONTROL

- A. The condenser water system will be enabled based on a time-of-day (TOD) schedule and system demand as indicated by zone thermostat or as programmed by the building operator. System operation shall be allowed at all times.
- B. Condenser Water Pump Control: When the condenser water loop is enabled, the DDC system shall start the lead condenser water pump.
  - 1. The condenser water pump shall ramp up to the pump speed determined during TAB. The pump speed setpoint shall be that which is determined during TAB to achieve the design flow.
  - 2. A failure of the lead CW pump shall cause the lag pump to start and an alarm condition shall be indicated at the building operator's terminal.
  - 3. The CW pumps shall rotate lead/lag status on a monthly basis, or as programmed by the building operator.
  - 4. If the CW flow switch signal does not match CW pump command, generate an alarm at the operator workstation.
- C. Condenser Water Cooling Control: The condenser water system operates using the manufacturer provided controller. The controllers shall be integrated into the building management system.
  - 1. When the condenser water loop is enabled, the IAS system shall enable the fluid cooler through a hardwired control point. The fluid cooler shall remain enabled with the condenser water loop.
  - 2. The IAS system shall set the condenser water cooling setpoint through it's BACnet point "Fluid Temp Setpoint." The setpoint shall initially be set to 80 F.
  - 3. The IAS system shall command the preconfigured operating mode of the fluid cooler during operation through it's BACnet point "Operation Mode." The operation mode shall initially be set to "Energy Saver."
  - 4. Manufacturer's description of "Energy Saver" mode: "During periods when ambient temperatures or load from the building or process are relatively high, the Nexus Modular Hybrid Cooler operates with all spray system active across all modules. During off-design conditions, The EC Fan System will automatically and intelligently reduce speed whenever possible. As the load is satisfied, the fans and spray pumps will cycle off. When demand increases and calls for heat rejection, each module turns on in sequence. Once all modules are turned on, all fans operate at a synchronized speed."
  - 5. If the water loop temperature exceeds a CW high limit of 100° F, generate an alarm at the operator workstation and reset all active control loops.
- D. Condenser Water Heating Control:
  - 1. If the condenser water drops 5° F (adj.) below the condenser water heating setpoint (67°F adj) for a period of 15 minutes (adj.) enable the boiler.
  - 2. Upon proof of pump operation as indicated by the current sensing relay and sufficient CW flow as indicated by the boiler's flow switch, enable the boiler's controller for

operation.

3. The boiler shall operate under its own internal controls to maintain the condenser water heating setpoint. This set point shall be set by the building operator via the DDC system.
4. If the condenser water temperature rises 5° F (adj.) above the condenser water heating setpoint for a period of 15 minutes (adj.), disable the boiler's controller.
5. Appropriate time delays shall be utilized between each step per the boiler manufacturer's recommended time intervals.
6. If the water loop temperature exceeds a CW low limit of 58° F, generate an alarm at the operator workstation and reset all active control loops.

E. Safeties:

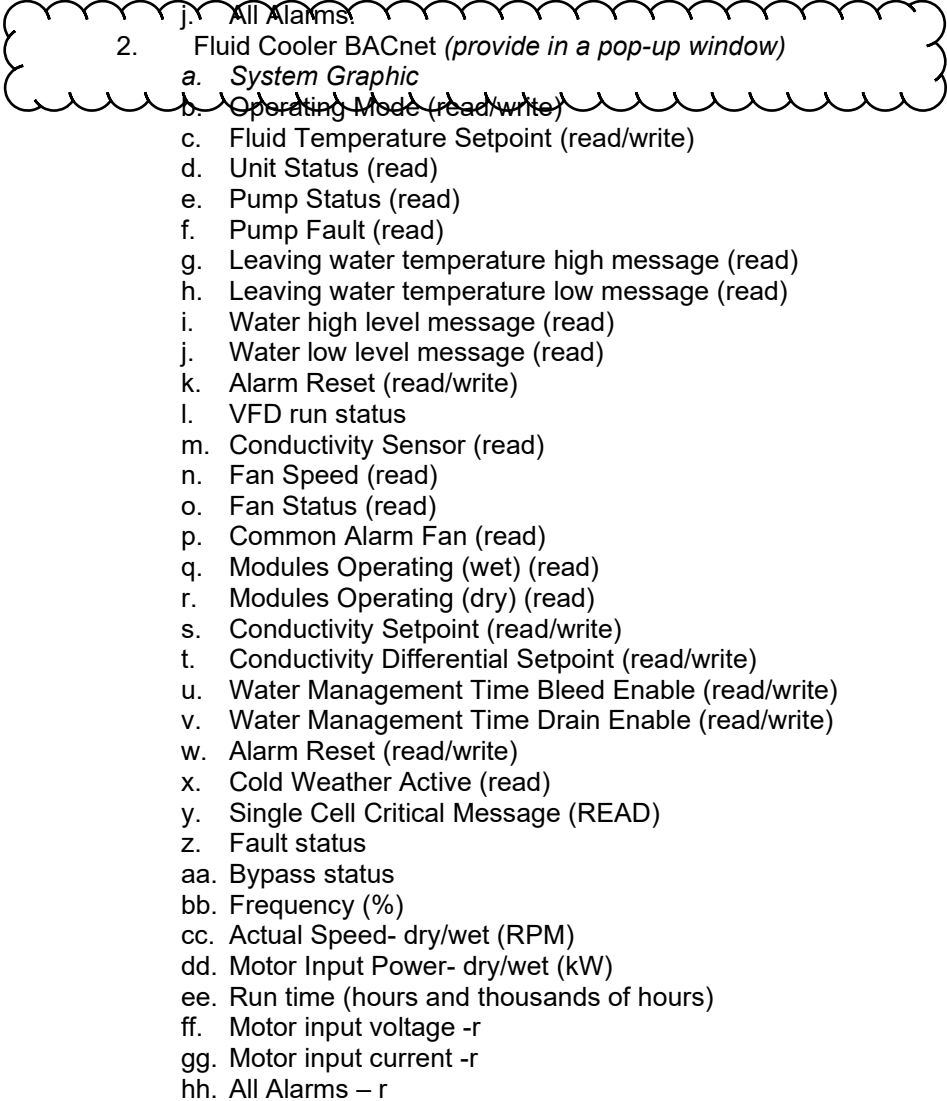
1. Disable the fluid cooler's pump if the water level in the fluid cooler's basin falls below its minimum allowable level. Initiate a Low Water Basin Alarm at the BAS operator workstation.
2. Disable the fluid cooler upon a signal from the vibration switch.
3. Disable the condenser water system and generate an alarm at the BAS operator workstation if the CW pump status is on and the cooling tower flow switch indicates no flow for a period of 3 minutes.

F. Operator Station Display: Indicate the following on operator workstation display terminal (minimum requirements):

1. System graphic(s) – provide one graphic for condenser water system overview.
  - a. Outside air dry bulb temperature
  - b. Outside air wet bulb temperature
  - c. Outside air dew point (Calculated)
  - d. Condenser water supply heating/cooling temperature setpoints
  - e. Condenser water supply temperature
  - f. Condenser water return temperature
  - g. CW pump speed
  - h. Boiler BACnet LAN points (display in a pop-up window)
    - 1) Boiler state (multistate value – program and display manufacturer descriptions associated with the boiler multistate value)
    - 2) Boiler status (multistate value – program and display manufacturer descriptions associated with the boiler multistate value)
    - 3) Boiler error code (multistate value – program and display manufacturer descriptions associated with the boiler multistate value)
    - 4) Firing rate (read)
    - 5) Supply temperature (read)
    - 6) Return temperature (read)
    - 7) Boiler mode (read/write)
    - 8) CH Setpoint (read/write)
    - 9) Reset Curve Boiler Maximum (read/write)
    - 10) Reset Curve Boiler Maximum (read/write)
    - 11) Burner enable (read/write)
    - 12) Boiler run time
  - i. VFD LAN points for each VFD (provide in a pop-up window)
    - 1) VFD run status
    - 2) Fault status
    - 3) Bypass status
    - 4) Frequency (Hz)
    - 5) RPM
    - 6) Current (amps)
    - 7) Power (kW)
    - 8) DC bus voltage
    - 9) Output voltage
    - 10) VFD temperature



11) Run time (hours and thousands of hours)

- 
- j. All Alarms
  - 2. Fluid Cooler BACnet *(provide in a pop-up window)*
    - a. System Graphic
    - b. Operating Mode (read/write)
    - c. Fluid Temperature Setpoint (read/write)
    - d. Unit Status (read)
    - e. Pump Status (read)
    - f. Pump Fault (read)
    - g. Leaving water temperature high message (read)
    - h. Leaving water temperature low message (read)
    - i. Water high level message (read)
    - j. Water low level message (read)
    - k. Alarm Reset (read/write)
    - l. VFD run status
    - m. Conductivity Sensor (read)
    - n. Fan Speed (read)
    - o. Fan Status (read)
    - p. Common Alarm Fan (read)
    - q. Modules Operating (wet) (read)
    - r. Modules Operating (dry) (read)
    - s. Conductivity Setpoint (read/write)
    - t. Conductivity Differential Setpoint (read/write)
    - u. Water Management Time Bleed Enable (read/write)
    - v. Water Management Time Drain Enable (read/write)
    - w. Alarm Reset (read/write)
    - x. Cold Weather Active (read)
    - y. Single Cell Critical Message (READ)
    - z. Fault status
    - aa. Bypass status
    - bb. Frequency (%)
    - cc. Actual Speed- dry/wet (RPM)
    - dd. Motor Input Power- dry/wet (kW)
    - ee. Run time (hours and thousands of hours)
    - ff. Motor input voltage -r
    - gg. Motor input current -r
    - hh. All Alarms – r

**1.8 BIOLOGY PREP SPACE (FUME HOOD) EXHAUST FAN – EF-1**

- A. Provide DDC control using electric actuation.
- B. The exhaust fan and WSHP-1 supply fan shall operate continuously.
- C. The fan VFD shall operate at a constant speed setpoint determined during TAB to achieve the fume hood and storage cabinet exhaust airflow requirements.
- D. Safety:
  - 1. The DDC system shall use a current sensing relay to monitor the fan status. The system shall issue a priority alarm if EF-1 or WSHP-1 status turns to “off”.
- E. Operator Station Display: Indicate the following on operator workstation display terminal (minimum requirements):
  - 1. System graphic(s).

- a. Exhaust fan on-off indication, run status, and alarms.
- b. Exhaust fan VFD speed.
- c. VFD LAN points for VFD (provide in a pop-up window)
  - 1) VFD run status
  - 2) Fault status
  - 3) Bypass status
  - 4) Frequency (Hz)
  - 5) RPM
  - 6) Current (amps)
  - 7) Power (kW)
  - 8) DC bus voltage
  - 9) Output voltage
  - 10) VFD temperature
  - 11) Run time (hours and thousands of hours)
- d. All Alarms.

### 1.9 STORAGE ROOM EXHAUST FAN- EF-2

- A. Provide DDC control using electric actuation.
- B. The exhaust fan shall be enabled based on demand as indicated by the room temperature sensor, or as programmed by the building operator. System operation shall be allowed at all times.
  - 1. The exhaust fan shall be energized when the room temperature sensor indicates the space has exceeded 85°F (adj.) and shall remain energized until the space temperature falls below 78°F (adj.).
  - 2. The exhaust fan shall run for a minimum of 10 minutes (adj.)
  - 3. The exhaust fan shall run for a minimum 5 minutes of each hour.
- C. Safety:
  - 1. The DDC system shall use a current sensing relay to monitor the fan status.
- D. Operator Station Display: Indicate the following on operator workstation display terminal (minimum requirements):
  - 1. System graphic(s).
    - a. Exhaust fan on-off indication, run status, and alarms.
    - b. Storage room temperature
    - c. Fan enable/disable temperature setpoints

### 1.10 DUCTLESS SPLIT SYSTEM CONTROL

- A. The unit shall maintain the room temperature setpoint using its manufacturer supplied controller.
- B. Unit controllers shall be integrated into the building management system via a BACnet gateway.
- C. Operator Station Display: Indicate the following on operator workstation display terminal (minimum requirements):
  - 1. System graphic(s).
  - 2. Integrated Points:
    - a. Enable/disable (r/w)
    - b. System mode (r/w)
    - c. Room temperature setpoint (r/w)

- d. Room temperature (r)
- e. Fault code (multistate value – program and display manufacturer descriptions associated with the multistate value)

### 1.11 UTILITY METERING

- A. Operator Station Display: Indicate the following on operator workstation display terminal (minimum requirements):
  - 1. Provide a dedicated utility metering GUI dashboard page for the building.
    - a. Instantaneous domestic water usage (gallons per minute)
    - b. Instantaneous natural gas usage (MBH)
    - c. Instantaneous electrical usage (kW)
    - d. Integrated electrical meter points (display on a drill down or pop up)
      - 1) Current per phase (amp)
      - 2) Power factor
      - 3) Reactive power (kVAR)
      - 4) Apparent power (kVA)
      - 5) Real power (kW)
  - 2. Combined building energy consumption based on the addition of electricity and natural gas. Convert all utility consumption to BTU's.
  - 3. Provide a stacked area graph to view the historic consumption of each utility. Provide area stacked graphs with gradient transparency. Line graphs are not acceptable.
  - 4. Allow the user to select the historical utility usage type to view. Historic utility usage type options shall include natural gas, electrical, water, and combined energy consumption.
  - 5. Allow the user to select the period to view. At a minimum, the choices shall include; today, yesterday, last week, last year, or a user selected time period.
  - 6. Provide an optional line overlay to compare previous time period energy consumption to the current selection. The previous time period shall be identical to the selected time period.
  - 7. For the combined electrical utility, provide a stacked area graph view which shows the contribution of each electrical submeter to the whole. Refer to electrical sheets E0.1 and E6.02 for an electrical single line and panel schedule which shows the service of each submeter. Provide at a minimum the following sub metered categories.
    - a. Whole building electrical meter
    - b. Single panel electrical use; in the stacked graphs, deduct electrical use of subpanels from the main panel electrical use.
  - 8. Show an energy use intensity (EUI) table which displays the following EUI's based on the most recent 12 months of complete usage history.
    - a. Combined building EUI (BTU/SF-YR)
    - b. Electrical use index (kWh/SF-YR)
    - c. Natural gas use index (BTU/SF-YR)
    - d. Water use index (Gal/SF-YR)

### 1.12 TRENDING

- 1. Provide trend collection on all physical DDC points specified. Establish trend collection intervals of 15 minutes for specified points. Provide trend data collection capacity to store up to 365 days' worth of data for all specified points.

### PART 2 PRODUCTS (NOT APPLICABLE)

### PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION 25 95 00



**SECTION 26 09 43**  
**NETWORK LIGHTING CONTROLS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes a networked lighting control system comprised of the following components
  - 1. System Software Interfaces
  - 2. System Backbone and Integration Equipment
  - 3. Wired Networked Devices
    - Wall Switches, Dimmers and Scene Controllers
    - Graphic Wallstations
    - Auxiliary Input/Output Devices
    - Occupancy and Photocell Sensors
    - a. Wall Switch Sensors
    - b. Embedded Sensors
    - c. Power Packs and Secondary Packs
    - d. Networked Luminaires
    - e. Relay and Dimming Panel
    - f. Bluetooth® Low Energy Programming Device
    - g. Communication Bridge
    - h.
    - i.
    - j.
    - k.
  - 4. The networked lighting control system shall meet all of the characteristics and performance requirements specified herein.
  - 5. The contractor shall provide, install and verify proper operation of all equipment necessary for proper operation of the system as specified herein and as shown on applicable drawings.

**1.2 RELATED DOCUMENTS**

- A. Section 26 27 26 Wiring Devices
- B. Section 26 51 13 Interior Lighting Fixtures

**1.3 SUBMITTALS**

- A. Submittal shall be provided including the following items.
  - 1. Bill of Materials necessary to install the networked lighting control system.
  - 2. Product Specification Sheets indicating general device descriptions, dimensions, electrical specifications, wiring details, and nomenclature.
  - 3. Riser Diagrams showing device wiring connections of system backbone and floor plans pertinent to the specific project. Engineers design drawings returned back to the Engineer for review are not acceptable.

**1.4 APPROVALS**

- A. Prior approval from owner's representative is required for products or systems manufactured by companies not specified in the Network Lighting Controls section of this specification.
- B. Any alternate product or system that has not received prior approval from the owner's representative at least 10 days prior to submission of a proposal package shall be rejected.

- C. Alternate products or systems require submission of catalog datasheets, system overview documents and installation manuals to owner's representative. The submittal shall include significant differences between the specified product and the alternate.

## 1.5 QUALITY ASSURANCE

- A. Product Qualifications
  - 1. System electrical components shall be listed or recognized by a nationally recognized testing laboratory (e.g., UL, ETL, or CSA) and shall be labeled with required markings as applicable.
  - 2. System luminaires and controls shall be designed and manufactured for interoperability.
  - 3. All components shall be subjected to 100% end of line testing prior to shipment to the project site to ensure proper device operation.
  - 4. All components and the manufacturing facility where product was manufactured must be RoHS compliant.
- B. Installation and Startup Qualifications
  - 1. System start-up shall be performed by qualified personnel approved or certified by the manufacturer.
- C. Service and Support Requirements
  - 1. Phone Support: Toll free technical support shall be available.
  - 2. Remote Support: The bidder shall offer a remote support capability.
  - 3. Onsite Support: The bidder shall offer onsite support that is billable at whole day rates.
  - 4. Service Contract: The bidder shall offer a Service Contract that packages phone, remote, and onsite support calls for the project. Response times for each type of support call shall be indicated in the terms of the service contract included in the bid package.

## 1.6 PROJECT CONDITIONS

- A. Only install equipment after the following site conditions are maintained:
  - 1. Ambient Temperature: 14 to 105°F.
  - 2. Relative Humidity: less than 90% non-condensing
- B. Equipment shall not be subjected to dust, debris, moisture, or temperature and humidity conditions exceeding the requirements indicated above, at any point prior to installation.
- C. Only properly rated equipment and enclosures, installed per the manufacturer's instructions, may be subjected to dust and moisture following installation.

## 1.7 WARRANTY

- A. The manufacturer shall provide a minimum five-year warranty on all hardware devices supplied and installed. Warranty coverage shall begin on the date of shipment.
- B. The hardware warranty shall cover repair or replacement, including programming, any defective products within the warranty period.

## 1.8 MAINTENANCE & SUSTAINABILITY

- A. The manufacturer shall make available to the owner new parts, upgrades, and/or replacements available for a minimum of 5 years following installation.

## **PART 2 - EQUIPMENT**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. nLight, Acuity Brands Lighting, Inc.
- B. Basis of Design System: Acuity Controls nLight

### **2.2 SYSTEM COMPLIANCE**

- A. System components shall comply with UL 916 and UL 924 standards where applicable.
- B. System components shall comply with CFR Title 47, Part 15 standards where applicable.
- C. All equipment shall be installed and connected in compliance with NFPA 70.

### **2.3 SYSTEM PERFORMANCE REQUIREMENTS**

- A. System Architecture
  - 1. System shall have an architecture that is based upon three main concepts: (1) networkable intelligent lighting control devices, (2) standalone lighting control zones using distributed intelligence, (3) optional system backbone for remote, time based and global operation between control zones.
  - 2. Intelligent lighting control devices shall have individually addressable network communication capability and consist of one or more basic lighting control components: occupancy sensor, photocell sensor, relay, dimming output, contact closure input, analog 10V input, and manual wallstation capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure shall be permissible so as to minimize overall device count of system.
  - 3. System must be capable of interfacing directly with networked luminaires such that either low voltage network cabling or RF communication is used to interconnect networked luminaires with control components such as sensors, switches and system backbone (see Control Zone Characteristics sections for each type of network connection, wired).
  - 4. Lighting control zones consisting of one or more networked luminaires and intelligent lighting control devices and shall be capable of providing automatic control from sensors (occupancy and/or photocell) and manual control from local wallstations without requiring connection to a higher-level system backbone; this capability is referred to as “distributed intelligence.”
    - a. Lighting control zones (wired) of at least 128 devices per zone shall be supported.
  - 5. The system shall be capable of providing individually addressable switching and dimming control of the following: networked luminaires, control zones, and relay and dimming outputs from centralized panels to provide design flexibility appropriate with sequence of operations required in each project area or typical space type.
  - 6. Networked luminaires and intelligent lighting control devices shall support individual (unique) configuration of device settings and properties.
  - 7. Networked luminaires and intelligent lighting control devices shall have distributed intelligence programming stored in non-volatile memory such that following any loss of power the lighting control zones shall operate according to their defined default settings and sequence of operations.
  - 8. Lighting control zones shall be capable of being networked with a higher level system backbone to provide time based control, remote control from inputs and/or systems external to the control zone, and remote configuration and monitoring through a software interface.

9. The system may include one or more system controllers that provide time-based control and global system control across multiple control zones and backbone network segments. The system controller also provides a means of connecting the lighting control system to a system software interface and building management systems via BACnet/IP protocol.
  10. The system may include “communication bridge” devices that route communication from lighting control zones (wired) to and from the system controller, for purposes of decreasing system wiring requirements.
  11. All system devices shall support remote firmware update, such that physical access to each device is not necessary, for purposes of upgrading functionality at a later date.
  12. Eclipse controller license shall be BACnet enabled (BAC) with Envysion visualization software option (SYS).
- B. Wired Networked Control Zone Characteristics
1. Connections to devices within a wired networked lighting control zone and to backbone components shall be with a single type of low voltage network cable, which shall be compliant with CAT5e specifications or higher. To prevent wiring errors and provide cost savings, the use of mixed types of low voltage network cables shall not be permitted.
  2. Devices in an area shall be connected via a “daisy-chain” topology; requiring all individual networked devices to be connected back to a central component in a “hub-and-spoke” topology shall not be permitted, so as to reduce the total amount of network cable required for each control zone.
  3. System shall provide the option of having pre-terminated plenum rated low voltage network cabling supplied with hardware so as to reduce the opportunity for improper wiring and communication errors during system installation.
  4. Following proper installation and provision of power, all networked devices connected together with low voltage network cable shall automatically form a functional lighting control zone without requiring any type of programming, regardless of the programming mechanism (e.g., software application, handheld remote, pushbutton). The “out of box” default sequence of operation is intended to provide typical sequence of operation so as to minimize the system start-up and programming requirements and to also have functional lighting control operation prior to system start-up and programming.
  5. Once software is installed, system shall be able to automatically discover all connected devices without requiring any provisioning of system or zone addresses.
  6. All networked devices shall have the ability to detect improper communication wiring and blink its LED in a specific cadence as to alert installation/start-up personnel.
  7. Networked control devices intended for control of egress and/or emergency light sources shall not require the use of additional, externally mounted UL924 shunting and/or 0-10V disconnect devices, so as to provide a compliant sequence of operation while reducing the overall installation and wiring costs of the system. The following types of wired networked control devices shall be provided for egress and/or emergency light fixtures:
    - a. Low-Voltage power sensing: These devices shall automatically provide 100% light level upon detection of loss of power sensed via the low voltage network cable connection.
    - b. UL924 Listed Line-Voltage power sensing: These devices shall be listed as emergency relays under the UL924 standard and shall automatically close the load control relay(s) and provide 100% light output upon detection of loss of power sensed via line voltage connections.
- C. System Integration Capabilities
1. The system shall interface with third party building management systems (BMS) to support two-way communication using the industry standard BACnet/IP or BACnet/MSTP protocols. The following system integration capabilities shall be available via BACnet/IP and BACnet/MSTP protocols:



- D. Supported Sequence of Operations
1. The following characteristics and performance requirements shall apply to wired control zones provided by the system.
  2. Control Zones
  3. Wallstation Capabilities
  4. Occupancy Sensing Capabilities
  5. Photocell Sensing Capabilities (Automatic Daylight Sensing)
  6. Schedule and Global Profile Capabilities
  7. Automated demand response capabilities. Profiles created for automated demand response events shall support automatic reduction of light level to programmable values. At least four levels of demand response profiles shall be supported by the system.

## 2.4 SYSTEM SOFTWARE INTERFACES

- A. Management Interface
1. System shall provide a web-based management interface that provides remote system control, live status monitoring, and configuration capabilities of lighting control settings and schedules.
  2. Management interface must be compatible with industry-standard web browser clients, including, but not limited to, Microsoft Internet Explorer®, Apple Safari®, Google Chrome®, Mozilla Firefox®.
  3. Management interface shall require all users to login with a User Name and Password and shall support creation of at least 100 unique user accounts.
  4. Management interface shall support at least three permission levels for users: read-only, read & change settings, and full administrative system access.
  5. Management interface shall be capable of restricting read-only and read & change access for user accounts to specific devices within the system.
  6. All system devices shall be capable of being given user-defined names.
  7. The following device identification information shall be displayed in the Management interface: model number, model description, serial number, manufacturing date code custom label(s), and parent network device.
  8. Management interface shall be able to read the live status of a networked luminaire or intelligent control device and shall be capable of displaying luminaire on/off status, dim level, power measurement, device temperature, PIR occupancy sensor status, microphonic occupancy sensor status, remaining occupancy time delay, photocell reading, and active Scenes or Profiles.
  9. Management interface shall be able to read the current active settings of a networked luminaire or intelligent control device and shall be capable of displaying dimming trim levels, occupancy sensor and photocell enable/disable, occupancy sensor time delay and light level settings, occupancy sensor response (normal or vacancy), and photocell setpoints and transition time delays.
  10. Management interface shall be able to change the current active settings and also default settings for an individual networked luminaire or intelligent control device.
  11. Management interface shall be capable of applying settings changes for a zone of devices or a group of selected devices using a single “save” action that does not require the user to save settings changes for each individual device.
  12. A printable network inventory report shall be available via the management interface.
  13. A printable report detailing all system profiles shall be available via the management interface.
  14. All sensitive information stored by the software shall be encrypted.
  15. All system software updates must be available for automatic download and installation via the Internet.
- B. Historical Database and Analytics Interface

1. System shall provide a historical database that stores device operational history and calculates energy usage for all networked luminaires and intelligent control devices.
  2. System shall be capable of reporting lighting system events and performance data back to the historical database for display and analysis.
  3. Historical database shall be capable of recording historical data for up to 20,000 networked devices for a period of at least 1 calendar year.
  4. An “Energy Scorecard” shall be displayed that shows calculated energy savings in dollars, kWh, or CO<sub>2</sub>.
  5. Software shall calculate the allocation of energy savings to different control measures (occupancy sensors, photocells, manual switching, etc.).
  6. Energy savings data shall be calculated for the system as a whole, or for individual zones.
  7. A time scaled graph showing all relay transitions shall be presented.
  8. A time scaled graph showing a zones occupancy time delay shall be presented
  9. A time scaled graph showing the total light level shall be presented.
  10. User shall be able to customize the baseline run-time hours for a space.
  11. User shall be able to customize up to four time-of-day billing rates and schedules.
  12. Historical data shall be exportable from the Historical Database via a “CSV” type of file format.
- C. Visualization Interfaces
1. System shall provide a web-based visualization interface that displays graphical floorplan.
  2. Graphical floorplan (HTML5 Graphics) shall offer the following types of system visualization:
- D. Personal Control Applications
1. Software interface shall support personal control software applications that provide user-specific control of individual luminaires, control zones, and scene presets.
  2. Personal control applications shall support control of dimming output or definition of dimming presets for luminaires and devices that are dimmable.
  3. The system administrator shall be capable of defining personal control permissions for each user account.
  4. Software interface shall provide a Microsoft Windows® operating system taskbar application for personal lighting control.
  5. Software interface shall provide an Apple iOS® operating system application (supported by mobile phones and mobile tablet devices) for personal lighting control.
- E. Smartphone Programming Interface for Wired Devices
1. Application interface shall be provided for both Apple iOS® and Android operating systems that allows configuration of lighting control settings.
  2. The application shall support the configuration of wired networked control devices via a Bluetooth® Low Energy (BLE) Programming Device.
  3. Programming capabilities through the application shall include, but not be limited to, the following:

## 2.5 SYSTEM BACKBONE AND SYSTEM INTEGRATION EQUIPMENT

- A. IP nLight ECLYPSE™ System Controller (IP-NE-CTRL)
1. System Controller shall be multi-tasking, real-time digital control processor consisting of modular hardware with plug-in enclosed processors, communication controllers, and power supplies.
  2. System Controller shall have 32-bit microprocessor operating at a minimum of 1 GHz.
  3. System Controller shall have minimum of 512MB memory, with a minimum of 4GB non-volatile flash, to support its own operating system and databases.

4. System Controller shall perform the following functions:
    - Facilitation of global network communication between different areas and control zones.
    - Time-based control of downstream wired and network devices.
    - Linking into an Ethernet network.
    - Integration with Building Management Systems (BMS) and Heating, Ventilation and Air Conditioning (HVAC) equipment.
    - Connection to various software interfaces, including management interface, historical database and analytics interface, visualization interface, and personal control applications.
  - a.
  - b.
  - c.
  - d.
  5. System Controller shall have an integral web server to support configuration, diagnostics and hosting of software interfaces.
  - e.
  6. Device shall have option for a graphical touch screen to support configuration and diagnostics.
  7. Device shall have three RJ-45 networked lighting control ports for connection to any of the following:
  8. Device shall be capable of communicating with mesh network bridges and software interfaces via LAN connection.
  9. Device shall automatically detect all networked devices connected to it, including those connected to wired and communication bridges.
  10. Device shall have a standard internal time clock.
  11. Device shall have 2 switched RJ-45 10/100 BaseT Ethernet ports for local area network (LAN) connection
    - a. Ethernet connection shall support daisy chain wiring to other lighting control system LAN devices, such as other system controllers and mesh networked communication bridges.
    - b. Ethernet connection shall support IPv4 and shall be capable of using a dedicated static or DHCP assigned IP address.
  12. Device shall have 2 x USB 2.0 Expansion ports for 802.11 Wi-Fi Adapter enabling connectivity including:
    - 1) Hot Spot
    - 2) Access Point
    - 3) Client
    - 4) Spanning Tree Protocol
  13. Each System Controller shall be capable of managing and operating at least 1500 networked devices (wired).
  14. System Controller shall support BACnet/IP and BACnet/MSTP protocols to directly interface with BMS and HVAC equipment without the need for additional protocol translation gateways.
- B. OpenADR Interface
1. System shall provide an interface to OpenADR protocol Demand Response Automation Servers (DRAS) typically provided by local electrical utility.
  2. OpenADR interface shall meet all of the requirements of Open ADR 2.0a Virtual End Nodes (VEN), including:
  3. OpenADR interface shall support the activation of system profiles configured for each of the automated demand response levels defined in the utility demand response program.

## 2.6 WIRED NETWORKED DEVICES

- A. Wired Networked Wall Switches, Dimmers, Scene Controllers
1. Devices shall recess into single-gang switch box and fit a standard GFI opening.
  2. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.

3. All switches shall have the ability to detect when it is not receiving valid communication and blink its LED in a pattern to visually indicate a potential wiring issue.
  4. Devices with mechanical push-buttons shall provide tactile and LED user feedback.
  5. Devices with mechanical push-buttons shall be made available with custom button labeling.
  6. Wall switches & dimmers shall support the following device options:
  7. Scene controllers shall support the following device options:
- B. Wired Networked Graphic Wallstations
1. Device shall surface mount to single-gang switch box.
  2. Device shall have a 3.5" full color touch screen.
  3. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply.
  4. Device shall have a micro-USB style connector for local computer connectivity.
  5. Communication shall be over standard low voltage network cabling with RJ-45 connectors.
  6. Device shall enable user supplied screen saver image to be uploaded within one of the following formats: jpg, png, gif, bmp, tif.
  7. Device shall enable configuration of all switches, dimmers, and lighting preset scenes via password protected setup screens.
  8. Graphic wallstations shall support the following device options:
    - a. Number of control zones: Up to 16
    - b. Number of scenes: Up to 16
    - c. Colors: Ivory, White, Light Almond, Gray
- C. Wired Networked Auxiliary Input / Output (I/O) Devices
1. Devices shall be plenum rated and be inline wired, screw mountable, or have an extended chase nipple for mounting to a ½ in knockout.
  2. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.
  3. Auxiliary Input/Output Devices shall be specified as an input or output device with the following options:
- D. Wired Networked Occupancy and Photosensors
1. Occupancy sensors shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
  2. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic or Microwave based sensing technologies shall not be accepted.
  3. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional "dual" technology shall be used.
  4. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR / Microphonics (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants. Sensors where both technologies detect motion (PIR / Ultrasonic) shall not be acceptable.
  5. All sensing technologies shall be acoustically passive, meaning they do not transmit sound waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonics technology. Ultrasonic or Microwave based sensing technologies shall not be accepted.
  6. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.



7. All sensors shall have the ability to detect when it is not receiving valid communication and blink its LED in a pattern to visually indicate a potential wiring issue.
  8. Sensor programming parameter shall be available and configurable remotely from the software and locally via the device push-button.
  9. Network system shall have ceiling, fixture, recessed & corner mounted sensors available, with multiple lens options available customized for specific applications.
  10. Sensors shall be available with zero or one integrated dry contact switching relays, capable of switching 1 amp at 24 VAC/VDC (resistive only).
  11. Sensors shall be available with one or two occupancy “poles”, each of which provides a programmable time delay.
  12. Sensors shall have optional features for photosensor/daylight override, dimming control, and low temperature/high humidity operation.
  13. Photosensor shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
  14. Photosensor and dimming sensor’s set-point and deadband shall be automatically calibrated through the sensor’s microprocessor by initiating an “Automatic Set-point Programming” procedure. Min and max dim settings as well as set-point may be manually entered.
  15. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
  16. A dual zone option shall be available for On/Off Photocell, Automatic Dimming Control Photocell, or Combination units. The secondary daylight zone shall be capable of being controlled as an “offset” from the primary zone.
- E. Wired Networked Wall Switch Sensors
1. Devices shall recess into single-gang switch box and fit a standard GFI opening.
  2. Communication and low voltage power shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors.
  3. All wall switch sensors shall have the ability to detect when it is not receiving valid communication and blink its LED in a pattern to visually indicate a potential wiring issue.
  4. Devices with mechanical push-buttons shall provide tactile user feedback.
  5. Wall switches sensors shall support the following device options:
- F. Wired Networked Embedded Sensors
1. Network system shall have embedded sensors consisting of occupancy sensors and/or dimming photocells that can be embedded into luminaire such that only the lens shows on luminaire face.
  2. Occupancy sensor detection pattern shall be suitable for 7.5 ft. to 20 ft. mounting heights
  3. Embedded sensors shall support the following device options:
- G. Wired Networked Power Packs and Secondary Packs
1. Power Packs shall incorporate one optional Class 1 relay, optional 0-10 VDC dimming output, and contribute low voltage Class 2 power to the rest of the system.
  2. Power Packs shall accept 120 or 277 VAC (or optionally 347 VAC) and carry a plenum rating.
  3. Secondary Packs shall incorporate the relay and 0-10 VDC or line voltage dimming output but shall not be required to contribute system power.
  4. Power Supplies shall provide system power only but are not required to switch line voltage circuit.
  5. Auxiliary Relay Packs shall switch low voltage circuits only, capable of switching 1 amp at 40 VAC/VDC (resistive only).

6. Communication shall be delivered to each device via standard low voltage network cabling with RJ-45 connectors. Secondary packs shall receive low voltage power via standard low voltage network cable.
  7. Power Pack programming parameter shall be available and configurable remotely from the software and locally via the device push-button.
  8. Power Pack shall securely mount to junction location through a threaded ½ in chase nipple or be capable of being secured within a luminaire ballast/driver channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
  9. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
  10. Power/Secondary Packs shall be available with the following options:
  11. Power Pack capable of full 16-Amp switching of all normal power lighting load types, with optional 0-10V dimming output capable of up to 100mA of sink current.
  12. Secondary Pack with UL924 listing for switching of full 16-Amp Emergency Power circuits, with optional 0-10V dimming output capable of up to 100mA of sink current.
  13. Power and Secondary Packs capable of full 20-Amp switching of general-purpose receptacle (plug-load) control.
  14. Secondary Pack capable of full 16-Amp switching of all normal power lighting load types.
  15. Secondary Pack capable of 5-Amps switching and dimming 120 VAC incandescent lighting loads or 120/277 VAC line voltage dimmable fluorescent ballasts (2-wire and 3-wire versions).
  16. Secondary Pack capable of 5-Amps switching and dimming of 120/277 VAC magnetic low voltage transformers.
  17. Secondary Pack capable of 4-Amps switching and dimming of 120 VAC electronic low voltage transformers.
  18. Secondary Pack capable of louver/damper motor control for skylights.
  19. Secondary Pack capable of providing a pulse on/pulse off signal for purposes of controlling shade systems via relay inputs.
  20. Secondary Pack capable of switching 1 amp at 40 VAC/VDC (resistive only) with the intent to provide relay signal to auxiliary system (e.g. BMS).
  21. Power Supply capable of providing auxiliary bus power (no switched or dimmed load).
- H. Wired Networked Relay and Dimming Panel
- a. 1. Relay and dimming panel shall be available with 4, 8, 12 or 16 individual Field Configurable Relays (FCR) per panel, with an equal number of individual 0-10V dimming outputs.
  - b.
  - c. 2. Standard relays used shall have the following required properties:
  - d.     Configurable in the field to operate with single-, double-, or triple-pole relay groupings.  
      Configurable in the field to operate with normally closed or normally open behavior.  
      Provides visual status of current state and manual override control of each relay.  
      Listed for the following minimum ratings:
    - 1) 40A @ 120-480VAC Ballast
    - 2) 16A @ 120-277VAC Electronic
    - 3) 20A @ 48VDC Resistive
    - 4) 2HP @ 120VAC,
    - 5) 3HP @ 240-277VAC
    - 6) 65kA SCCR @ 480VAC
  3. 0-10 dimming outputs shall support a minimum of 100mA sink current per output.
  4. Relay and dimming outputs shall be individually programmable to support all standard sequence of operations as defined in this specification.

5. Panel shall be UL924 listed for control of emergency lighting circuits.
  6. Panel shall power itself from an integrated 120-277VAC or 347VAC supply.
  7. Panel shall provide a configurable low-voltage sensor input with the following properties:
  8. Configurable to support any of the following input types:
  9. Panel shall provide a contact closure input that acts as a panel override to activate the normally configured state of all relays (i.e., normally open or normally closed) in the panel. This input is intended to provide an interface to alarm systems, fire panels, or BMS system to override the panel.
  10. Panel shall supply current limited low voltage power to other networked devices connected via low voltage network cable.
  11. Panel shall be available with NEMA 1 rated enclosure with the following properties:
  12. Panel shall be rated from 32-122 °F.
- I. Wired Networked Bluetooth® Low Energy Programming Device
1. Device shall be plenum rated and be inline wired, screw mountable.
  2. Communication and low voltage power shall be delivered to device via standard low voltage network cabling with RJ-45 connectors.
  3. Bluetooth Low Energy connection shall allow connection from smartphone application for programming device settings within the local daisy-chain zone (see list of available settings in section, 2.4-System Software Interfaces, Sub-section .5).
- J. Wired Networked Communication Bridge
1. Device shall surface mount to a standard 4” x 4” square junction box.
  2. Device shall have 8 RJ-45 ports for connection to lighting control zones (up to 128 devices per port), additional network bridges, and System Controller.
  3. Device shall be capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to System Controller.
  4. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply or powered via low voltage network connections from powered lighting control devices (e.g. power packs).
  5. Wired Bridge shall be capable of redistributing power from its local supply and connected lighting control zones with excess power to lighting control zones with insufficient local power. This architecture also enables loss of power to a particular area to be less impactful on network lighting control system.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION REQUIREMENTS**

- A. Installation Procedures and Verification
1. The successful bidder shall review all required installation and pre-startup procedures with the manufacturer’s representative through pre-construction meetings.
  2. The successful bidder shall install and connect the networked lighting control system components according to the manufacturer’s installation instructions, wiring diagrams, the project submittals and plans specifications.
  3. The successful bidder shall be responsible for testing of all lighting control low voltage network cable included in the bid. Bidder is responsible for verification of the following minimum parameters:
- B. Coordination with Owner’s IT Network Infrastructure
1. The successful bidder is required to coordinate with the owner’s representative to secure all required network connections to the owner’s IT network infrastructure.

- C. Provide labels for all devices. All devices to be labeled by Campus/ Building/Room/Type within program. Coordinate requirements with College.
- D. Documentation and Deliverables
  - 1. The installing contractor shall be responsible for documenting installed location of all networked devices, including networked luminaires. This includes responsibility to provide as-built plan drawing showing device address barcodes corresponding to locations of installed equipment.
  - 2. The installing contractor is also responsible for the following additional documentation to the manufacturer's representative if visualization / graphical floorplan software is provided as part of bid package.

### **3.2 SYSTEM STARTUP**

- A. Upon completion of installation by the installer, including completion of all required verification and documentation required by the manufacturer, the system shall be started up and programmed by an authorized representative of the manufacturer.
  - 1. Low voltage network cable testing shall be performed prior to system startup.
- B. System start-up and programming shall include:
  - 1. Verifying operational communication to all system devices.
  - 2. Programming the network devices into functional control zones to meet the required sequence of operation.
  - 3. Programming and verifying all sequence of operations.
  - 4. Customization of owner's software interfaces and applications.
- C. Initial start-up and programming is to occur on-site. Additional programming may occur on-site or remotely over the Internet as necessary.

### **3.3 PROJECT TURNOVER**

- A. System Documentation and as-builts.
  - 1. Submit software database file with desired device labels and notes completed.
- B. Owner Training
  - 1. Provisions for onsite training for owner and designated attendees to be included in submittal package. Training shall be a minimum of (1) day and shall be videotaped by the Contractor, and video provided to the Owner.
  - 2. Contractor shall include in their bid a second training to occur (6) months after occupancy of building by the Owner. The second training shall be a minimum of (4) hours.

**END OF SECTION 26 09 43**



**SECTION 26 24 16**

**PANELBOARDS**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

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

**1.02 SUMMARY**

- A. Section Includes:
  - 1. Distribution panelboards.
  - 2. Lighting and appliance branch-circuit panelboards.
- B. Related Sections include the following:
  - 1. Section 26 05 53 "Identification for Electrical Systems".
  - 2. Section 26 05 73 "Overcurrent Protective Device Coordination Study" for short-circuit rating of devices and for setting of overcurrent protective devices.

**1.03 DEFINITIONS**

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RMS: Root mean square.
- D. SPDT: Single pole, double throw
- E. SPD: Surge Protective Device

**1.04 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
  - 2. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the latest California Building Code (CBC).
  - 3. Square D; a brand of Schneider Electric

4. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
  5. Siemens Energy & Automation, Inc..
  6. Coordinate two paragraphs below with Drawings. See the "Disconnecting and Overcurrent Protective Devices" Article in the Evaluations for guidance on making selections.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Where indicated provide circuit breakers UL listed for application at 100% of their continuous ampere rating in their intended enclosure.
  2. Thermal-Magnetic Circuit Breakers (below 400A frame): Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Provide field adjustable magnetic trip setting for circuit-breakers serving motor loads or other special applications as indicated
  3. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  4. Electronic trip circuit breakers (400A frame size and larger) with rms sensing; field-replaceable rating plug or field-replaceable electronic trip; and the following field-adjustable settings:
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long- and short-time time adjustments.
    - d. Ground-fault pickup level, time delay, and I<sup>2</sup>t response.
    - e. CBs shall have an integral power supply installed at the factory if required for proper functioning of the breaker. An external power supply shall not be acceptable.
  5. Circuit breakers shall have a minimum interrupting rating of 10,000 amperes RMS symmetrical at 240 volts, and 14,000 amperes RMS symmetrical at 480 volts, unless otherwise noted on the drawings. Verify maximum available fault levels from the Short Circuit and Coordination Study. Minimum interrupting rating (AIC) shall be 110% of the available fault level.
  6. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
  7. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
  8. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
  9. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
  10. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
    - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    - d. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
    - e. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
    - f. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

- g. Circuit breaker handle locks shall be provided for all circuits that supply exit signs, emergency lights, energy management, and control system (EMCS) panels and fire alarm panels.

h. Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

i. Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
  - 1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."
  - 2. Fused Switch Features and Accessories: Standard ampere ratings and number of poles.
  - 3. Auxiliary Contacts: Two normally open and normally closed contact(s) that operate with switch handle operation.
- D. All panelboards shall have door-in-door type cover. Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

### 1.05 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

## PART 2 - EXECUTION

### 2.01 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NECA 407.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 2.02 INSTALLATION

- A. Install panelboards and accessories according to NECA 407.
- B. Equipment Mounting: Install panelboards on concrete bases, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
  - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.

2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
  3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  4. Install anchor bolts to elevations required for proper attachment to panelboards.
  5. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- D. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
- E. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated. Mounting height of Over Current Protective Devices shall be 6"7" above finished floor to the center of the grip of device operating handle unless a lower height is indicated or required by code.
- F. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- G. Install overcurrent protective devices and controllers not already factory installed.
1. Set field-adjustable, circuit-breaker trip ranges.
- H. Install filler plates in unused spaces.
- I. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.
- J. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- K. Comply with NECA 1.

### **2.03 IDENTIFICATION**

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."



## 2.04 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- E. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - 3. Perform the following infrared scan tests and inspections and prepare reports:
    - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
    - c. Instruments and Equipment:
      - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- F. Panelboards will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

## 2.05 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as indicated in Section 26 05 72 "Overcurrent Protective Device Coordination Study."
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

**2.06 PROTECTION**

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

## **GUIDELINE A GRAPHICAL USER INTERFACE REQUIREMENTS**

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### **INTRODUCTION**

#### **PURPOSE AND SCOPE**

This Guideline provides requirements for the graphical user interface (GUI) requirements associated with MCCCCD's IAS system. The intent of the requirements is to provide consistent and functional IAS graphics across all MCCCCD systems regardless of the controls system manufacturer or installation contractor selected for each project.

#### **BACKGROUND**

MCCCCD is standardized on a third party visualization software to serve as the primary user interface for the IAS network. The Graphical User Interface on the IAS network shall be provided in whole through DGLogik DGLux5 (aka Atrius Solution Builder) visualization software. All IAS Command and Control and functionality shall be provided within the DGLux environment. Embedded screen interfaces from other thin client applications are not acceptable.

#### **REQUIRED SUBMITTALS**

Guideline A - Specific Submittals:

- **Sample Graphic Screens:** the IAS Installation Contractor shall submit sample graphic screens within 120 days of project notice to proceed for District and A/E review. The following graphic screens shall be provided:
  - Proposed equipment pages for each unique HVAC system in the project
  - A proposed sample HVAC floor plan including a project specific three-dimensional floor plan rendering.
  - The proposed facility homepage including the building three-dimensional rendering
  - The proposed facility energy dashboard and energy history page
  - The proposed facility fault detection and diagnostics overview page

### **GRAPHIC INTERFACE REQUIREMENTS - GENERAL**

#### **GENERAL**

The IAS Installation Contractor shall configure the project graphics to adhere to the specific requirements described in the following sections of this Guideline. Each graphic developed by the contractor shall include all control points, devices and user adjustable set points/parameters associated with the system. Vendor names, logos, hyperlinks to a vendor website, or other vendor identification or promotion, are not permitted on the graphics other than a reference to the graphics producer as described in the Graphics Page Header section below. Graphics shall be built using MiraCosta's available graphic library wherever available to match existing graphics to the extent possible. Each graphic page shall be submitted for review and requires approval by MCCCCD and Design Team. Any exceptions or additions to the graphic requirements shall be reviewed and approved by the MCCCCD Project Manager.

**GRAPHICS PAGE MENU**

- The navigation tree shall be present on all graphics pages and allow the user to easily navigate the graphical user interface.
- The tree shall categorize all graphics pages into categories based on location or equipment type and directly link the user to the desired graphics page.



Specific Requirements:

- The navigation tree shown is existing and shall be modified to include all new graphics pages required.
- The modifications to the navigation tree shall include links to the modified or added pages in the same format as the sample shown.
- The additional pages shall be organized within the existing navigation tree to match the existing navigation tree structure. Each page shall be organized as follows:

Campus → Building → Floor → Equipment/Graphic Name.

**BUILDING OR CAMPUS HOME PAGE**

- The Campus Home page includes an enlarged view of the campus. The IAS contractor shall modify the graphic and include any building and landscape additions/modifications. The current AutoCAD 3DS graphics file shall be made available for modification for project involving new buildings, building renovations, or building additions.
- A sample building / campus home page graphic is shown below:



Specific Requirements:

- 1) A mouse-over on any building shall highlight the building and display the building name. Clicking on the selected building name shall navigate the user to the floor plan display of the building.



## GRAPHICAL INTERFACE REQUIREMENTS- FLOOR PLANS

### FLOOR PLAN HVAC GRAPHICS

- Individual floor plan pages shall include a custom three-dimensional graphic of the individual floor displaying doorways, shading, and room names. The floor plans shall be rendered by the IAS Installation Contractor to the detail shown below using Autodesk 3ds Max 3D rendering software, or equivalent.
- Each enlarged floor plan shall display color overlays to indicate individual HVAC zones.
- Display dynamic gradient coloring/shading of each zone based on a user selected variable. At a minimum, provide the following variable display choices:
  - “Temperature” – Display zone temperature (Deg F)
  - “Setpoint Deviation” – Display zone temperature deviation from setpoint (Deg F)
  - “Heat/Cool Demand” – Display the zone % heating/cooling command (%)
  - “Discharge” – Display the zone current discharge air temperature (Deg F)
- Provide a Playback button to display a video of historic conditions for the selected variable in display.
- A sample floor plan section HVAC graphic page shown below:



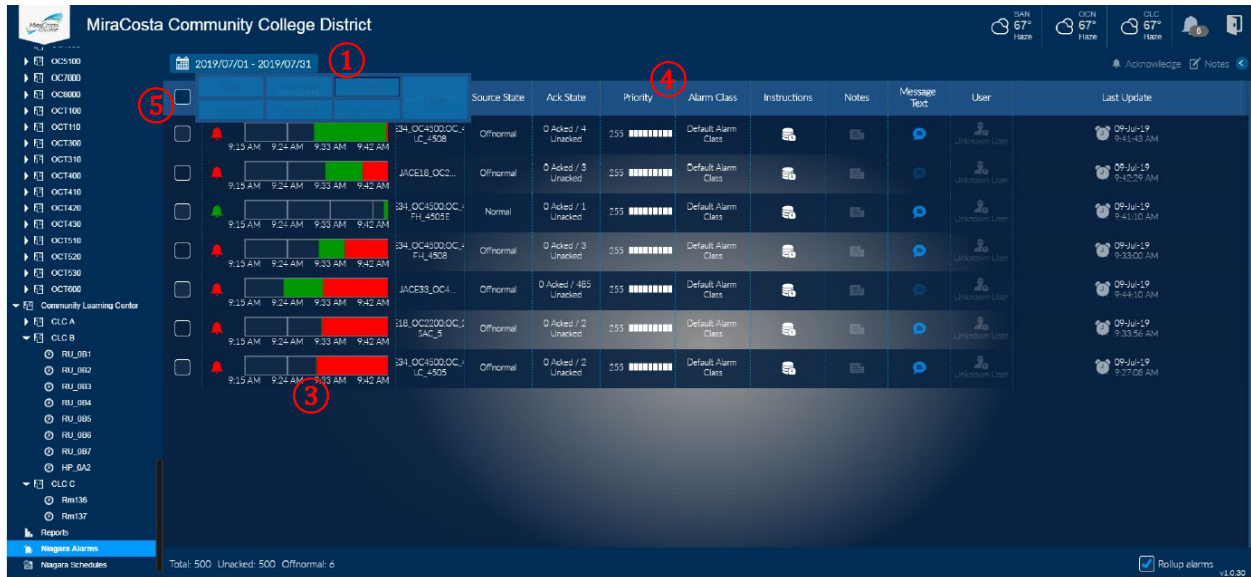
#### Specific Requirements:

- 1) User drop down selection for color gradient variable
- 2) On mouse-over, a pop up window shall display zone name, space temperature and setpoint. Clicking on a zone shall navigate the user to the HVAC graphic of the system serving the zone.
- 3) Provide room names and numbers within the floor plans.
- 4) Provide a playback feature which shows a video of historic data points over a user selected time period.

## GRAPHICAL INTERFACE REQUIREMENTS – SUPPORT PAGES

### ALARM MANAGEMNET GRAPHICS PAGE

- At minimum each individual building shall contain an Alarm Page (all alarms) in the existing alarm console.
- A sample alarm management graphic page is shown below:

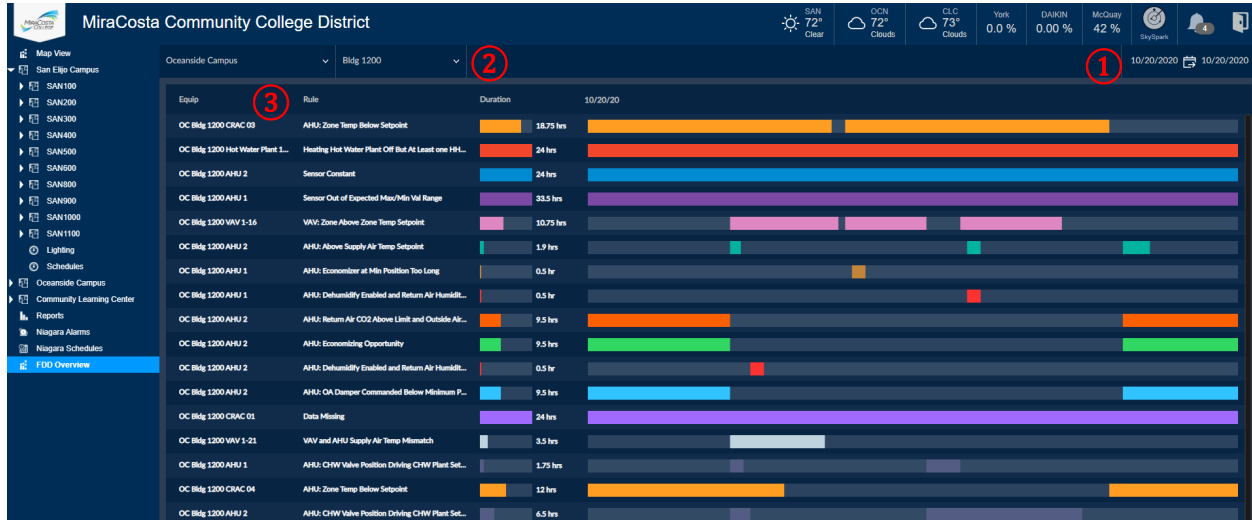


#### Specific Requirements:

- Provide user selection for the date range of alarms to display.
- Provide alarm filters. At a minimum, allow the user to filter alarms by Alarm Class, Priority, State, and Acknowledged State.
- Provide a graph timeline of the alarm status within the selected timeframe.
- Provide alarm details including alarm state, message, priority, user, user notes, and ack status.
- Provide selections to allow the user to perform acknowledgement of multiple alarms by category or filtered view.

**FAULT DETECTION AND DIAGNOSTIC GRAPHIC OVERVIEW**

- Each individual building shall be added to the campus Fault Detection and Diagnostic Overview Page.
- The campus fault detection and diagnostic graphic page is shown below:



Specific Requirements:

- 1) Data selection time range.
- 2) Provide selection of building and campus
- 3) Provide active faults with associated, timeframes, and messages, duration, and graphic display of duration

**ENERGY DASHBOARD PAGE**

- At minimum, each individual building shall contain an Energy Dashboard Page.
- A sample energy dashboard graphic page is shown below:

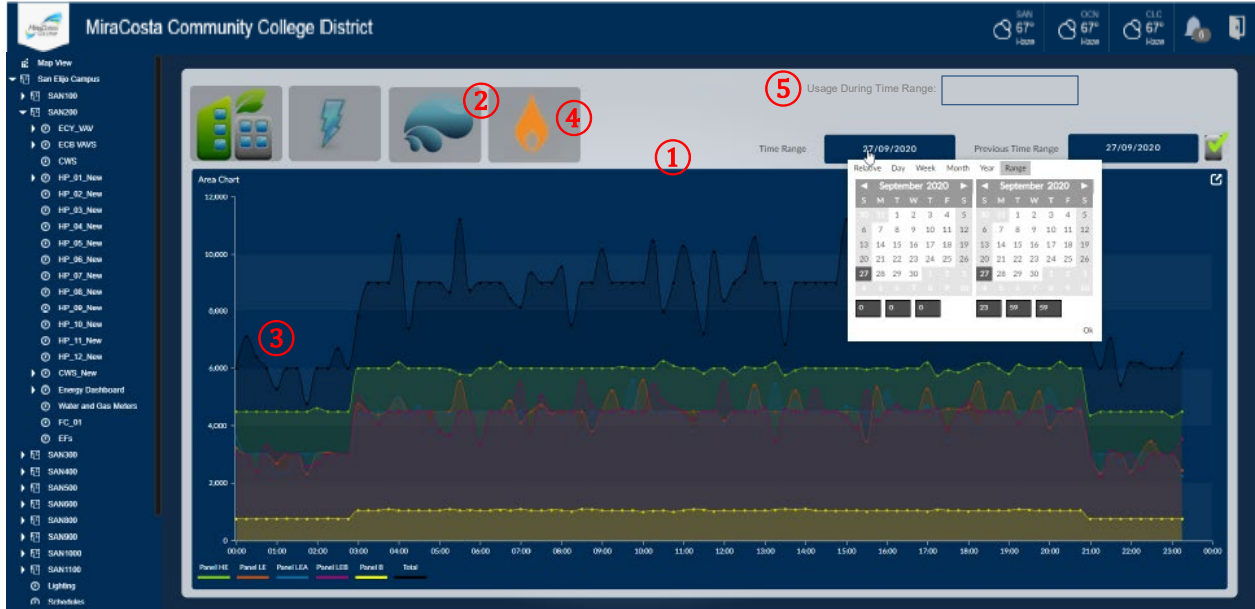


Specific Requirements:

- 1) Building Instantaneous Energy Demand: Provide building energy demand in kBTU/hr based on the addition of electricity and natural gas meters.
- 2) Instantaneous Utility Demands: Provide whole buildings electrical usage (kW), natural gas usage (kBTU/hr), and domestic water usage (Gallons/min).
- 3) Instantaneous Energy Demand Profile: Provide a pie-chart of electrical and natural gas demands normalized into kBTU/hr.
- 4) Provide building total, electrical, natural gas, and domestic water intensities based on last 12-month consumption data.

**ENERGY HISTORY PAGE**

- At minimum, each individual building shall contain an Energy History Page.
- A sample energy history graphic page is shown below:



Specific Requirements:

- 1) Time Range: Data selection time range to allow the user to view historical consumption of each utility.
- 2) Utility Selection: Provide selection of desired utility to display whole building, electricity, natural gas, and water usage.
- 3) Electrical Submeters: Provide a stacked area graph view which shows the contribution of each electrical submeter to the whole.
- 4) Water Submeters: If project includes cooling tower or fluid cooler water metering, display both domestic and HVAC water usage. Calculate domestic and HVAC usage from whole building usage.
- 5) Usage Totalization: Display the total usage of the selected utility within the selected time frame for units, display kWh for electrical, therms for natural gas, and gallons for water.



**GRAPHICAL INTERFACE REQUIREMENTS - SYSTEMS**

**AIR HANDLING UNIT (AHU)**

AHU graphic shall have the following common features and displays.



Specific Requirements:

- 1) Indicate the HVAC system name.
- 2) Label all points according to the IAS drawing object name abbreviation. On mouse-over, the point's written English object description shall pop-up.
- 3) Provide user selection for views of each HVAC system's trend views.
- 4) Provide a playback feature which shows a video of historic data points over a user selected time period.

**VARIABLE AIR VOLUME SYSTEM**

VAV Unit graphic shall have the following common features and displays.

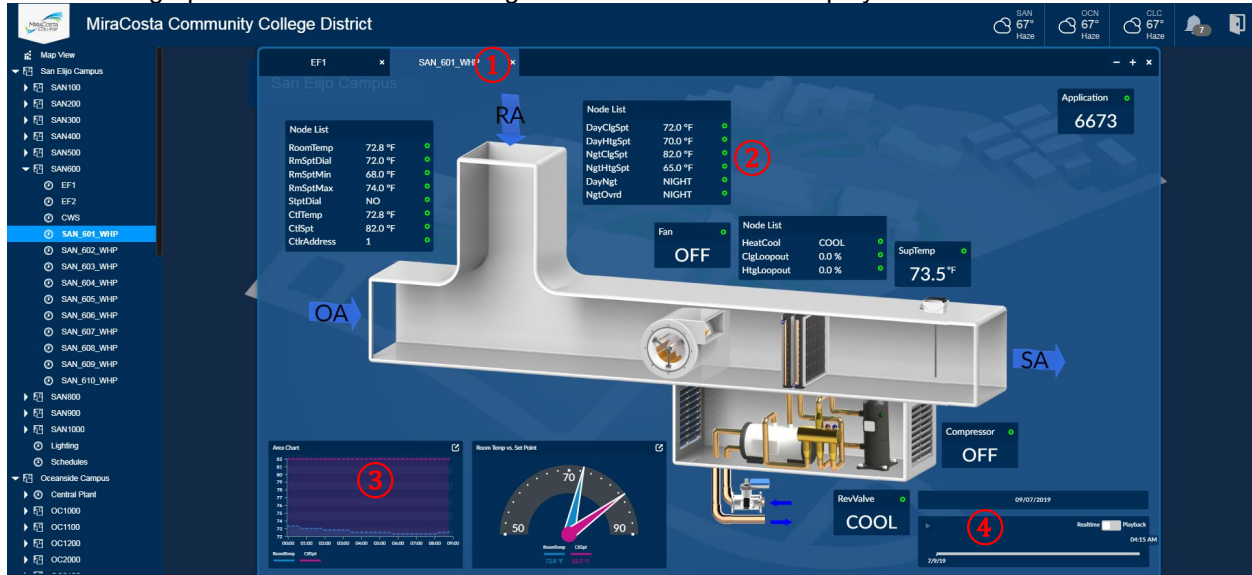


Specific Requirements:

- 1) Indicate the VAV Unit name. The name shall contain the AHU name followed by the VAV Unit name.
- 2) Label all points according to the IAS drawing object name abbreviation. On mouse-over, the point's written English object description shall pop-up.
- 3) Provide user selection for views of each HVAC system's trend views.
- 4) Provide a playback feature which shows a video of historic data points over a user selected time period.

**WATER SOURCE HEAT PUMP (WSHP)**

WSHP Unit graphic shall have the following common features and displays.



Specific Requirements:

- 1) Indicate the WSHP Unit name.
- 2) Label all points according to the IAS drawing object name abbreviation. On mouse-over, the point's written English object description shall pop-up.
- 3) Provide user selection for views of each HVAC system's trend views.
- 4) Provide a playback feature which shows a video of historic data points over a user selected time period.

**HEATING HOT WATER PLANTS**

Heating Hot Water Plant graphic shall have the following common features and displays.



Specific Requirements:

- 1) Label all points according to the IAS drawing object name abbreviation. On mouse-over, the point's written English object description shall pop-up.
- 2) Display a chart of Heating Hot Water Supply temperature vs Time period.
- 3) Provide a playback feature which shows a video of historic data points over a user selected time period.

## **GUIDELINE B – IAS POINT TAGGING REQUIREMENTS**

### **1.0 GENERAL**

#### **1.1 PURPOSE AND SCOPE**

This Guideline provides requirements for data modeling of building systems and equipment based on the Project Haystack open source data modeling standard. The purpose is to provide a consistent, standardized methodology for describing data points associated with DDC automation systems and their associated descriptive information known as metadata or data semantics. The intent of this Point Tagging Guideline is to build the DDC database of points and tags in a common vocabulary that can be interpreted automatically by a variety of software and web based applications. The District's goals are as follows:

- To enable owners, operators, and service providers to more efficiently derive value from the vast amounts of data the DDC systems are collecting and
- To eliminate the need for manual mapping of points from one application to another over the lifetime of the DDC network.

#### **1.2 BACKGROUND**

Modern automation systems and smart devices have made it easy to collect significant quantities of data including environmental conditions, equipment operational status, and energy usage and performance. This data typically exists in unstructured formats without standard or consistent organization, making it difficult for anyone but the service technician to interpret trends, perform analysis, or identify potential faults without significant manual effort.

The first step to turning smart device data into actionable intelligence is to give the data context to define exactly what each piece of data means and how fits into an overall system. This requires descriptions of each point's type, units, associated system type, equipment parent/child relationship, controller and network information, and physical locations. In today's complex systems, it is not possible to capture the full extent of descriptive information desired simply using data point names, even if standardized. point names that attempted to capture this range of information would be impossibly long, therefore structured combinations are needed.

In order to capture the semantic data required for automatic software point recognition, DDC network data shall be configured using all applicable Project Haystack tag definitions available at the time of installation. Project Haystack is an open source, community-driven initiative modeled on the open source specifications found in the software and IT industry. There is future work to integrate Haystack tags with BACnet XD extended data. Project Haystack encompasses the following elements:

- A data modeling methodology
- A library of published tagging libraries
- A REST communication protocol designed to exchange Haystack tags between applications.
- An assortment of complementary software applications developed by various Haystack community members including:
  - Haystack Java Toolkit
  - Niagara NHaystack Module
  - Haystack CPP
  - Haystack Dart Client Library
  - NodeHaystack

#### **1.3 APPLICABLE POLICIES, STANDARDS, AND PROCEDURES**

Project Haystack  
*Guide Specification for Data Modeling of Building Systems and Equipment*  
Version 2013-10-1  
Project Haystack  
Academic Free License 3.0 - Version 3.0.2 (16-Jan-2017)



### 2.0 TECHNICAL OVERVIEW

#### 2.1 TAGS

The Project Haystack data modeling standard for Buildings and Equipment systems shall use a simple metamodel based on the concept of “tags” as described below.

**Tags:** Tags are name/value pairs, associated with entities like air handling units, electric meters, etc. Tags are simple and dynamic, add structure, and provide the flexibility needed to establish standardized models of diverse systems and equipment. Tags are a modeling technique that allows easy customization of data models on a per-task, per-project or per-equipment basis, while retaining the ability to be interpreted by external applications using a standard, defined methodology and vocabulary. Tags shall support the definition of the following essential data elements:

- **Entity:** An Entity is an abstraction for a physical object in the real world. Entities include sites, facilities, equipment, sensor points, weather stations, etc. In software systems, an entity might be modeled as a record in a database, an object in a building automation system, or a row in a csv file or spreadsheet.
- **Id:** The id tag is used to model the unique identifier of an entity in a system using a Ref value type. For the DDC network, the id tag shall be the unique DDC point name as defined in Guideline 9. This identifier may be used by other entities to cross-reference entities, associations, and systems.
- **Dis:** The dis tag is used with entities to define display text used to describe an entity. Dis values are intended to be short (less than 30 or 40 characters), but fully descriptive of the entity for a human user. For the DDC network, the dis tag shall be identical to the point description on the DDC Points List.

**Tag Kinds**– The Project Haystack standard provides the following permitted tag value types:

- **Marker:** this tag type is merely a marker annotation with no meaningful value. Marker tags are used to indicate a "type" or "is-a" relationship.
- **Bool:** boolean "true" or "false".
- **Number:** integer or floating point number annotated with a Unit of Measurement, where units of measure are prescribed for various tasks.
- **Str:** a string of Unicode characters.
- **Uri:** a Universal Resource Identifier.
- **Ref:** reference to another entity. The Project Haystack specification does not currently prescribe specific identities or reference mechanisms, but shall be used to cross link entities. Refs are formatted with a leading "@" and require a specific subset of ASCII characters be used: a-z, A-Z, 0-9, underbar, colon, dash, or dot.
- **Bin:** a binary blob with a MIME type formatted as Bin(text/plain)
- **Date:** an ISO 8601 date as year, month, day: 2011-06-07.
- **Time:** an ISO 8601 time as hour, minute, seconds: 09:51:27.354.
- **DateTime:** an ISO 8601 timestamp followed by timezone name:
  - 2011-06-07T09:51:27-04:00 New\_York
  - 2012-09-29T14:56:18.277Z UTC

**Tag Database** – The Project Haystack standard continuously updates and incorporates new tags into its database. The DDC Installation Contractor shall download the Project Haystack Tags Database at the beginning of each project to ensure that the most up to date relevant tags are incorporated within the project. The Tags Database can be downloaded in the Project Haystack Download page in the following link:

[Project-haystack.org/download](http://Project-haystack.org/download)

#### 2.2 DDC NIAGARA MODULES

The Project Haystack Community has developed, and makes available, a comprehensive implementation of the Haystack protocol in the form of a software module for use with Niagara-based systems. The

module, known as NHaystack, is licensed under the Academic Free License ("AFL") v. 3.0. Public access to the NHaystack software module is maintained via the project-haystack.org site.

The NHaystack module shall be the preferred method of communication between the Niagara-based devices and other software applications that are consuming Niagara data or writing commands back to Niagara-based systems.

### 3.0 MINIMUM MODEL REQUIREMENTS

#### 3.1 TAGGING REQUIREMENTS OVERVIEW

The goal of the Project Haystack data modeling standard is to ensure consistent modeling of building systems, devices and associated data. The following DDC application requirements outline the use of the modeling standard in applications related to buildings, energy, and facility management.

The tags identified in Section 3 shall be applied to all integrated system types in MiraCosta's DDC network.

#### 3.2 POINT TAGGING

Including standardized associations with sites and equipment via id reference, units of measure as a minimum. Where possible, ranges of acceptable values are required.

Points are typically a digital or analog sensor or actuator entity (*hard-wired points*). Points can also represent a configuration value such as a setpoint or schedule log (*virtual or network points*). Point entities are tagged with the point tag.

##### Point Kinds:

All points shall be classified as Bool, Number, or Str using the kind tag:

- **Bool:** model digital points as true/false. Bool points may also define an enum tag for the text to use for the true/false states
- **Number:** model analog points such as temperature or pressure. These points shall also include the unit to indicate the point's unit of measurement.
- **Str: models:** an enumerated point with a mode such as "Off, Slow, Fast". Enumerated points shall also define an enum tag.

##### Point Min/Max:

The following tags shall be used to define a minimum and/or maximum for the point:

- **minVal:** minimum point value
- **maxVal:** maximum point value

When these tags are applied to a sensor point, they model the range of values the sensor can read and report. Values outside of these range shall indicate a fault condition in the sensor.

When these tags are applied to a cmd or sp, they model the range of valid user inputs when commanding the point.

##### Point Cur:

The term *cur* indicates synchronization of a point's current real-time value. This typically indicates refresh rates within the order of a few seconds. If a point supports a current or live real-time value then it shall be tagged with cur tag.

The following tags are used to model the current value and status:

- **curVal:** current value of the point as Number, Bool, or Str

## GUIDELINE B – IAS POINT TAGGING REQUIREMENTS

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- **curStatus:** ok, down, fault, disabled, or unknown
- **curErr:** error message if curStatus indicated error

### Point Write

Writable points are points which model an output or setpoint and may be commanded. Writable points are modeled on the BACnet 16-level priority array with a relinquish default which effectively acts as level 17. Writable points which may be commanded by the pointWrite operation shall be tagged with the writable tag.

The following levels have special behavior:

- **Level 1:** highest priority reserved for emergency overrides
- **Level 8:** manual override with ability to set timer to expire back to auto
- **Default:** implicitly acts as level 17 for relinquish default

Refer to Guideline 3 – HVAC Control BACnet Field Level Network Guidelines, Section 4.4 Command Priorities for details on BACnet priority levels.

The priority array provides for contention resolution when many different control applications may be vying for control of a given point. Low level applications like scheduling typically control levels 14, 15, or 16. Then users can override at level 8. But at higher levels like 2 to 7 can be used to trump a user override (for example a demand response energy routine that requires higher priority).

The actual value to write is resolved by starting at level 1 and working down to relinquish default to find the first non-null value. It is possible for all levels to be null, in which case the overall write output is null (which in turn may be auto/null to another system). Anytime a null value is written to a priority level, the level has been set to auto or released (this allows the next highest level to take command of the output).

The following tags are used to model the writable state of a point:

- **writeVal:** this is the current "winning" value of the priority array, or if this tag is missing then the winning value is null
- **writeLevel:** number from 1 to 17 indicate the winning priority array level
- **writeStatus:** status of the server's ability to write the last value to the output device: ok, disabled, down, fault.
- **writeErr:** indicates the error message if writeStatus is error condition

### Point His

If a point is *historized* this means that it has a time-series sampling of the point's value over a time range. Historized points are sometimes called *logged* or *trended* points. Historized points shall be tagged with the his tag.

If a point implements the his tag, then it shall also implement these tags:

- **tz:** all historized points must define this tag with their timezone name (must match the point's site timezone)
- **hisInterpolate:** optionally defined to indicate whether the point is logged by interval of change-of-value
- **hisTotalized:** optionally defined to indicate a point is collected an ongoing accumulated value

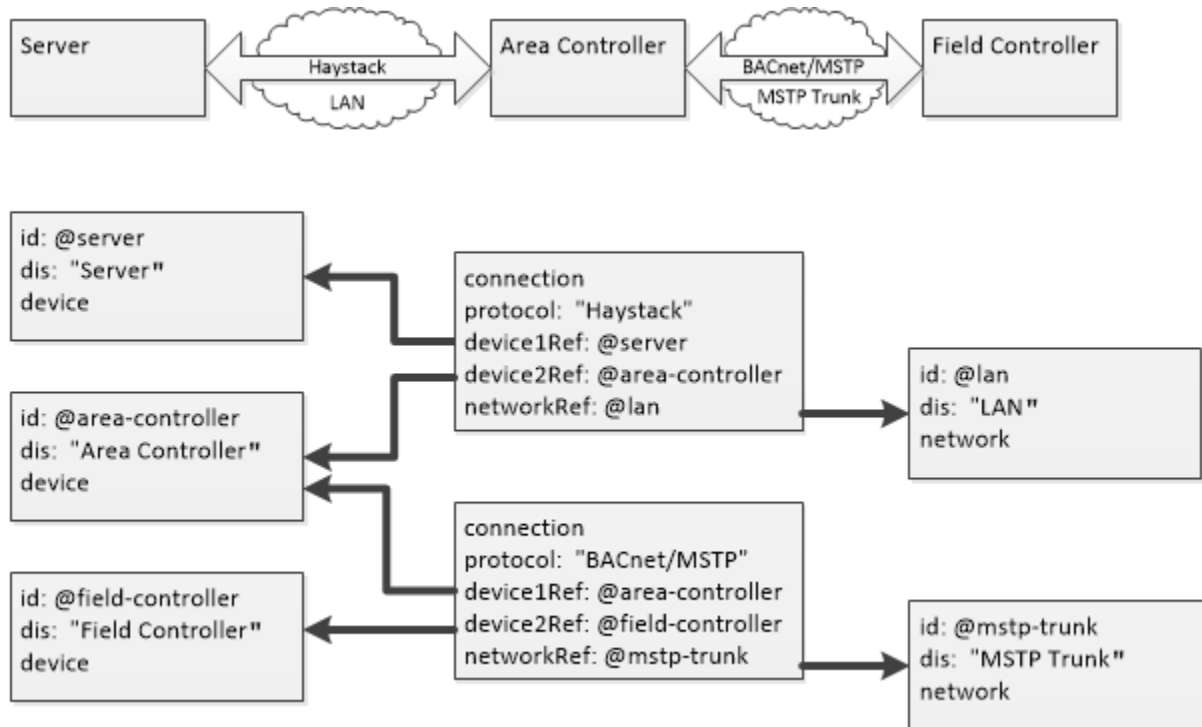
The current status of historization shall be modeled with:

- **hisStatus:** ok, down, fault, disabled, pending, syncing, unknown
- **hisErr:** error message if hisStatus indicated error

## 3.3 NETWORK TAGGING

The following diagram illustrates how devices, networks, and communication connections between devices are modeled:

## GUIDELINE B – IAS POINT TAGGING REQUIREMENTS



### Devices

The device tag models a physical device. Devices include servers, area controllers, field controllers, etc.

### Networks

The network tag models a network. Networks tags shall be used to setup logical connections between devices.

### Connections

Device-to-device communication shall be modeled using a connection with the following tags:

- **connection:** marker tag
- **protocol:** string enumeration communications protocol
- **device1Ref:** first device end point
- **device2Ref:** second device end point
- **networkRef:** network used for the communication

If a device sits "higher" in the network architecture, then it shall be tagged with device1Ref. For example, given a connection between a server and area controller, then the server shall be device1Ref and the area controller shall be device2Ref.

### 3.4 EQUIPMENT TAGGING

Equipment is modeled using the equip tag. Equipment is often a physical asset such as an AHU, boiler, or chiller. However, equip can also be used to model a logical grouping such as a chiller plant.

All equipment shall be associated within a single site using the siteRef tag. In turn, equipment will often contain points which are associated with the equipment via the equipRef tag.

Here is an example of an AHU equipment entity:

```
id: @MCCCD.ahuG11A1B  
dis: "MCCCD AHU-G1 1A/1B"
```

## GUIDELINE B – IAS POINT TAGGING REQUIREMENTS

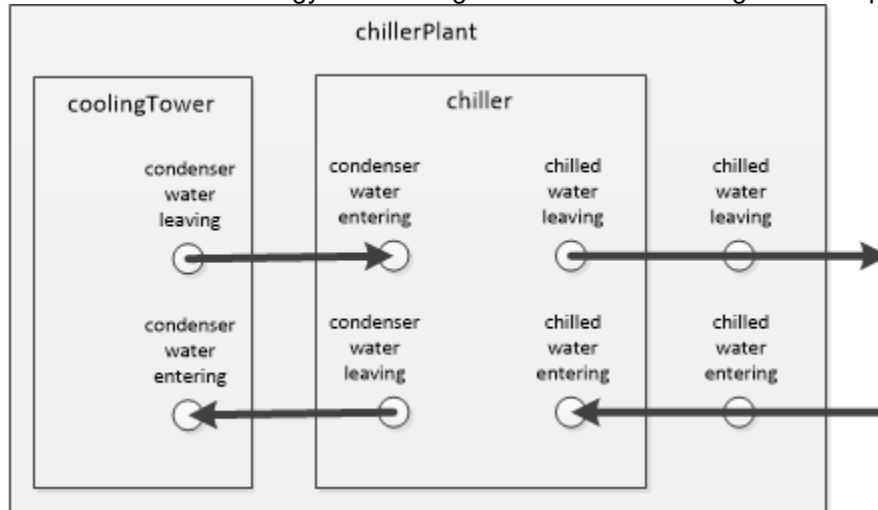
*equip*  
*siteRef: @MCCCD.BLDG1*  
*ahu*

The equipRef tag can optionally be used on equip entities to model nested equipment and containment relationships.

### Chiller Plants

A chiller plant is composed of multiple pieces of equipment used to generate chilled water. The entire plant is modeled as an equip with its own plant-level points. Sub-equipment such as chillers and cooling towers are also modeled as equip contained by the plant via the equipRef tag.

The follow diagram shows the terminology used for logical flow of water through a chiller plant:



Note that the terminology for sensors/setpoints are based on the perspective of the equipment. The condenser water *leaving* the chiller, is the condenser water *entering* the cooling tower.

Model the entire plant using the chillerPlant tag. The plant is modeled as an equip and it will define its own plant level points:

Chilled water to/from AHUs

- chilled water leaving temp sensor
- chilled water leaving temp sp
- chilled water leaving flow sensor
- chilled water leaving pressure sensor
- chilled water entering temp sensor
- chilled water entering flow sensor
- chilled water entering pressure sensor
- chilled water delta temp sensor
- chilled water delta flow sensor
- chilled water delta pressure sensor
- chilled water delta pressure sp
- chilled water bypass valve cmd

Condenser water between Chillers/Cooling Towers

- condenser water delta pressure sensor
- condenser water bypass valve cmd

Note: not every combination of sp is listed, just most common setpoints.

Also define the following tags for pipework and its associated equip and points:

- **primaryLoop**: pipework within the chiller plant
- **secondaryLoop**: pipework from the chiller plant to the building



## **GUIDELINE B – IAS POINT TAGGING REQUIREMENTS**

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### **Chillers**

Chiller equipments are marked with the chiller tag. Equip level tags:

- equipRef must reference parent chillerPlant if associated with a plant
- waterCooled or airCooled
- absorption or if vapor compression: reciprocal, screw, or centrifugal
- coolingCapacity

Points associated with chiller equip:

Run/Status

- run cmd
- run sensor
- enable cmd
- load cmd
- load sensor
- efficiency sensor
- power sensor
- energy sensor

Chilled water to/from AHUs

- chilled water leaving temp sensor
- chilled water leaving temp sp
- chilled water leaving flow sensor
- chilled water leaving pressure sensor
- chilled water entering temp sensor
- chilled water entering flow sensor
- chilled water entering pressure sensor
- chilled water delta temp sensor
- chilled water delta flow sensor
- chilled water delta pressure sensor
- chilled water valve isolation cmd

Condenser water to/from cooling towers

- condenser water leaving temp sensor
- condenser water leaving flow sensor
- condenser water leaving pressure sensor
- condenser water entering temp sensor
- condenser water entering pressure sensor
- condenser water entering flow sensor
- condenser water valve isolation cmd

Misc Internal

- condenser cmd
- condenser refig temp sensor
- condenser refig pressure sensor
- evaporator refig temp sensor
- evaporator refig pressure sensor

Note: not every combination of sp is listed, just most common setpoints. Chillers share the same point modeling conventions as VFDs. Chillers which measure energy shall model their points using the same conventions as elec meters or thermal meters.

### **Cooling Towers**

Cooling towers equipments are marked with the coolingTower tag. Equip level tags:

## **GUIDELINE B – IAS POINT TAGGING REQUIREMENTS**

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- equipRef must reference parent chillerPlant if associated with a plant
- openLoop or closedLoop

Points associated with cooling tower equip:

- condenser water leaving temp sensor
- condenser water leaving temp sp
- condenser water leaving flow sensor
- condenser water leaving pressure sensor
- condenser water entering temp sensor
- condenser water entering pressure sensor
- condenser water entering flow sensor
- fan cmd
- fan sensor

### **Heat Exchangers**

Heat exchangers are tagged with heatExchanger. Equip level tags:

- equipRef must reference parent chillerPlant if associated with a plant
- Points associated with heat exchanger equip:

- chilled water leaving temp sensor
- chilled water entering temp sensor
- condenser water leaving temp sensor
- condenser water entering flow sensor

### **Boilers**

Boiler

- The boiler tag is used model boiler assets.

Boiler Plant

- The boilerPlant tag is used to group one more boilers.

### **Air Handling Units**

Overview

The ahu tag is used model air handling equipment designed to heat or cool air. In Project Haystack, packaged rooftop units are considered a special class of AHU. Packaged units use the ahu tag, but shall also specify the rooftop tag:

Ahu	//any type of air handler unit (built-up or RTU)
Ahu and rooftop	//only packaged rooftop units (RTU's)
Ahu and not rooftop	// only built-up custom AHU's

Tags

AHUs shall always be marked as ahu and equip. The following tags are also used:

- **hvac**: always specified to mark as an HVAC asset
- **rooftop**: if the AHU is a packaged rooftop unit (RTU)
- **boilerPlantRef**: to associate the AHU with the boiler plant supplying its hot water or steam
- **chillerPlantRef**: to associate the AHU with the chiller plant supplying its chilled water

Heating and Cooling Method

AHUs shall define their heating method using one of the following tags:

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- elecHeat
- hotWaterHeat
- steamHeat
- gasHeat

Cooling method shall be defined using one of the following tags:

- chilledWaterCool
- dxCool

### Constant vs Variable Volume

An AHU shall be tagged as either constantVolume or variableVolume based on its ability to adjust the volume of air flow. Typically this distinction is based on whether the AHU's fan is single speed or a VFD.

### Zone Delivery

The following tags define the system used to deliver air to the zones:

- **directZone:** AHU supplies air directly to the zone
- **vavZone:** AHU supplies air to VAV terminal units
- **chilledBeamZone:** AHU supplies air to chilled beam terminal units
- **multiZone:** air is split into a duct per zone

A Variable Volume Temperature or VVT system is defined as a constant volume AHU with VAV terminal units. This is indicated by the presence of both the constantVolume and vavZone tags.

### Ductwork

In multi-duct systems, the AHU discharges into multiple ducts for simultaneous cooling, heating, or neutral air:

- **singleDuct:** AHU uses a single duct
- **dualDuct:** the AHU discharges to two ducts which is some combination of hotDeck, coldDeck, or neutralDeck
- **tripleDuct:** the AHU discharges into three ducts which are the hotDeck, coldDeck, and neutralDeck

### Sections

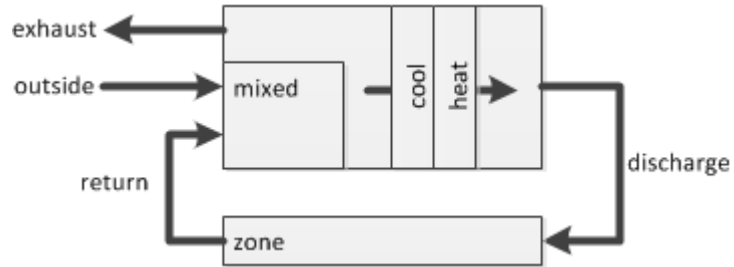
Most points in an AHU are associated with one of the following sections of the unit:

- **discharge:** air exiting the unit to be supplied to the zones/terminal units
- **return:** air returning from the zone back into the unit
- **outside:** fresh, outside air entering the unit for air quality and economizing
- **exhaust:** air exiting the unit back outside
- **mixed:** return and outside air mixed together before passing through the heating/cooling elements
- **cool:** cooling elements/coils
- **heat:** heating elements/coils
- **zone:** conditioned space associated with the unit

The follow diagram shows the logical flow of air through an AHU:

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### Points

The following lists points commonly used with an AHU:

#### Discharge

- discharge air temp sensor
- discharge air humidity sensor
- discharge air pressure sensor
- discharge air flow sensor
- discharge air fan cmd
- discharge air fan sensor

#### Return

- return air temp sensor
- return air humidity sensor
- return air pressure sensor
- return air flow sensor
- return air co2 sensor
- return air fan cmd
- return air damper cmd

#### Mixed

- mixed air temp sensor

#### Outside

- outside air temp sensor
- outside air humidity sensor
- outside air pressure sensor
- outside air flow sensor
- outside air flow sp
- outside air damper cmd

#### Exhaust

- exhaust air fan cmd
- exhaust air damper cmd

#### Conditioning

- cool stage cmd
- heat stage cmd
- humidifier cmd
- filter sensor

### **VAV terminal air units**

The vav tag is used to model variable air volume assets. VAVs shall always be marked as equip.

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### Tags

VAVs shall be classified with the following type tags:

- coolOnly
- series fanPowered elecReheat
- series fanPowered hotWaterReheat
- parallel fanPowered elecReheat
- parallel fanPowered hotWaterReheat

The additional equip level tags are defined for VAVs:

- **hvac**: always specified to mark as an HVAC asset
- singleDuct or dualDuct: ductwork configuration
- **ahuRef**: supply AHU
- **chillerPlantRef**: plant supplying chilled water if applicable
- **boilerPlantRef**: plant supplying hot water if applicable
- pressureDependent or pressureIndependent: control based on duct static pressure

### Sections

We associate points with sections of a VAV using these tags:

- **entering**: air entering the unit from the AHU
- **discharge**: air exiting the unit to be supplied to the zones
- **zone**: conditioned space associated with the unit

### Points

VAVs points include zone points:

- zone air temp sensor
- zone air temp effective sp
- zone air temp occ cooling sp
- zone air temp occ heating sp
- zone air temp unocc cooling sp
- zone air temp unocc heating sp
- zone air temp standby cooling sp
- zone air temp standby heating sp
- zone air humidity sensor
- zone air co2 sensor
- zone air co2 sp

Other standardized points:

- discharge air temp sensor
- discharge air pressure sensor
- discharge air flow sensor
- discharge air flow effective sp
- discharge air flow min sp
- discharge air flow max sp
- discharge air flow reheating max sp
- discharge air flow standby sp
- discharge air fan cmd
- discharge air fan sensor
- discharge air damper cmd
- entering air temp sensor
- reheat cmd



## **GUIDELINE B – IAS POINT TAGGING REQUIREMENTS**

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- vavMode sp
- ductArea sp

### **Fan Coil Units**

The fcu tag is used to model fan coil units. Fan coils are unitary equipment which use zone itself for supply air.

FCUs shall define their cooling/heating method using AHU conventions.

FCUs shall following model of AHU points

### **Units Ventilators**

The uv tag is used to model unit ventilators. Unit ventilators differ from FCUs in that they have direct access to outside air.

UVs shall define their cooling/heating method using AHU conventions.

UVs shall following model of AHU points

### **Heat Pumps**

The heatPump tag is used to model heat pumps.

### **Variable Frequency Drives**

The standardized points for VFDs are:

- run cmd
- run sensor
- enable cmd
- speed cmd
- freq cmd

The primary on/off point of equipment is always modeled with the run tag. Paired with cmd it models the on/off command point; paired with sensor it models the run status point. Many VFDs also include a secondary enable point which requires both run and enable to be commanded to true in order for the equipment to be on.

Speed of the VFD is commanded separately via the speed or freq point. Use of these points require that the equipment has already been commanded on.

Many VFDs will also provide many of the same points as an electric meter. Measurements such as electric demand, consumption, voltage, and current shall follow the same conventions as elec meters:

- power sensor
- energy sensor
- current sensor
- current phase sensor
- volt sensor
- volt phase sensor
- pf sensor
- pf phase sensor
- freq sensor

### **Pumps**

Pumps are required to be modeled as equip entities with the pump tag. If the pump motor is a VFD then it shall also define the vfd tag and model its points using the standard VFD conventions discussed above. Simple non-VFD pumps shall model their on/off state via a run point.

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### **Fans**

Fans may optionally be defined as either an equip or a point. If the fan motor is a VFD then it is recommended to make the fan a sub-equip. However in many cases a simple fan in a terminal unit such as a vav is better modeled as a point.

#### Fan Points

In simple cases where the fan is just a command and/or feedback sensor then it is best to model it as a point.

If annotated as an output with the cmd tag, then the point models the command status of the fan:

false (off) or true (on)

variable speed then it is 0% (off) to 100% (full speed)

If annotated as an input with the sensor tag, then the point models a sensor used to verify if the fan status:

false indicated no air flow (off) or true indicates successful airflow (fan is on)

if numeric the point is differential pressure across the fan measured in "inH<sub>2</sub>O" or "kPa"

### **3.5 SITE TAGGING**

#### **Zones**

The zone tag is used for points associated with a conditioned space in a building. Zone points are used consistently by any equipment used to condition the space including:

- directZone ahu
- vav
- fcu
- uv
- heatPump

#### Zone Points

The following are the standardized zone points:

- zone air temp sensor
- zone air temp effective sp
- zone air temp occ cooling sp
- zone air temp occ heating sp
- zone air temp unocc cooling sp
- zone air temp unocc heating sp
- zone air temp standby cooling sp
- zone air temp standby heating sp
- zone air humidity sensor
- zone air co2 sensor
- zone air co2 sp

#### **Sites**

A *site* entity models a single facility using the site tag. For example a campus is better modeled with each building as a site, versus treating the entire campus as one site.

Core tags used with sites:

- **geoAddr:** the geographic free-form address of the site (which might include other geolocation tags such as geoCity or geoCoord)

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- **tz:** the timezone where the site is located
- **area:** square footage or square meters of the facility. This enables site normalization by area.
- **weatherRef:** associate the site with a weather station to visualize weather conditions and perform weather based energy normalization
- **primaryFunction:** enumerated string which describes the primary function of the building
- **yearBuilt:** four digit year in which the building was constructed

### Weather

Building operations and energy usage are heavily influenced by weather conditions. This makes modeling of weather data a critical feature of Project Haystack. Because weather stations and measurements are often shared across multiple buildings, weather is not modeled as part of a site. Rather the weather tag models a separate top-level entity which represents a weather station or logical grouping of weather observations.

All weather entities shall define a tz tag. Optionally they can also define geolocation tags such as geoCountry, geoCity, and geoCoord.

#### Weather Points

Weather data follows the same conventions as points, but to indicate that they associated with a weather entity, and not a site entity, we use the special tag weatherPoint to indicate a weather related point.

The following weather points are defined by the standard library:

- **weatherCond:** enumeration of conditions (clear, cloudy, raining)
- **air temp:** dry bulb outside temperature in °C or °F
- **wetBulb temp:** wet bulb outside temperature in °C or °F
- **humidity:** percent humidity
- **sunrise:** historized trend of sunrise/sunsets as true/false transitions

Weather points are associated with their weather entity using the weatherRef tag. In Haystack, weather station data is annotated with weatherPoint and site-local sensors with outside:

- weatherPoint temp versus outside temp
- weatherPoint humidity versus outside humidity

SAN 400&900 Renovation Pre-Bid RFIs



RFI No.	Questions	Answers
1	On page 3 of Front-End Bid Docs, it states “Due to the ongoing COVID-19 pandemic only general contractors and only one person per general contractor firm will be allowed to attend the Mandatory Pre-Bid Conference and Job Walk.” Is it possible to have two persons per general contractor attend the job walk on Feb. 19?	We will now allow up to 3 individuals per GC firm for the walk this Friday. A different sub trade walk will be coordinated for a later date.
2	Can you confirm the year built of buildings 400?	The original B400 building was built 1986/1987.
3	On the Greenhouse sheet A2.01 Detail 14 Wall Type A-1, it calls for a pony wall. What are the specifications for the wood stud framing, drywall, wall base, and tile?	Build per DSA approved Contract Documents. Refer to Structural sheet S2.0 for framing. Specifically Foundation Plan A and detail 11. Provide Dal-Tile, 3x6 Amity/Gray AM52 with Mapei grout/Pewter. 6" Base is Roppe 178/Pewter.
4	Currently the plans call for an aluminum greenhouse structure. Is it acceptable to provide a galvanized steel structure?	Build per DSA approved Contract Documents. No a galvanized steel structure is not acceptable
5	On the BID FORM Attachment “A”, which line item does the Greenhouse cost fall into?	DISTRICT TO RESPOND
6	Sheet A8.10 Keynote RF-1, Epoxy flooring calls for Flowcrete in the legend and then has Duraflex named on the bottom. Which is the used material?	Dura-Flex is basis of design with the color being Ocean.
7	Specs Sec section 033000 Sealed concrete calls for a densifier with a non-skid requirement, is it acceptable to ‘grind and seal’ for this area?	Install per DSA approved contract documents
8	The B400 FA drawings show a fiber optic cable is needed between B440 and B900. Will these terminate within the FA panels? If so, will they terminate to a small fiber enclosure with adapter plate and then utilize a patch cord to plug into the NIC in the FACP? Or will they terminate in the data rack in a rack mount enclosure and then have a fiber patch cord run over to the FACP and plug into the NIC? Or will this fiber be terminated in the FACP on both sides and plugged in directly to the NIC with the spare strands left hanging within the FACP?	Please refer to PBGI RFI 001 response.

RFI No.	Questions	Answers
9	There seems to be a discrepancy between the two drawing sets. B900 within the Wire Legend, shows a MM50um OM2 Corning fiber. This does not state how many strands. B400 shows a note stating to install a 6 strand OM4. To meet campus standards and Manufacturer standard. Shall we assume, installing a Corning 6 strand OM2 as OM4 seems to be overkill for a Fire Alarm Network?	Please refer to PBGI RFI 001 response.



## REQUEST FOR INFORMATION

**Date:** 3/9/2021 **Project Name:** Miracosta San Elijo B400/900  
**Attention:** David Lozano **RFI Title:** Fire Alarm Fiber  
**From:** John Bowlds **PEGI RFI Number:** 001  
**Plan/Sheet Number(s):** B900-FA001 & B400-FA1.01 **Specifications:** \_\_\_\_\_

### Description of Request:

The B400 FA drawings show a fiber optic cable is needed between B440 and B900.

1. Will these terminate within the FA panels?

If so, will they terminate to a small fiber enclosure with adapter plate and then utilize a patch cord to plug into the NIC in the FACP?

Or will they terminate in the data rack in a rack mount enclosure and then have a fiber patch cord run over to the FACP and plug into the NIC?

Or will this fiber be terminated in the FACP on both sides and plugged in directly to the NIC with the spare strands left hanging within the FACP?

2. There seems to be a discrepancy between the two drawings.

B900 within the Wire Legend, shows a MM50um OM2 Corning fiber. This does not state how many strands. B400 shows a note stating to install a 6 strand OM4. To meet campus standards and Manufacturer standard Shall we assume, installing a Corning 6 strand OM2 as OM4 seems to be overkill for a Fire Alarm Network?

**Response:** 1. We anticipate that it will terminate at fire alarm panel directly.  
2. Shall be multimode fiber between B400 and B900. Provide 6 strand OM4.  
Prior to ordering or installing equipment, Contractor shall field verify existing fiber optic method at B900 and report and discrepancies to the Architect/Engineer.

**Reply Needed By:** \_\_\_\_\_

**Cost Impact:** YES  NO

**Schedule Impact:** YES  NO



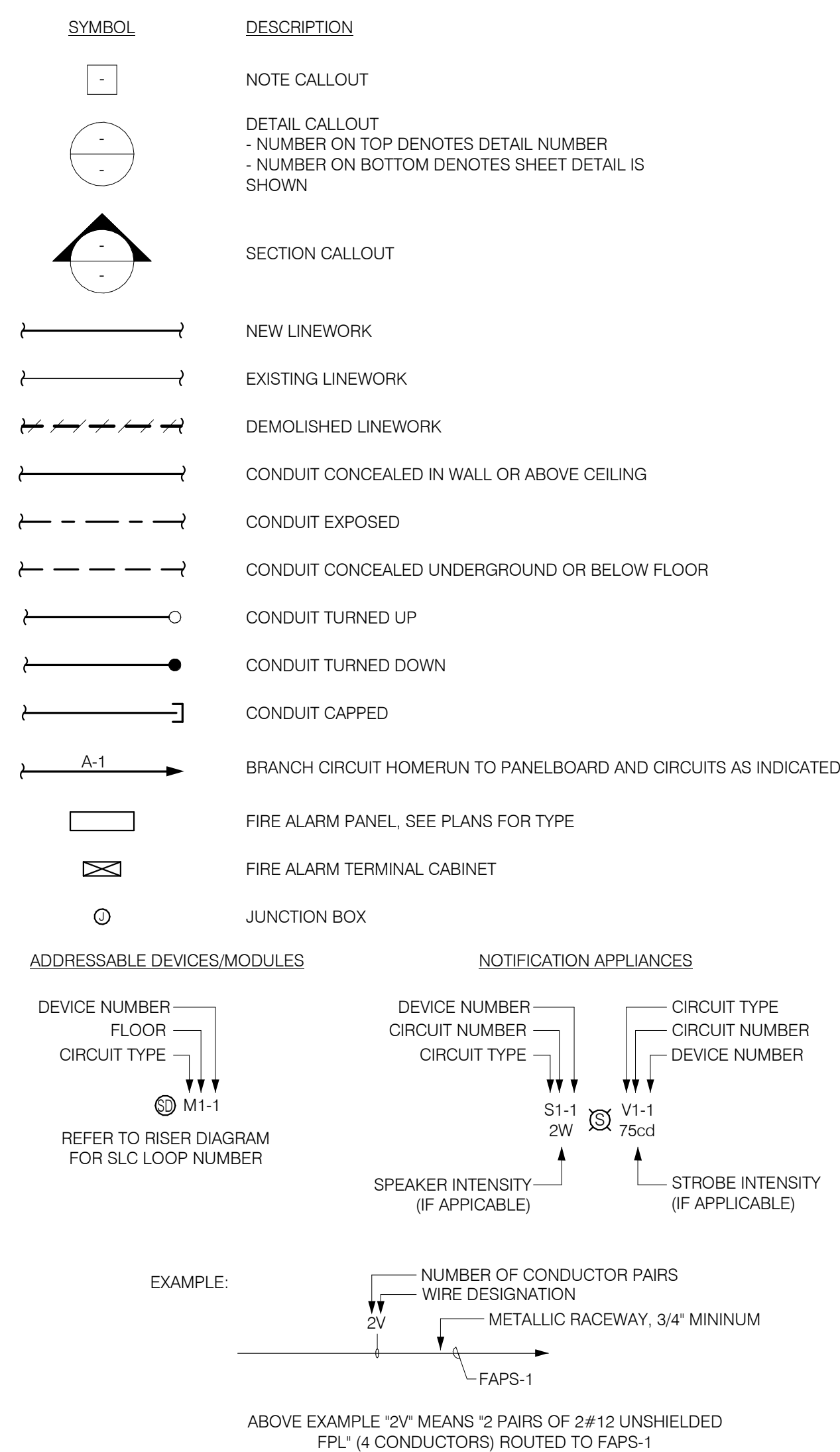
DEVICE SCHEDULE				
SYMBOL	MODEL	MANUFACTURER	DESCRIPTION	C.S.F.M.
[FACP]	NSF2-3030	NOTIFIER	FIRE ALARM CONTROL PANEL	7165-0028-0224
[LVECP]	DVC-EM DS-FM	NOTIFIER	DISTRIBUTED AUDIO AMPLIFIER FOR EMERGENCY VOICE EVACUATION	7165-0028-0224
[AMP]	DAAS-5070 DS-FM	NOTIFIER	DISTRIBUTED AUDIO AMPLIFIER FOR EMERGENCY VOICE EVACUATION	7165-0028-0224
[FAPS]	FCPS-2456	NOTIFIER	FIRE ALARM REMOTE POWER SUPPLY	7315-0028-0225
[FATC]	-	-	FIRE ALARM TERMINAL CABINET	-
[DOC]	ACE-11	SPACE AGE ELECTRONICS	SYSTEM RECORD DOCUMENT CABINET	7300-0553-0110
[ANN]	LCD2-80	NOTIFIER	REMOTE ANNUNCIATOR IN ENCLASURE WITH REMOTE MICROPHONE	7165-0028-0224
[MIC]	RM-11	NOTIFIER	REMOTE MICROPHONE IN ENCLASURE WITH REMOTE ANNUNCIATOR	7300-0028-0198
[DIALER]	TG-7FS	TELEGUARD	SYSTEM RECORD DOCUMENT CABINET	7300-1402-0109
[ATLAS]	IP-ZCM/ ZCM1RMK	ATLAS	ATLAS COMMUNICATION PANEL	-
[⊙]	FSP-951 B300-6	NOTIFIER	PHOTOELECTRIC SMOKE DETECTOR DETECTOR BASE	7272-0028-0503 7300-1653-0109
[□]	NBG-12LX	NOTIFIER	MANUAL PULL STATION	7150-0028-0199
[M]	PAM-1	APOLLO AMERICA	MULTI VOLTAGE CONTROL RELAY	7300-1004-0101
[□]	FRM-1	NOTIFIER	RELAY MODULE	7300-0028-0219
[M]	FMM-1	NOTIFIER	MONITOR MODULE	7300-0028-0219
[□]	FCM-1	NOTIFIER	CONTROL MODULE	7300-0028-0219
[⊘]	SCWL	NOTIFIER	MULTI-CANDELA CEILING STROBE LED	7125-1653-0504
[⊙]	SPSCWL	NOTIFIER	MULTI-CANDELA MULTI-TAP CEILING SPEAKER STROBE (70V NOMINAL) WITH BACKBOX	7320-1653-0505
[⊙]	SPSWK	NOTIFIER	WEATHERPROOF EXTERIOR WALL SPEAKER STROBE WITH SELECTABLE CANDELA (70V NOMINAL) WITH BACKBOX	7320-1653-0201
[—EOL]	-	-	END OF LINE RESISTOR	-

WIRE LEGEND		
WIRE TYPE DESCRIPTION	WIRE DESCRIPTION	USED ON
M	2-CONDUCTOR TWISTED PAIR NON-SHIELDED #16 AWG WEST PENN WIRE #D990 FPLR, CSFM: 7161-0859-0101	SLC ADDRESSABLE DATA CIRCUITS
V	2-CONDUCTOR SOLID #12 AWG	STROBE NOTIFICATION CIRCUIT
S	2-CONDUCTOR TWISTED PAIR SHIELDED #16 AWG WEST PENN WIRE #991 FPLR, CSFM: 7161-0859-0101	SPEAKER NOTIFICATION CIRCUIT
P	2-CONDUCTOR TWISTED PAIR NON-SHIELDED #14 AWG WEST PENN WIRE #994 FPLR, CSFM: 7161-0859-0101	AUXILIARY POWER
D	4-CONDUCTOR POWER/DATA #18 AWG WEST PENN WIRE #4245 FPLR, CSFM: 7161-0859-0101	NETWORK/ANNUNCIATOR
N	2-CONDUCTOR POWER/DATA #18 AWG WEST PENN WIRE #4245 FPLR, CSFM: 7161-0859-0101	NETWORK
F	MULTI-MODE 50/125 LO CONNECTORS, CORNING OM2	FIBER/AUDIO RISER
T	SHIELDED CAT6+ , GENESIS CABLE 5192 CSFM: 7161-1487-0100	TELEPHONE

- NOTE:
- ALARM, TROUBLE, AND SUPERVISORY SIGNALS FROM ALL ADDRESSABLE DEVICES SHALL BE ENCODED ON AN NFPA 72 CLASS B SIGNALING LINE CIRCUIT (SLC).
  - INITIATION DEVICE CIRCUITS (IDC) CONTAINING MORE THAN ONE DEVICE SHALL BE WIRED NFPA 72 CLASS B AS PART OF AN ADDRESSABLE DEVICE CONNECTED BY THE SLC.
  - NOTIFICATION APPLIANCE CIRCUITS (NAC) SHALL BE WIRED CLASS B.
  - PROVIDE WET LOCATION RATED CABLES WHERE INSTALLED UNDERGROUND OUTSIDE THE BUILDING.
  - ALARM SIGNALS ARRIVING AT THE FACP SHALL NOT BE LOST FOLLOWING A PRIMARY POWER FAILURE (OR OUTAGE) UNTIL THE ALARM SIGNAL IS PROCESSED AND RECORDED.

ACTION	DEVICE	SEQUENCE OF OPERATIONS					
		MANUAL PULL STATION	AREA SMOKE OR HEAT DETECTOR	DUCT SMOKE DETECTOR	SPRINKLER WATER FLOW SWITCH	SPRINKLER VALVE TAMPER SWITCH	POWER FAILURE
SOUND SPRINKLER BELL		-	-	-	X	-	-
ANNUNCIATE AT FIRE ALARM CONTROL PANEL (ALARM OR TROUBLE)		X	X	X	X	X	X
ANNUNCIATE AT REMOTE FIRE ALARM ANNUNCIATOR (ALARM OR TROUBLE)		X	X	X	X	X	X
ACTIVATE AUDIBLE/VISUAL ALARM SIGNALS THROUGHOUT BUILDING		X	X	X	X	-	-
ANNUNCIATE AT 24-HOUR ATTENDED REMOTE LOCATION (ALARM AND TROUBLE)		X	X	X	X	X	X
SHUT DOWN AIR HANDLING (HVAC) UNIT >2000 CFM		-	X	X	-	-	-

### LEGEND



### SCOPE OF WORK

- PROVIDE A COMPLETE MANUAL AND AUTOMATIC ADDRESSABLE FIRE ALARM WITH VOICE-EVAC SYSTEM FOR CAMPUS. PROVIDE DEVICES AS SHOWN IN THE DEVICE SCHEDULE, THE FLOOR PLANS AND THE SPECIFICATIONS IN THIS CONSTRUCTION DOCUMENT SET.
- WORK SHALL INCLUDE BUT NOT BE LIMITED TO: THE INSTALLATION AND TESTING OF THE CAMPUS FIRE ALARM SYSTEM, REMOVAL OF THE EXISTING FIRE ALARM SYSTEM, AND TESTING OF A DEDICATED AND INSTALLATION AND PHONE LINE TO THE ELEVATOR FOR EMERGENCY COMMUNICATION. FIBER WIRE SHALL BE RAN, CONNECTED, AND PROGRAMMED TO FIRE ALARM PANEL FOR INTERCONNECTION AMONGST BUILDINGS.
- WHERE AN EXISTING REQUIRED FIRE PROTECTION SYSTEM IS TAKEN OUT OF SERVICE THE FIRE DEPARTMENT AND FIRE CODE OFFICIAL SHALL BE NOTIFIED THE OCCUPIED AREAS) OF A BUILDING LEFT UNPROTECTED WHERE IMPAIRMENTS ARE MADE TO THE FIRE PROTECTION SYSTEM SHALL BE EVACUATED OR PROVIDED WITH A FIRE WATCH FOR ALL OCCUPANTS UNTIL THE FIRE PROTECTION SYSTEM HAS BEEN RETURNED TO NORMAL SERVICE.
- UPON COMPLETION A COMPLETE PRETEST SHALL BE PERFORMED TO VERIFY FUNCTIONALITY. IF THE FUNCTIONALITY IS COMPLETE THEN THE PROPER DOCUMENTATION SHALL BE SUBMITTED TO THE AUTHORITY HAVING JURISDICTION PRIOR TO SCHEDULING A FINAL INSPECTION.
- THE FOLLOWING DOCUMENTATION SHALL BE PROVIDED TO THE OWNER UPON FINAL ACCEPTANCE OF THE SYSTEM:
  - OWNERS MANUAL AND INSTALLATION INSTRUCTION COVERING ALL SYSTEMS EQUIPMENT AND REQUIREMENTS.
  - RECORD SHOP DRAWINGS IN AUTOCAD FORMAT.
  - RECORD COPY OF SITE SPECIFIC SOFTWARE (FOR SOFTWARE BASED).
  - NFPA 72 RECORD OF COMPLETION DOCUMENTATION.

### ABBREVIATIONS

ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
&	AND	LOTO	LOCK-OUT & TAG-OUT
@	AT	LTG	LIGHTING
A OR AMP	AMPERES	LV	LOW VOLTAGE
ABV	ABOVE	M	METER
AF	AMPERE FUSE RATING	MAX	MAXIMUM
AF	AMPERE FUSE RATING	MCC	MOTOR CONTROL CENTER
AFB	ABOVE FINISHED FLOOR	MFG, MFR	MANUFACTURER
AFG	ABOVE FINISH GRADE	MH	MANHOLE
AMP	AMPLIFIER	MIN	MINIMUM
ANN	ANNUNCIATOR	MTD	MOUNTED
APPROX.	APPROXIMATE	MTG	MOUNTING
ARCH	ARCHITECT; ARCHITECTURAL	MTR	MOTOR
AUTO	AUTOMATIC	MTB	MAIN TELEPHONE TERMINAL BOARD
AUX	AUXILIARY	MV	MULTI-VOLTAGE
AWG	AMERICAN WIRE GAUGE	N	NORTH
BAT	BATTERY	NAC	NOTIFICATION APPLIANCE CIRCUIT
BEL	BELOW	NC	NORMALLY CLOSED
BKBD	BACKBOARD	NEC	NATIONAL ELECTRICAL CODE
BLDD	BUILDING	NF	NON-FUSED
C	CONDUIT	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
C.O.	CONDUIT ONLY WITH PULL WIRE	NIC	NOT IN CONTRACT
CKT	CIRCUIT	NO.	NUMBER
CL	CENTER LINE	OC	ON CENTER
CLG	CEILING	OD	OUTSIDE DIAMETER
CMU	CONCRETE MASONRY UNIT	OH	OVERHEAD
COL	COLUMN	P	POLE
CSFD	COMBINATION SMOKE FIRE DAMPER	PB	PULL BOX
CU	COPPER	PV	POST INDICATING VALVE
DD	DUCT DETECTOR	PL	PLATE
DH	DOOR HOLDER	PNL	PANEL
DIAG	DIAGRAM	POC	POINT OF CONNECTION
DIS	DISCONNECT	PREF	PREFERRED
DIST	DISTANCE	PRI	PRIMARY
DWG	DRAWING	PVC	POLY-VINYL CHLORIDE
DWP	DEPARTMENT OF WATER & POWER	PWR	POWER
EA	EACH	REC/RECEPT	RECEPTACLE
ELEC.	ELECTRICAL	REQ'D	REQUIRED
EM	EMERGENCY	RGS	RIGID GALVANIZED STEEL
EMH	ELECTRICAL MANHOLE	RM	ROOM
EMT	ELECTRICAL METALLIC TUBING	RMC	RIGID METAL CONDUIT
EOL	END OF LINE	RPPB	REDUCED PRESSURE BACK FLOW PREVENTER
EPO	EMERGENCY POWER OFF	SCE	SOUTHERN CALIFORNIA EDISON
EQUIP	EQUIPMENT	SF	SQUARE FEET
EXIST(E)	EXISTING	SHT	SHEET
EXP	EXPLOSION PROOF	SIG	SIGNAL
FA	FIRE ALARM	SLC	SIGNALING LINE CIRCUIT
FACP	FIRE ALARM CONTROL PANEL	SLS	SPARE
FAPS	FIRE ALARM POWER SUPPLY	SPCS	SPECIFICATIONS
FATC	FIRE ALARM TERMINAL CABINET	ST	STREET
FFE	FINISHED FLOOR ELEVATION	STD	STANDARD
FIN.	FINISH	STP	SHIELDED TWISTED PAIR
FIXT	FIXTURE	SW	SWITCH
FLR	FLOOR	SWBD	SWITCHBOARD
FMC	FLEXIBLE METAL CONDUIT	SWGR	SWITCHGEAR
FO	FIBER OPTIC	T.O.D.	TOP OF DUCTBANK
FP	FIRE PUMP	T.O.M.	TOP OF MANHOLE
FT	FEET	TB	TERMINAL BLOCK
FTG	FOOTING	TEL./TELE	TELEPHONE
GEN	GENERATOR	TMH	TELEPHONE MANHOLE
GFI	GROUND FAULT INTERRUPTER	TPS	TWISTED SHIELDED PAIR
GND	GROUND	TRANSF.XMTR	TRANSFORMER
HCA	HAND-OFF-AUTOMATIC	TS	TAMPER SWITCH
HP	HORSEPOWER	TYP	TYPICAL
HT	HEIGHT	UG	UNDERGROUND
HTR	HEATER	UON	UNLESS OTHERWISE NOTED
HZ	HERTZ	V	VOLTS
IDC	INITIATION DEVICE CIRCUIT	VA	VOLT-AMPERES
IMC	INTERMEDIATE METAL CONDUIT	VAC	VOLTS, ALTERNATING CURRENT
J, J.B, J-BOX	JUNCTION BOX	VOC	VOLTS, DIRECT CURRENT
KV	KILOVOLT	VECP	VOICE/EVACUATION CONTROL PANEL
KVA	KILOVOLT-AMPERES	W	WATTS
KW	KILOWATT	W	WITH
LF	LINEAR FEET	WO	WITHOUT
LFMC	LIQUIDTIGHT FLEXIBLE METAL CONDUIT	WP	WEATHERPROOF
LGST	LARGEST		
LOC.	LOCATION		

IN THE EVENT ABBREVIATIONS NOT MENTIONED HEREIN ARE USED, REFERENCE WILL BE MADE TO ANSI Y1.1, MILITARY STANDARD ABBREVIATIONS, AND OTHER STANDARD INDUSTRY CONVENTIONS.

### APPLICABLE CODES

PART	DESCRIPTION	EDITION
CALIFORNIA BUILDINGS STANDARDS CODE (CALIFORNIA CODE OF REGULATIONS, TITLE 24)		
PART 1	2019 CALIFORNIA BUILDING STANDARDS ADMINISTRATIVE CODE, TITLE 24 C.C.R.	
PART 2	2019 CALIFORNIA CODE, TITLE 24 C.C.R. (2018 INTERNATIONAL BUILDING CODE OF THE INTERNATIONAL CODE COUNCIL, WITH CALIFORNIA AMENDMENTS)	
PART 3	2019 CALIFORNIA ELECTRICAL CODE, TITLE 24 C.C.R. (2017 NATIONAL ELECTRICAL CODE OF THE NATIONAL FIRE PREVENTION ASSOCIATION, NFPA)	
PART 4	2019 CALIFORNIA MECHANICAL CODE, TITLE 24 C.C.R. (2018 UNIFORM MECHANICAL CODE OF THE INTERNATIONAL ASSOCIATION OF PLUMBERS AND MECHANICAL OFFICIALS, IAPMO)	
PART 5	2019 CALIFORNIA PLUMBING CODE, TITLE 24 C.C.R. (2015 UNIFORM PLUMBING CODE OF THE INTERNATIONAL ASSOCIATION OF PLUMBERS AND MECHANICAL OFFICIALS, IAPMO)	
PART 6	2019 CALIFORNIA ENERGY CODE, TITLE 24 C.C.R.	
PART 7	CURRENTLY VACANT	
PART 8	2019 CALIFORNIA HISTORICAL BUILDING CODE, TITLE 24 C.C.R.	
PART 9	2019 CALIFORNIA FIRE CODE, TITLE 24 C.C.R. (2015 INTERNATIONAL FIRE CODE OF THE INTERNATIONAL CODE COUNCIL)	
PART 10	2019 CALIFORNIA EXISTING BUILDING CODE, TITLE 24 C.C.R. (2018 INTERNATIONAL EXISTING BUILDING CODE OF THE INTERNATIONAL CODE COUNCIL, WITH AMENDMENTS)	
PART 11	2019 CALIFORNIA GREEN BUILDING STANDARDS CODE (CALGREEN), TITLE 24 C.C.R.	
PART 12	2019 CALIFORNIA REFERENCED STANDARDS CODE, TITLE 24 C.C.R.	
PARTIAL LIST OF APPLICABLE STANDARDS:		
CALIFORNIA BUILDING CODE (FOR SPM) REFERENCED STANDARDS CHAPTER 35		
NFPA 13	AUTOMATIC SPRINKLER SYSTEMS (CALIFORNIA AMENDED)	2016 EDITION
NFPA 14	STANDPIPE SYSTEMS (CALIFORNIA AMENDED)	2016 EDITION
NFPA 17	DRY CHEMICAL EXTINGUISHING SYSTEMS	2017 EDITION
NFPA 17A	WET CHEMICAL EXTINGUISHING SYSTEMS	2016 EDITION
NFPA 20	STATIONARY PUMPS	2016 EDITION
NFPA 24	PRIVATE FIRE SERVICE MAINS (CALIFORNIA AMENDED)	2016 EDITION
NFPA 72	NATIONAL FIRE ALARM CODE (CALIFORNIA AMENDED) (NOTE: SEE UL STANDARD 1971 FOR "VISUAL DEVICES")	2016 EDITION
NFPA 80	FIRE DOOR AND OTHER OPENINGS PROTECTIVES	2016 EDITION

### WIRE FILL CHART

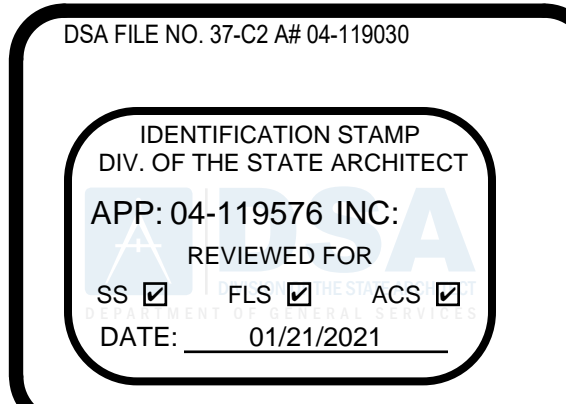
TRADE SIZE	INTERNAL DIAMETER INCHES	TOTAL 100%	AREA - SQUARE INCHES								
			PERCENT REDUCTION PER NUMBER OF 18AWG TWISTED SHIELDED PAIRS	OVER 2 COND. 40%							
				1	2	3	4	5	6	7	8
1/2	0.622	0.30	0.12	33%	66%	99%	X	X	X	X	X
3/4	0.824	0.53	0.21	19%	38%	57%	76%	95%	X	X	X
1	1.049	0.86	0.34	12%	24%	36%	48%	60%	72%	84%	96%
1 1/4	1.380	1.50	0.60	7%	14%	21%	28%	35%	42%	49%	56%
1 1/2	1.610	2.04	0.82	5%	10%	15%	20%	25	30%	35%	40%
2	2.067	3.36	1.34	3.00%	6%	9%	12%	15%	18%	21%	24%

### GENERAL NOTES

- CONTROL CIRCUITS ARE NON POWER LIMITED. MINIMUM RECOMMENDED WIRE SIZE TO BE DETERMINED BY CIRCUIT LOAD.
- WIRING SHALL NOT BE LOOPED THROUGH DEVICES UPON TERMINATION. WIRE MUST BE CUT FOR IN AND OUT RUNS PRIOR TO DEVICE TERMINATION.
- WHERE SHIELDED CABLE IS USED, THE SHIELD SHALL BE CONTINUOUS AND GROUNDED ONLY AT THE RESPECTIVE CONTROL PANEL.
- T-TAPPING OR PARALLEL BRANCHING OF NOTIFICATION APPLIANCE DEVICE CIRCUITS IS PROHIBITED ON CLASS A CIRCUITS.
- ELECTRICAL CONTRACTOR IS REQUIRED TO USE: COLOR CODE, WIRE NUMBERS, OR AS SPECIFIED IN THE PROJECT SPECIFICATIONS ON ALL CIRCUITS AND SHALL BE CONTINUOUS, OTHERWISE, NO FINAL CONNECTIONS OR TESTING SHALL BE PERFORMED. IF WIRE COLOR CODING IS USED, GREEN WILL BE USED FOR GROUND BONDING ONLY.
- POINT AND COMMON ANNUNCIATION AND T-TAPPING PROHIBITED.
- ALL WIRING, INITIATING DEVICES AND ANNUNCIATOR PANELS SHALL BE SUPERVISED TO THE PRINCIPAL POINT OF ANNUNCIATION (FIRE ALARM CONTROL PANEL(S) TO SUPERVISE ANNUNCIATOR PANEL(S), SUB-PANEL(S), ALL CIRCUITS AND INITIATING DEVICES).
- FIRE ALARM SIGNAL SHALL MEET ANSI S3.41, AUDIBLE EMERGENCY EVACUATION SIGNAL (TEMPORAL PATTERN).
- AUDIBILITY OF ALARM SHALL BE NOT LESS THAN 15DB ABOVE AMBIENT SOUND THROUGHOUT THE AREA OF ALARM.
- ALL STROBE APPLIANCES SHALL BE SYNCHRONIZED IN ACCORDANCE WITH NATIONAL FIRE ALARM CODE (NFPA 72), REFERENCE APPLICABLE EDITIONS UNDER "APPLICABLE CODES & REGULATIONS".
- STROBE APPLIANCE LOCATIONS ARE BASED ON 10 FOOT CEILING HEIGHTS AND ARE INSTALLED IN ACCORDANCE WITH NATIONAL FIRE ALARM CODE (NFPA 72), UNLESS OTHERWISE NOTED. REFERENCE APPLICABLE EDITIONS UNDER "APPLICABLE CODES & REGULATIONS".
- WALL-MOUNTED STROBE AND HORN/STROBE APPLIANCES SHALL BE MOUNTED A MINIMUM OF 80 INCHES ABOVE FINISHED FLOOR OR 6 INCHES MINIMUM BELOW THE CEILING, (WHICH EVER IS LOWER). MEASUREMENT ARE TO BE TAKEN FROM BOTTOM OF STROBE.
- PHOTOELECTRIC DETECTORS SHALL NOT BE IN DIRECT AIR STREAM SUPPLY AIR OUTLETS.
- REFER TO RESPECTIVE CATALOG CUT SHEETS FOR ELECTRICAL MOUNTING HARDWARE.
- ALL DEVICES OF THE FIRE ALARM SYSTEM SHALL BE APPROVED AND LISTED BY THE CALIFORNIA STATE FIRE MARSHAL.
- AUDIBILITY WILL BE DETERMINED BY THE FIELD FIRE MARSHAL.
- ALL FIRE ALARM CIRCUITS SHALL BE LABELED AT CONNECTIONS AND AT JUNCTION BOXES.
- DUCT SMOKE DETECTORS SHALL BE TESTED FOR DUCT VELOCITY AND PRESSURE DIFFERENTIAL IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS.
- DIFFERENTIAL PRESSURE SWITCHES SHALL BE SUPPLIED AND INSTALLED BY A LICENSED MECHANICAL CONTRACTOR. THE ELECTRICAL CONNECTION TO THE DIFFERENTIAL PRESSURE SWITCH SHALL BE MADE BY THE FIRE ALARM CONTRACTOR.
- UNLESS OTHERWISE NOTED ALL WIRING AND INSTALLATION METHODS SHALL CONFORM TO CALIFORNIA ELECTRICAL CODE (CEC), ARTICLE 760. SEE APPLICABLE EDITION UNDER "APPLICABLE CODES & REGULATIONS".
- ALL WIRE CONDUCTORS SHALL BE POWER LIMITED COPPER WIRING AND INSTALLED WITHIN A METALLIC RACEWAY.
- PER SPECIFICATION CONDUIT RISERS SHALL BE INSTALLED INSIDE A TWO HOUR FIRE RATED ENCLOSURE PROVIDED BY OTHERS. HORIZONTAL OFFSET CONDUITS AND JUNCTION BOXES SHALL BE PROTECTED BY TWO HOUR FIRE RATED ENCLOSURES PROVIDED BY OTHERS.
- ADDITIONAL JUNCTION BOXES NOT SHOWN MAY BE REQUIRED TO ACCOMMODATE PROPER RACEWAY INSTALLATIONS. IT IS THE ELECTRICAL CONTRACTORS RESPONSIBILITY TO DETERMINE THE NECESSARY AMOUNT OF JUNCTION BOXES REQUIRED.
- SUBMITTED DRAWING PACKAGE MUST BE REVIEWED BY UNIVERSITY REPRESENTATIVE AND ONE COPY OF THE REVIEWED DRAWING AND SUBMITTAL MUST BE RETURNED TO SIEMENS BEFORE ANY EQUIPMENT IS SHIPPED OR INSTALLED. CUSTOM ANNUNCIATORS WILL NOT BE FABRICATED UNTIL WRITTEN APPROVAL OF LAYOUT AND/OR ARTWORK IS RECEIVED.
- FOR INSPECTION AND OR TESTING THE FIRE MARSHAL SHALL BE NOTIFIED FOR SCHEDULING AN APPOINTMENT.
- A CERTIFICATE OF COMPLIANCE SHALL BE PREPARED BY THE INSTALLER AND GIVEN TO THE FIRE MARSHAL UPON COMPLETION OF THE INSTALLATION.
- ANY DISCREPANCIES BETWEEN THE DRAWINGS AND THE CODE OR RECOGNIZED STANDARDS SHALL BE BROUGHT TO THE ATTENTION OF THE INSPECTOR OF RECORD. THE STRICTER REQUIREMENT WILL PREVAIL.
- A STAMPED SET OF APPROVED FIRE ALARM PLANS SHALL BE ON THE JOB SITE AND USED FOR INSTALLATION. ANY DEVIATION FROM APPROVED PLANS, INCLUDING THE SUBSTITUTION OF DEVICES SHALL BE APPROVED BY THE FIRE MARSHAL.
- UPON COMPLETION OF THE FIRE ALARM SYSTEM, A SATISFACTORY TEST OF THE ENTIRE SYSTEM SHALL BE MADE IN THE PRESENCE OF THE FIRE MARSHAL.
- UNLESS SPECIFICALLY SHOWN ON THESE PLANS NO STRUCTURAL MEMBERS SHALL BE CUT, DRILLED NOR NOTCHED WITHOUT PRIOR WRITTEN AUTHORIZATION FROM THE STRUCTURAL ENGINEER AND THE DISTRICT STRUCTURAL ENGINEER FROM THE DIVISION OF THE STATE ARCHITECT.
- REFER TO THE SPECIFICATIONS BOOK FOR ADDITIONAL REQUIREMENTS.
- MONITORING SHALL BE PROVIDED BY THE OWNER.

### SHEET INDEX

SHEET	DESCRIPTION
FA001	GENERAL NOTES, LEGEND, ABBREVIATIONS AND SHEET INDEX
FA002	DEMOLITION NOTES
FA101	SITE PLAN
FA201	FLOOR PLANS
FA501	RISER DIAGRAM
FA502	FIRE ALARM CALCULATIONS
FA601	DETAILS
FA602	DETAILS
FAD201	DEMOLITION FLOOR PLANS



ARCHITECTURE

**MCC SAN ELIJO BUILDING 900 MODERNIZATION**

3333 Manchester Ave, Cardiff, CA 92007

100% CONSTRUCTION DOCUMENTS

MIRA COSTA COLLEGE

CONSULTANT

**P2S ENG**

Long Beach | Los Angeles  
San Diego | San Jose

p2sinc.com

ENGINEER

ARCHITECT

CLIENT		
MIRACOSTA COMMUNITY COLLEGE DISTRICT		
PROJECT NUMBER		
-		
DATE:	2020/11/10	
DRAWN BY:	-	
CHECKED BY:	-	
REVISIONS		
No.	Description	Date

100% CONSTRUCTION DOCUMENTS

**GENERAL NOTES, LEGEND, ABBREVIATIONS AND SHEET INDEX**

**FA001**





RFI No.	Questions	Answers
10	Finish plan A810 shows room 410 student lounge hatched as Vs-vinyl sheet, finish schedule on page A810 shows that room as CP-1 carpet. Please clarify.	Student Lounge 410 to receive CARPET (roll). Provide Mannington Palma 2, SCENA, Eustatia - Broadloom / roll
11	Finish plan A810 shows CP-1 carpet as a modular carpet and the spec is for a modular carpet but the description calls for a 12'6" roll product. Please clarify if CP-1 is a carpet tile or roll product.	CP-1 is Roll per District Standards

*Report*

**LIMITED HAZARDOUS MATERIALS  
SURVEY REPORT  
MIRACOSTA COLLEGE  
SAN ELIJO CAMPUS  
BUILDING 400  
3333 MANCHESTER AVE, CARDIFF, CA**

**AEG Project No. 2K20051**

**Prepared for:  
MiraCosta CCD Measure MM Bond Program Team  
Mr. David Dunn  
1 Barnard Drive  
Oceanside, CA 92056**

**Prepared by:**



**Advanced Environmental Group, Inc.  
1530 Via Tulipan  
San Clemente, California 92673**

**February 24, 2021**



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### FIGURES. SAMPLE LOCATIONS

### TABLE 1 SUMMARY OF HOMOGENEOUS BUILDING MATERIAL AREAS EVALUATED

### APPENDIX A LABORATORY ANALYTICAL RESULTS – BULK ASBESTOS

### APPENDIX B POTENTIAL DISTURBANCE FACTORS

### APPENDIX C CLASSIFICATION OF HAZARD POTENTIAL

### APPENDIX D PRIORITY RESPONSE ACTIONS

### APPENDIX E PHOTOGRAPHS

## EXECUTIVE SUMMARY

Advanced Environmental Group, Inc. (AEG) was retained by MiraCosta CCD Measure MM Bond Program Team on January 13, 2021 to conduct a limited asbestos survey of Building 400 located at MiraCosta College's San Elijo Campus, 3333 Manchester Ave., Cardiff, CA. The survey was conducted over one day on February 4, 2021.

**This Executive Summary is provided solely for the purpose of overview. Any party who relies on this report must read the entire report. The Executive Summary may have omitted important details, any of which could be crucial to proper understanding and risk assessment of the subject matter.**

The remaining body of this report elaborates upon these salient items with details relative to the management of asbestos-containing building materials (ACBM).

### **Asbestos**

AEG identified homogeneous building materials, which were suspected of containing asbestos. Homogeneous areas for bulk sampling purposes are areas one that seems by texture, color and wear to be uniform and applied during the same general time period. After the homogeneous areas had been identified, representative bulk samples were collected for laboratory analysis.

Because ACBM have compositional variability, it is possible to obtain different laboratory results for samples from the same homogeneous area. Therefore, a homogeneous area with at least one positive sample for asbestos will result in the entire homogeneous area being designated as an asbestos-containing material (ACM).

ACBM are categorized into surfacing ACM, thermal system insulation (TSI) ACM, or miscellaneous ACM that is found in a building. In addition, the condition, approximate quantities and whether ACBM is friable or non-friable ACM was determined during the survey. *Friable asbestos material* means any material containing more than 1 percent asbestos as determined using the method specified in Appendix E, subpart E, 40 CFR part 763 section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

AEG identified a total of eighteen (18) homogeneous building materials from Building 400, none of which were identified as ACM. Asbestos bulk sample results are presented in Table 1 and Appendix A. The homogeneous area is summarized hereafter in three action item groups.

### **GROUP A - IMMEDIATE INTERDICTION / ABATEMENT**

(Regulated Carcinogen Spill, Highly Deteriorated Materials)

*The following areas contain materials either in highly deteriorated condition, or have been disturbed to the extent that ACM has been spilled onto building, equipment or environmental surfaces; it is recommended that immediate interdiction of potential personal exposure be implemented, and the contamination be abated immediately by removing it under contract with an asbestos abatement contractor registered with the State of California, Department of Industrial Relations/Division of Occupational Safety and Health (DIR/DOSH) Carcinogen Control Unit, with third-party industrial hygiene site supervision to assure maximal limitation of liability.*

- None Reported

### **GROUP B - ADDITIONAL ANALYTICAL SURVEILLANCE**

(Required to Validate Inconclusive and or Irregular Results)

*The following areas contain materials which when sampled produced analytical results which were inconclusive, or non-replicated in comparative samples; it is recommended that the materials be re-sampled to adequately characterize the material.*

- None Reported

### **GROUP C - CONVENTIONAL PROCEDURES**

(Regulatory Notification / Periodic Surveys / Operations & Management Plan)

*The following materials, which appear to retain their structural integrity, either contained ACM or PACM, which if left undisturbed may not create an exposure. These materials are in conformance with State of California carcinogen regulations but will require periodic survey and notification of possibly exposed persons/employees. If the structure is occupied without full abatement of the materials, Operations and Management Plans should be developed and implemented including periodic visual inspection and area air monitoring. Mandatory ACM property conveyance regulations would also apply if property ownership changes.*

- None Reported

The air quality management district (AQMD) or local air pollution control district (APCD) requires owners of buildings and or their contractors to make notification to the State and or Environmental Protection Agency (EPA) Regional Office prior to all demolition or renovation of facilities where asbestos material will be disturbed. Notification must be postmarked at least ten working days prior to the start of any demolition or renovation activity that will disturb asbestos. Notification is mandatory for renovation jobs which involve the disturbance of friable or regulated

asbestos containing material (RACM) meeting or exceeding the minimum of 260 linear feet; 160 square feet; or 35 cubic feet.

Respectfully Submitted,



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Matthew Michaelian, CIH, CAC  
Certified Industrial Hygienist # 11012  
Certified Asbestos Consultant #16-5628



## 1.0 INTRODUCTION

On February 4, 2021, AEG conducted a limited building survey of Building 400 located at MiraCosta College's San Elijo Campus, 3333 Manchester Ave., Cardiff, CA. The survey was conducted at the request of MiraCosta CCD Measure MM Bond Program Team. The purpose of the survey was to characterize potentially hazardous asbestos building materials scheduled for demolition and renovation activities. The focus of the survey was asbestos containing building materials (ACBM) in the building interior and exterior that will be disturbed during renovation work. AEG collected bulk samples for subsequent asbestos.

The survey was performed by Mr. John Gibson, Certified Site Surveillance Technician, (CSST) DOSH Certification Number 17-6078



## 2.0 SCOPE OF WORK AND LIMITATIONS

### 2.1 Scope of Work

- Conduct a survey to assess the existence of friable and non-friable ACBM;
- Provide laboratory analysis utilizing Polarized Light Microscopy (PLM) for asbestos in bulk samples; and
- Provide a report to include comments on disturbance of any ACM discovered, location of such materials, discussion, and conclusion.

### 2.2 Limitations

Recommendations and conclusions contained in this report are based on evaluation of technical information which was made available and reviewed during the course of this survey. Our work product and judgments rendered meet or exceed the standard of care of our profession at this time. The number of samples taken from a construction material depended upon the amount present, its friability and accessibility, as well as the professional judgment of the inspector conducting the survey. No other warranty is made, expressed or implied. All quantities are approximates only and should not be used for bidding purposes. Contractor shall confirm quantities in the field.

- ***Note: No sub-grade investigations were conducted for waterproofing materials, utilities or other materials which may contain asbestos. If the abovementioned materials or any other inaccessible, untested suspect materials (e.g. concrete) are encountered, they should be tested as asbestos containing materials and not disturbed, unless sampling and analysis of the materials proves otherwise.***

### **3.0 SAMPLING PROCEDURES AND ANALYTICAL METHOD**

#### **3.1 Bulk Sampling Procedure**

Samples were obtained from representative areas which were accessible. Field data and hazard assessments were documented in field notes and photos. The following guidelines would be used for sample collection and are designed to minimize both damage to the ACBM and subsequent fiber release.

- The surface of the materials to be sampled were wetted with an amended water mist from a spray bottle;
- Bulk samples of suspect materials were collected and transferred to a single-use sample container such as 25-millimeter (mm) plastic vial or sealable plastic bag;
- When applicable, samples were collected down to the substrate to assure that all layers of the material were penetrated;
- The container was labeled with the unique sample identification (ID) number; and
- After use, all equipment was cleaned to prevent cross-contamination using wet towels, and debris was discarded in double plastic bags.

##### **3.1.1 Bulk Sample Analysis – Asbestos**

Samples collected were submitted to SGS Forensic Analytical Laboratories of Carson, California and were examined by Polarized Light Microscopy (PLM) in accordance with EPA Test Method 600/M4-82-020, "Area Estimation Method". The percentage of asbestos is determined by visual estimation. Laboratory results are reported based on the percentage of asbestiform minerals identified within each sample layer. The lower limit of reliable detection by PLM is 1 percent by volume. When asbestos or other minerals are observed in concentrations believed to be less than the reliable detection limit (less than 1 percent) the results are usually indicated as trace.

## 4.0 SUMMARY OF MATERIALS EVALUATED

### 4.1 Asbestos

AEG identified homogeneous areas of materials, which were suspected of containing asbestos. Homogeneous areas, for bulk sampling purposes is one that seems by texture, color, and wear to be uniform and applied during the same general time period. After the homogeneous areas had been identified, representative bulk sample(s) are collected for laboratory analysis. A debris field for example would not be considered a homogeneous area since materials are mixed and randomly disbursed.

Because ACM have compositional variability, it is possible to obtain different laboratory results for samples from the same homogeneous area. Therefore, a homogeneous area with at least one positive sample for will result in the entire homogeneous area being designated as an ACM.

ACBM were categorized into surfacing ACM, thermal system insulation (TSI) ACM, or miscellaneous ACM that is found in a building. In addition, the condition, approximate quantities and whether ACM is friable or non-friable ACM was determined during the survey. *Friable asbestos material* means any material containing more than 1 percent asbestos as determined using the method specified in appendix E, subpart E, 40 CFR part 763 section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos (friable) content is less than 10 percent as determined by a method other than point counting by polarized light microscopy (PLM), verify the asbestos content by point counting using PLM.

All suspected ACBMs were evaluated and the findings are presented in Table 1. Asbestos bulk laboratory reports are presented in Appendix A. The tables present each homogeneous area assessed and identify the type of material such as surfacing, TSI or other, and whether the material is considered friable or non-friable. Approximate quantities were measured and or calculated and reported in square feet (sq. ft.). Bulk sample identification numbers are listed with total composite results reported in percent concentration on the next line. Subsequent lines reflect

material layers identified and type of asbestos, such as Chrysotile or Amosite, and respective percent concentration. The remaining information presented in the table describes the material condition and potential for disturbance. Potential for disturbance factors are presented in Appendix C. Classification of hazard potential is determined from the ratings found on the tables and applying them to a decision tree presented in Appendix D. Priority response actions based on hazard rankings are presented in Appendix E. Out of a total of eighteen (18) homogeneous building material identified, none (0) were listed as ACM. A total of eighty (80) samples were collected from within the area. Sample locations are shown in Figure 1.

## **5.0 REGULATIONS**

### **5.1 Asbestos**

California Occupational Safety and Health Administration (Cal/OSHA) regulates asbestos under Title 8 CCR §1532.1 and, §5208 which address Construction and General Industry, respectively. Upon analysis of bulk samples, analytical results are compared to government agency standards. Currently, Cal/OSHA) and the EPA define material with contains more than one percent asbestos to be an asbestos containing material. Cal/OSHA also includes a definition for Asbestos Containing Construction Material (ACCM) as material containing more than 0.1% asbestos by weight.

The San Diego County Air Pollution Control District (SDCAPCD) requires owners of buildings and or their contractors to make notification to the State and or Environmental Protection Agency (EPA) Regional Office prior to all demolition or renovation of facilities where asbestos material will be disturbed as per Rule 361.145 and 361.150 which adopts the National Emission Standard for Hazardous Air Pollutants (NESHAPS) for Asbestos 40 CFR Chapter 61 Subpart M. Notification must be postmarked at least ten working days prior to the start of any demolition or renovation activity that will disturb asbestos. Notification is mandatory for renovation jobs which involve the disturbance of friable or regulated asbestos containing material (RACM) meeting or exceeding the minimum of 260 linear feet; 160 square feet; or 35 cubic feet. Cal/OSHA local district office is required to be notified when material disturbed is equal to or more than 100 square feet.

Removal of ACM must be performed in accordance with all applicable federal, state, and local health and safety regulations and policies. These include the following:

- Title 8 CCR §1532.1 (Construction Standard)
- Title 8 CCR §5208 (General Industry)
- SDCAPCD Regulation XI, Rule 361.145 and 361.150 which adopts the NESHAPS for Asbestos 40 CFR Chapter 61 Subpart M
- Department of Transportation (DOT) Parts 171 and 172



## **6.0 DISCUSSION**

Based on the visual survey and bulk samples collected from the Building 400, AEG identified a total of eighteen (18) homogeneous building material areas. No homogeneous building materials sampled contained asbestos. A total of eighty (80) samples were collected. AEG's findings are presented in Table 1 are discussed below.

### **6.1 Asbestos**

Homogenous building materials confirmed by laboratory analyses as containing asbestos at greater than 1 percent by area are as follows:

- None reported

## **7.0 CONCLUSIONS AND RECOMMENDATIONS**

In summary, no ACBM was identified. Note: During any renovation or demolition activity where suspect ACM is discovered within inaccessible areas, work in that area should be discontinued and the material should be sampled and tested prior to any further handling or disturbance.

Based on the survey findings, AEG has provided the recommendations described in the following sections.

### **7.1 Asbestos**

Building materials containing asbestos, where present, should be abated before any demolition or renovation occurs that will disturb such material. Removal of ACM must be performed in accordance with all applicable federal, state and local health and safety regulation.

AEG recommends that technical asbestos abatement specifications outlining industry standards specific to the project be prepared by a State of California Certified Asbestos Consultant (CAC) prior to bid solicitation, where applicable. Independent third-party air monitoring should be provided by State of California CAC or Certified Site Surveillance Technician (CSST) during any future abatement to evaluate protection of site employees, sub-contractors, visitors and the Environment, where applicable.

**FIGURES. Sample Locations**















TABLE 1

SUMMARY OF HOMOGENEOUS BUILDING MATERIAL AREAS EVALUATED

MIRA COSTA COLLEGE SAN ELIJO CAMPUS  
BUILDING 400  
3333 MANCHESTER AVE., CARDIFF, CA

FEBRUARY 4, 2021

Campus	Building	Room/ Description	Color/ Description	Homogeneous Building Material	Type of Material	Friability	Amount of Material		Sample ID Number/ Results - Total Composite (%) / Layers (% Type & Description)	Type of Damage				Overall Condition Rating <sup>2</sup>	Accessibility	Frequency of Contact	Influence of Vibration	Potential for Air Erosion	Overall Disturbance Rating			
							Linear Feet	Approx. Sq. Ft.		Damage	Deterioration	Water	Physical							Description of damage	Good (G); Fair (F); Poor (P)	Accessible, Inaccessible
San Elijo	Building 400	Room 401; Room 402; Room 403; Room 404; Room 405; Room 406	White	Drywall, Tape & Joint Compound	Miscellaneous	Friable		1300	JG020421-1A -> 1G / Non-Detect (ND)	Good					G	Accessible	L	L	L	G	Y	2
San Elijo	Building 400	Room 406, SE Soffit	White	Drywall, Tape & Joint Compound	Miscellaneous	Friable		700	JG020421-2A -> 2C / Non-Detect (ND)	Damaged	X	X			P	Accessible	L	L	L	G	Y	3
San Elijo	Building 400	Room 406, North Wall	White/Tan	Fiberboard	Miscellaneous	Friable		270	JG020421-3A -> 3C / Non-Detect (ND)	Good					G	Accessible	L	L	L	G	Y	4
San Elijo	Building 400	Room 401; Room 402; Room 404; Room 406; Room 407	White	2' x 4' Rough Fissured Ceiling Tile	Miscellaneous	Friable		5500	JG020421-4A -> 4I / Non-Detect (ND)	Good					G	Inaccessible	L	L	L	G	Y	5
San Elijo	Building 400	Room 402; Room 406	Green Speck	12" X 12" Vinyl Floor Tile w/ Mastic	Miscellaneous	Non-Friable		2560	JG020421-5A -> 5E / Non-Detect (ND)	Good					G	Accessible	H	L	L	G	Y	6

**TABLE 1**  
**SUMMARY OF HOMOGENEOUS BUILDING MATERIAL AREAS EVALUATED**

**MIRA COSTA COLLEGE SAN ELIJO CAMPUS**  
**BUILDING 400**  
**3333 MANCHESTER AVE., CARDIFF, CA**

**FEBRUARY 4, 2021**

Campus	Building	Room/ Description	Color/ Description	Homogeneous Building Material	Type of Material	Friability	Amount of Material		Sample ID Number/ Results - Total Composite (%) / Layers (% Type & Description)	Type of Damage				Overall Condition Rating <sup>2</sup>	Accessibility	Frequency of Contact	Influence of Vibration	Potential for Air Erosion	Overall Disturbance Rating	Photo	Photo ID No.	
							Linear Feet	Approx. Sq. Ft.		Damage	Deterioration	Water	Physical									Description of damage
San Elijo	Building 400	Room 406	Beige Speck	12" X 12" Vinyl Floor Tile w/ Mastic	Miscellaneous	Non-Friable		126	JG020421-6A -> 6C / Non-Detect (ND)	Good					G	Accessible	H	L	L	G	Y	7
San Elijo	Building 400	Room 402A; Room 404; Room 406A; Room 406B	Green Speck	Vinyl Sheet Flooring w/ Mastic	Miscellaneous	Non-Friable		1020	JG020421-7A -> 7E / Non-Detect (ND)	Good					G	Accessible	H	L	L	G	Y	8
San Elijo	Building 400	Room 401; Room 403; Room 405; Room 407;	Tan	Carpet Adhesive	Miscellaneous	Non-Friable		1710	JG020421-8A -> 8E / Non-Detect (ND)	Good					G	Inaccessible	L	L	L	G	Y	9
San Elijo	Building 400	Room 406	Grey	4" Vinyl Cove Base/ Adhesive	Miscellaneous	Non-Friable	136		JG020421-9A -> 9C / Non-Detect (ND)	Good					G	Accessible	M	L	L	G	Y	6
San Elijo	Building 400	Room 402B; Room 404; Room 406B	Dark Green	4" Vinyl Cove Base/ Adhesive	Miscellaneous	Non-Friable	196		JG020421-10A -> 10C / Non-Detect (ND)	Good					G	Accessible	M	L	L	G	Y	10
San Elijo	Building 400	Room 402	Light Green	4" Vinyl Cove Base/ Adhesive	Miscellaneous	Non-Friable	160		JG020421-11A -> 11C / Non-Detect (ND)	Good					G	Accessible	M	L	L	G	Y	11



**TABLE 1**  
**SUMMARY OF HOMOGENEOUS BUILDING MATERIAL AREAS EVALUATED**

**MIRA COSTA COLLEGE SAN ELIJO CAMPUS**  
**BUILDING 400**  
**3333 MANCHESTER AVE., CARDIFF, CA**

**FEBRUARY 4, 2021**

Campus	Building	Room/ Description	Color/ Description	Homogeneous Building Material	Type of Material	Friability	Amount of Material		Sample ID Number/ Results - Total Composite (%)/ Layers (% Type & Description)	Type of Damage				Overall Condition Rating <sup>2</sup>	Accessibility	Frequency of Contact		Influence of Vibration		Potential for Air Erosion		Overall Disturbance Rating	
							Linear Feet	Approx. Sq. Ft.		Damage	Deterioration	Water	Physical			Description of damage	Good (G); Fair (F); Poor (P)	Accessible, Inaccessible	Description	High (H);Moderate (M);Low (L)	Description		High (H);Moderate (M);Low (L)
San Elijo	Building 400	Room 401, Room 403; Room 407	Tan	4" Vinyl Cove Base/ Adhesive	Miscellaneous	Non-Friable	300		JG020421-12A -> 12C / Non-Detect (ND)	Good					G	Accessible	M	L	L		G	Y	12
San Elijo	Building 400	Exterior Perimeter Walls & SE Roof Parapet	Grey	Stucco	Miscellaneous	Non-Friable		>5000	JG020421-13A -> 13G / Non-Detect (ND)	Good					G	Accessible	L	L	H		G	Y	13, 14
San Elijo	Building 400	Exterior Main Roof	Black	Built-up Roofing Material	Miscellaneous	Non-Friable		3100	JG020421-14A -> 14E / Non-Detect (ND)	Good					G	Inaccessible	L	L	H		G	Y	15
San Elijo	Building 400	Exterior Main Roof	Black	Roof Penetration Mastic	Miscellaneous	Non-Friable		200	JG020421-15A -> 15E / Non-Detect (ND)	Good					G	Inaccessible	L	L	H		G	Y	16
San Elijo	Building 400	Exterior SW Tile Roof	Black	Roofing Felt	Miscellaneous	Non-Friable		896	JG020421-16A -> 16E / Non-Detect (ND)	Good					G	Inaccessible	L	L	H		G	Y	17
San Elijo	Building 400	Exterior East Tile Roof	White/ Black	Roofing Sealant/ Mastic	Miscellaneous	Non-Friable		30	JG020421-17A -> 17C / Non-Detect (ND)	Good					G	Inaccessible	L	L	H		G	Y	18



TABLE 1

SUMMARY OF HOMOGENEOUS BUILDING MATERIAL AREAS EVALUATED

MIRA COSTA COLLEGE SAN ELIJO CAMPUS  
BUILDING 400  
3333 MANCHESTER AVE., CARDIFF, CA

FEBRUARY 4, 2021

Campus	Building	Room/ Description	Color/ Description	Homogeneous Building Material	Surfacing; Thermal Sys. Insulation; Miscellaneous	Friable; Non-Friable	Amount of Material		Sample ID Number/ Results - Total Composite (%) / Layers (% Type & Description)	Type of Damage				Overall Condition Rating <sup>2</sup>	Accessibility	Frequency of Contact	Influence of Vibration	Potential for Air Erosion	Overall Disturbance Rating						
							Linear Feet	Approx. Sq. Ft.		Damage	Deterioration	Water	Physical							Description of damage					
										Good (G); Fair (F); Poor (P)	Accessible, Inaccessible	Description	High (H); Moderate (M); Low (L)	Description	High (H); Moderate (M); Low (L)	Description	High (H); Moderate (M); Low (L)	Description	Good (G); Fair (F); Poor (P)	Photo	Photo ID No.				
San Elijo	Building 400	Room 402; Mechanical Room 408	Grey	Concrete	Miscellaneous	Non-Friable		300	JG020421-18A -> 18C / Non-Detect (ND)	Good					G	Accessible	L		L		L		G	Y	19, 20

**APPENDIX A**

**LABORATORY ANALYTICAL RESULTS – BULK ASBESTOS**

# Bulk Asbestos Analysis

(EPA Method 600/M4-82-020, Visual Area Estimation)\*  
NVLAP Lab Code: 101459-1

Advanced Environmental Group, Inc.  
Lev Michaelian

1530 Via Tulipan  
San Clemente, CA 92673

**Client ID:** 5358  
**Report Number:** B313575  
**Date Received:** 02/08/21  
**Date Analyzed:** 02/15/21  
**Date Printed:** 02/15/21  
**First Reported:** 02/15/21

**Job ID/Site:** 2K20051; MiraCosta College San Elijo - Building 400, 3333 Manchester Ave,  
Cardiff, CA 92007

**Date(s) Collected:** 02/03/2021

**SGSFL Job ID:** 5358  
**Total Samples Submitted:** 80  
**Total Samples Analyzed:** 80

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>JG020421-1A</b>	51414284						
Layer: White Drywall			<b>ND</b>				
Layer: Drywall Tape			<b>ND</b>				
Layer: White Skimcoat/Joint Compounds			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (10 %)	Fibrous Glass (Trace)						
<b>JG020421-1B</b>	51414285						
Layer: White Drywall			<b>ND</b>				
Layer: Drywall Tape			<b>ND</b>				
Layer: White Skimcoat/Joint Compounds			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (10 %)	Fibrous Glass (Trace)						
<b>JG020421-1C</b>	51414286						
Layer: White Drywall			<b>ND</b>				
Layer: Drywall Tape			<b>ND</b>				
Layer: White Skimcoat/Joint Compounds			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (10 %)	Fibrous Glass (Trace)						
<b>JG020421-1D</b>	51414287						
Layer: White Drywall			<b>ND</b>				
Layer: Drywall Tape			<b>ND</b>				
Layer: White Skimcoat/Joint Compounds			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (10 %)	Fibrous Glass (Trace)						
<b>JG020421-1E</b>	51414288						
Layer: White Drywall			<b>ND</b>				
Layer: Drywall Tape			<b>ND</b>				
Layer: White Skimcoat/Joint Compounds			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (10 %)	Fibrous Glass (Trace)						

MM-20-020 SAN B400/B900 Renovations  
Attachment 2 to Addendum 3 - B400

**Report Number:** B313575

**Date Printed:** 02/15/21

**Client Name:** Advanced Environmental Group, Inc.

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>JG020421-1F</b>	51414289						
Layer: White Drywall			<b>ND</b>				
Layer: Drywall Tape			<b>ND</b>				
Layer: White Skimcoat/Joint Compounds			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (10 %)	Fibrous Glass (Trace)						
<b>JG020421-1G</b>	51414290						
Layer: White Drywall			<b>ND</b>				
Layer: Drywall Tape			<b>ND</b>				
Layer: White Skimcoat/Joint Compounds			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (10 %)	Fibrous Glass (Trace)						
<b>JG020421-2A</b>	51414291						
Layer: White Drywall			<b>ND</b>				
Layer: White Skimcoat/Joint Compound			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)	Fibrous Glass (Trace)						
<b>JG020421-2B</b>	51414292						
Layer: White Drywall			<b>ND</b>				
Layer: White Skimcoat/Joint Compound			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (5 %)	Fibrous Glass (Trace)						
<b>JG020421-2C</b>	51414293						
Layer: White Drywall			<b>ND</b>				
Layer: White Skimcoat/Joint Compound			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (20 %)	Fibrous Glass (Trace)						
<b>JG020421-3A</b>	51414294						
Layer: Tan Fibrous Material			<b>ND</b>				
Layer: Off-White Wallcovering			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (95 %)							
<b>JG020421-3B</b>	51414295						
Layer: Tan Fibrous Material			<b>ND</b>				
Layer: Off-White Wallcovering			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (95 %)							

MM-20-020 SAN B400/B900 Renovations  
Attachment 2 to Addendum 3 - B400

**Report Number:** B313575

**Date Printed:** 02/15/21

**Client Name:** Advanced Environmental Group, Inc.

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>JG020421-3C</b>	51414296						
Layer: Tan Fibrous Material			<b>ND</b>				
Layer: Off-White Wallcovering			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (95 %)							
<b>JG020421-4A</b>	51414297						
Layer: Beige Fibrous Material			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (35 %)    Fibrous Glass (45 %)							
<b>JG020421-4B</b>	51414298						
Layer: Beige Fibrous Material			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (35 %)    Fibrous Glass (45 %)							
<b>JG020421-4C</b>	51414299						
Layer: Beige Fibrous Material			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (35 %)    Fibrous Glass (45 %)							
<b>JG020421-4D</b>	51414300						
Layer: Beige Fibrous Material			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (35 %)    Fibrous Glass (45 %)							
<b>JG020421-4E</b>	51414301						
Layer: Beige Fibrous Material			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (35 %)    Fibrous Glass (45 %)							
<b>JG020421-4F</b>	51414302						
Layer: Beige Fibrous Material			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (35 %)    Fibrous Glass (45 %)							
<b>JG020421-4G</b>	51414303						
Layer: Beige Fibrous Material			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (35 %)    Fibrous Glass (45 %)							



MM-20-020 SAN B400/B900 Renovations  
Attachment 2 to Addendum 3 - B400

**Report Number:** B313575

**Date Printed:** 02/15/21

**Client Name:** Advanced Environmental Group, Inc.

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>JG020421-4H</b>	51414304						
Layer: Beige Fibrous Material			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (35 %)	Fibrous Glass (45 %)						
<b>JG020421-4I</b>	51414305						
Layer: Beige Fibrous Material			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (35 %)	Fibrous Glass (45 %)						
<b>JG020421-5A</b>	51414306						
Layer: Green Tile			<b>ND</b>				
Layer: Yellow Mastic			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-5B</b>	51414307						
Layer: Green Tile			<b>ND</b>				
Layer: Yellow Mastic			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-5C</b>	51414308						
Layer: Green Tile			<b>ND</b>				
Layer: Yellow Mastic			<b>ND</b>				
Layer: White Non-Fibrous Material			<b>ND</b>				
Layer: Grey Cementitious Material			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-5D</b>	51414309						
Layer: Green Tile			<b>ND</b>				
Layer: Yellow Mastic			<b>ND</b>				
Layer: White Non-Fibrous Material			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-5E</b>	51414310						
Layer: Green Tile			<b>ND</b>				
Layer: Yellow Mastic			<b>ND</b>				
Layer: White Non-Fibrous Material			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							

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Attachment 2 to Addendum 3 - B400

**Report Number:** B313575

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**Client Name:** Advanced Environmental Group, Inc.

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>JG020421-6A</b>	51414311						
Layer: Beige Tile			ND				
Layer: Yellow Mastic			ND				
Layer: Grey Cementitious Material			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-6B</b>	51414312						
Layer: Beige Tile			ND				
Layer: Yellow Mastic			ND				
Layer: Grey Cementitious Material			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-6C</b>	51414313						
Layer: Beige Tile			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-7A</b>	51414314						
Layer: Green Sheet Flooring			ND				
Layer: Fibrous Backing			ND				
Layer: Beige Mastic			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (20 %)    Fibrous Glass (5 %)    Synthetic (10 %)							
<b>JG020421-7B</b>	51414315						
Layer: Green Sheet Flooring			ND				
Layer: Fibrous Backing			ND				
Layer: Clear Mastic			ND				
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (20 %)    Fibrous Glass (5 %)    Synthetic (10 %)							
<b>JG020421-7C</b>	51414316						
Layer: Green Sheet Flooring			ND				
Layer: Fibrous Backing			ND				
Layer: Yellow Mastic			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (20 %)    Fibrous Glass (5 %)    Synthetic (10 %)							
<b>JG020421-7D</b>	51414317						
Layer: Green Sheet Flooring			ND				
Layer: Fibrous Backing			ND				
Layer: Clear Mastic			ND				
Layer: White Non-Fibrous Material			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (20 %)    Fibrous Glass (5 %)    Synthetic (10 %)							

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**Client Name:** Advanced Environmental Group, Inc.

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>JG020421-7E</b>	51414318						
Layer: Green Sheet Flooring			<b>ND</b>				
Layer: Fibrous Backing			<b>ND</b>				
Layer: Clear Mastic with Debris			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (20 %)	Fibrous Glass (5 %)	Synthetic (10 %)					
<b>JG020421-8A</b>	51414319						
Layer: Tan Mastic			<b>ND</b>				
Layer: Grey Cementitious Material			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-8B</b>	51414320						
Layer: Tan Mastic			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-8C</b>	51414321						
Layer: Tan Mastic			<b>ND</b>				
Layer: Grey Cementitious Material			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-8D</b>	51414322						
Layer: Tan Mastic			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-8E</b>	51414323						
Layer: Tan Mastic			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-9A</b>	51414324						
Layer: Grey Non-Fibrous Material			<b>ND</b>				
Layer: White Mastic			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Layer: White Skimcoat/Joint Compound			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-9B</b>	51414325						
Layer: Grey Non-Fibrous Material			<b>ND</b>				
Layer: Yellow Mastic			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Layer: White Skimcoat/Joint Compound			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							

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Client Name: Advanced Environmental Group, Inc.

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>JG020421-9C</b>	51414326						
Layer: Grey Non-Fibrous Material			ND				
Layer: White Mastic			ND				
Layer: Paint			ND				
Layer: White Skimcoat/Joint Compound			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>JG020421-10A</b>	51414327						
Layer: Green Non-Fibrous Material			ND				
Layer: Off-White Mastic			ND				
Layer: Paint			ND				
Layer: White Skimcoat/Joint Compound			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>JG020421-10B</b>	51414328						
Layer: Green Non-Fibrous Material			ND				
Layer: Off-White Mastic			ND				
Layer: Paint			ND				
Layer: White Skimcoat/Joint Compound			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>JG020421-10C</b>	51414329						
Layer: Green Non-Fibrous Material			ND				
Layer: Off-White Mastic			ND				
Layer: Paint			ND				
Layer: White Skimcoat/Joint Compound			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>JG020421-11A</b>	51414330						
Layer: Light Green Non-Fibrous Material			ND				
Layer: Off-White Mastic			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							
<b>JG020421-11B</b>	51414331						
Layer: Light Green Non-Fibrous Material			ND				
Layer: Off-White Mastic			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		Asbestos (ND)					
Cellulose (Trace)							

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**Client Name:** Advanced Environmental Group, Inc.

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>JG020421-11C</b>	51414332						
Layer: Light Green Non-Fibrous Material			<b>ND</b>				
Layer: Off-White Mastic			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-12A</b>	51414333						
Layer: Brown Non-Fibrous Material			<b>ND</b>				
Layer: Off-White Mastic			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Layer: White Skimcoat/Joint Compound			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-12B</b>	51414334						
Layer: Brown Non-Fibrous Material			<b>ND</b>				
Layer: Off-White Mastic			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Layer: White Skimcoat/Joint Compound			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-12C</b>	51414335						
Layer: Brown Non-Fibrous Material			<b>ND</b>				
Layer: Off-White Mastic			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Layer: White Skimcoat/Joint Compound			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-13A</b>	51414336						
Layer: Grey Cementitious Material			<b>ND</b>				
Layer: Brown Cementitious Material			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-13B</b>	51414337						
Layer: Grey Cementitious Material			<b>ND</b>				
Layer: Brown Cementitious Material			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-13C</b>	51414338						
Layer: Grey Cementitious Material			<b>ND</b>				
Layer: Brown Cementitious Material			<b>ND</b>				
Layer: Paint			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							



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**Client Name:** Advanced Environmental Group, Inc.

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>JG020421-13D</b>	51414339						
Layer: Grey Cementitious Material			ND				
Layer: Brown Cementitious Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-13E</b>	51414340						
Layer: Grey Cementitious Material			ND				
Layer: Brown Cementitious Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-13F</b>	51414341						
Layer: Grey Cementitious Material			ND				
Layer: Brown Cementitious Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-13G</b>	51414342						
Layer: Grey Cementitious Material			ND				
Layer: Brown Cementitious Material			ND				
Layer: Paint			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-14A</b>	51414343						
Layer: Grey Roof Shingles			ND				
Layer: Black Tars			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)	Fibrous Glass (15 %)						
<b>JG020421-14B</b>	51414344						
Layer: Grey Roof Shingles			ND				
Layer: Black Tars			ND				
Layer: Black Semi-Fibrous Tar			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)	Fibrous Glass (15 %)						
<b>JG020421-14C</b>	51414345						
Layer: Grey Roof Shingles			ND				
Layer: Black Tars			ND				
Layer: Black Semi-Fibrous Tar with Stones			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)	Fibrous Glass (15 %)						

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**Client Name:** Advanced Environmental Group, Inc.

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>JG020421-14D</b>	51414346						
Layer: Grey Roof Shingles			ND				
Layer: Black Tars			ND				
Layer: Black Semi-Fibrous Tar with Stones			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)	Fibrous Glass (15 %)						
<b>JG020421-14E</b>	51414347						
Layer: Grey Roof Shingle			ND				
Layer: Black Tar			ND				
Layer: Black Felt			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)	Fibrous Glass (2 %)	Synthetic (30 %)					
<b>JG020421-15A</b>	51414348						
Layer: Silver Paint			ND				
Layer: Black Semi-Fibrous Tar			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (7 %)	Fibrous Glass (2 %)						
<b>JG020421-15B</b>	51414349						
Layer: Silver Paint			ND				
Layer: Black Tar			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-15C</b>	51414350						
Layer: Silver Paint			ND				
Layer: Black Semi-Fibrous Tar			ND				
Layer: Stones			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (7 %)	Fibrous Glass (2 %)						
<b>JG020421-15D</b>	51414351						
Layer: Black Semi-Fibrous Tar			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (10 %)							
<b>JG020421-15E</b>	51414352						
Layer: Black Semi-Fibrous Tar w/ Silver Paint			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (10 %)							
<b>JG020421-16A</b>	51414353						
Layer: Black Felt			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Fibrous Glass (35 %)							
<b>JG020421-16B</b>	51414354						
Layer: Black Felt			ND				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Fibrous Glass (35 %)							

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**Client Name:** Advanced Environmental Group, Inc.

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
<b>JG020421-16C</b>	51414355						
Layer: Black Felt			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Fibrous Glass (35 %)							
<b>JG020421-16D</b>	51414356						
Layer: Black Felt			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Fibrous Glass (35 %)							
<b>JG020421-16E</b>	51414357						
Layer: Black Felt			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Fibrous Glass (35 %)							
<b>JG020421-17A</b>	51414358						
Layer: White Coating			<b>ND</b>				
Layer: Black Semi-Fibrous Tar			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (5 %)	Synthetic (Trace)						
<b>JG020421-17B</b>	51414359						
Layer: White Coating			<b>ND</b>				
Layer: Black Semi-Fibrous Tar			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (5 %)	Synthetic (Trace)						
<b>JG020421-17C</b>	51414360						
Layer: White Coating			<b>ND</b>				
Layer: Black Semi-Fibrous Tar			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (5 %)	Synthetic (Trace)						
<b>JG020421-18A</b>	51414361						
Layer: Grey Cementitious Material			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-18B</b>	51414362						
Layer: Grey Cementitious Material with Debris			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							
<b>JG020421-18C</b>	51414363						
Layer: Grey Cementitious Material			<b>ND</b>				
Total Composite Values of Fibrous Components:		<b>Asbestos (ND)</b>					
Cellulose (Trace)							

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**Client Name:** Advanced Environmental Group, Inc.

**Report Number:** B313575

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Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
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Tiffani Ludd, Laboratory Supervisor, Carson Laboratory

**Note: Limit of Quantification ('LOQ') = 1%. 'Trace' denotes the presence of asbestos below the LOQ. 'ND' = 'None Detected'.**

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\* Note: This report is in compliance with EPA method 600/R-93-116 and EPA Method 40CFR, Part 763, Appendix E to Subpart E.

Client Name & Address: Advanced Environmental Group, Inc. 1530 Via Tulipan, San Clemente CA 92673		Client No.:	PO / Job#: 2K20051	Date: 2/4/21
Contact: Matt Michaelian		Phone: (949) 361-7797	Turn Around Time: <input type="checkbox"/> Same Day / <input type="checkbox"/> 1Day / <input type="checkbox"/> 2Day / <input type="checkbox"/> 3Day / <input type="checkbox"/> 4Day / <input checked="" type="checkbox"/> 5Day	
E-mail: mmichaelian@aegconsultants.com		<input type="checkbox"/> PCM: <input type="checkbox"/> NIOSH 7400A / <input type="checkbox"/> NIOSH 7400B <input type="checkbox"/> Rotometer <input checked="" type="checkbox"/> PLM: <input checked="" type="checkbox"/> Standard / <input type="checkbox"/> Point Count 400-1000 / <input type="checkbox"/> CARB 435		
Site Name: MiraCosta College San Elijo - Building 400		<input type="checkbox"/> TEM Air: <input type="checkbox"/> AHERA / <input type="checkbox"/> Yamate2 / <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> TEM Bulk: <input type="checkbox"/> Quantitative / <input type="checkbox"/> Qualitative / <input type="checkbox"/> Chatfield <input type="checkbox"/> TEM Water: <input type="checkbox"/> Potable / <input type="checkbox"/> Non-Potable / <input type="checkbox"/> Weight % <input type="checkbox"/> TEM Microvac: <input type="checkbox"/> Qual / <input type="checkbox"/> D5755(str/area) / <input type="checkbox"/> D5756(str/mass)		
Site Location: 3333 Manchester Ave, Cardiff, CA 92007		<input type="checkbox"/> IAQ Particle Identification (PLM LAB) <input type="checkbox"/> PLM Opaques/Soot <input type="checkbox"/> Particle Identification (TEM LAB) <input type="checkbox"/> Special Project <input type="checkbox"/> Metals Analysis Matrix: Method: Analytes:		

Comments:  Silica in Air  w/Gravimetry  Quartz Only

Sample ID	Date / Time	Sample Location / Description	FOR AIR SAMPLES ONLY				Sample Area / Air Volume
			Type	Time On/Off	Avg LPM	Total Time	
JG020421-1A	2/4/21	Room 401, NE Wall, Drvwall/Joint Compound	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> E				
JG020421-1B		Room 402, NW Wall @ Window, Drvwall/Joint Compound	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> E				
JG020421-1C		Room 402, SW Wall @ Window, Drvwall/Joint Compound	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> E				
JG020421-1D		Room 403, NW Wall, Drvwall/Joint Compound	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> E				
JG020421-1E		Room 404, SE Wall @ Door, Drvwall/Joint Compound	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> E				
JG020421-1F		Room 405, NW Wall, Drvwall/Joint Compound	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> E				
JG020421-1G		Room 406, East Wall @ Window, Drvwall/Joint Compound	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> E				
JG020421-2A		Room 406, SE Soffit, Drvwall/Joint Compound	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> E				
JG020421-2B		Room 406, South Soffit, Drvwall/Joint Compound	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> E				
JG020421-2C		Room 406, East Soffit, Drvwall/Joint Compound	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> E				

Sampled By: John Gibson	Date/Time: 2/3/21	Shipped Via: <input checked="" type="checkbox"/> Fed Ex <input type="checkbox"/> UPS <input type="checkbox"/> US Mail <input type="checkbox"/> Courier <input type="checkbox"/> Drop Off <input type="checkbox"/> Other:		
Relinquished By:	Date / Time: 2/5/21 4:30pm	Relinquished By:	Date / Time:	Relinquished By:
Received By:	Date / Time: 2-8-21 8:35am PLE	Received By:	Date / Time:	Received By:
Condition Acceptable? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No		Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No



Client Name & Address: Advanced Environmental Group, Inc. 1530 Via Tulipan, San Clemente CA 92673		Client No.:	PO / Job#: 2K20051	Date: 2/4/21
Contact: Matt Michaelian		Phone: (949) 361-7797	Turn Around Time: <input type="checkbox"/> Same Day / <input type="checkbox"/> 1Day / <input type="checkbox"/> 2Day / <input type="checkbox"/> 3Day / <input type="checkbox"/> 4Day / <input checked="" type="checkbox"/> 5Day	
E-mail: mmichaelian@aegconsultants.com		<input type="checkbox"/> PCM: <input type="checkbox"/> NIOSH 7400A / <input type="checkbox"/> NIOSH 7400B <input type="checkbox"/> Rotometer <input checked="" type="checkbox"/> PLM: <input checked="" type="checkbox"/> Standard / <input type="checkbox"/> Point Count 400-1000 / <input type="checkbox"/> CARB 435		
Site Name: MiraCosta College San Elijo - Building 400		<input type="checkbox"/> TEM Air: <input type="checkbox"/> AHERA / <input type="checkbox"/> Yamate2 / <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> TEM Bulk: <input type="checkbox"/> Quantitative / <input type="checkbox"/> Qualitative / <input type="checkbox"/> Chatfield <input type="checkbox"/> TEM Water: <input type="checkbox"/> Potable / <input type="checkbox"/> Non-Potable / <input type="checkbox"/> Weight % <input type="checkbox"/> TEM Microvac: <input type="checkbox"/> Qual / <input type="checkbox"/> D5755(str/area) / <input type="checkbox"/> D5756(str/mass)		
Site Location: 3333 Manchester Ave, Cardiff, CA 92007		<input type="checkbox"/> IAQ Particle Identification (PLM LAB) <input type="checkbox"/> PLM Opaques/Soot <input type="checkbox"/> Particle Identification (TEM LAB) <input type="checkbox"/> Special Project <input type="checkbox"/> Metals Analysis Matrix: Method: Analytes:		

Comments:  Silica in Air  w/Gravimetry  Quartz Only

Sample ID	Date / Time	Sample Location / Description	FOR AIR SAMPLES ONLY				Sample Area / Air Volume
			Type	Time On/Off	Avg LPM	Total Time	
JG020421-3A	2/4/21	Room 406, North Wall, West, Fiberboard	IA P C				
JG020421-3B		Room 406, North Wall, Center, Fiberboard	IA P C				
JG020421-3C		Room 406, North Wall, East, Fiberboard	IA P C				
JG020421-4A		Room 401, NE Ceiling, Acoustic Ceiling Tile	IA P C				
JG020421-4B		Room 401, SE Ceiling, Acoustic Ceiling Tile	IA P C				
JG020421-4C		Room 402, NE Ceiling, Acoustic Ceiling Tile	IA P C				
JG020421-4D		Room 402, SE Ceiling, Acoustic Ceiling Tile	IA P C				
JG020421-4E		Room 404, SE Ceiling, Acoustic Ceiling Tile	IA P C				
JG020421-4F		Room 406, NW Ceiling, Acoustic Ceiling Tile	IA P C				
JG020421-4G		Room 406, SE Ceiling, Acoustic Ceiling Tile	IA P C				

Sampled By: John Gibson	Date/Time: 2/3/21	Shipped Via: <input checked="" type="checkbox"/> Fed Ex <input type="checkbox"/> UPS <input type="checkbox"/> US Mail <input type="checkbox"/> Courier <input type="checkbox"/> Drop Off <input type="checkbox"/> Other:
Relinquished By: <i>[Signature]</i>	Relinquished By:	Relinquished By:
Date / Time: 2/5/21 4:30pm	Date / Time:	Date / Time:
Received By: <i>[Signature]</i>	Received By:	Received By:
Date / Time: 2-8-21 8:35am P/E	Date / Time:	Date / Time:
Condition Acceptable? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No

Client Name & Address: Advanced Environmental Group, Inc. 1530 Via Tulipan, San Clemente CA 92673		Client No.:	PO / Job#: 2K20051	Date: 2/4/21
Contact: Matt Michaelian		Phone: (949) 361-7797	Turn Around Time: <input type="checkbox"/> Same Day / <input type="checkbox"/> 1Day / <input type="checkbox"/> 2Day / <input type="checkbox"/> 3Day / <input type="checkbox"/> 4Day / <input checked="" type="checkbox"/> 5Day	
E-mail: mmichaelian@aegconsultants.com		<input type="checkbox"/> PCM: <input type="checkbox"/> NIOSH 7400A / <input type="checkbox"/> NIOSH 7400B <input type="checkbox"/> Rotometer <input checked="" type="checkbox"/> PLM: <input checked="" type="checkbox"/> Standard / <input type="checkbox"/> Point Count 400-1000 / <input type="checkbox"/> CARB 435		
Site Name: MiraCosta College San Elijo - Building 400		<input type="checkbox"/> TEM Air: <input type="checkbox"/> AHERA / <input type="checkbox"/> Yamate2 / <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> TEM Bulk: <input type="checkbox"/> Quantitative / <input type="checkbox"/> Qualitative / <input type="checkbox"/> Chatfield <input checked="" type="checkbox"/> TEM Water: <input type="checkbox"/> Potable / <input type="checkbox"/> Non-Potable / <input type="checkbox"/> Weight % <input checked="" type="checkbox"/> TEM Microvac: <input type="checkbox"/> Qual / <input checked="" type="checkbox"/> D5755(str/area) / <input type="checkbox"/> D5756(str/mass)		
Site Location: 3333 Manchester Ave, Cardiff, CA 92007		<input type="checkbox"/> IAQ Particle Identification (PLM LAB) <input type="checkbox"/> PLM Opaques/Soot <input type="checkbox"/> Particle Identification (TEM LAB) <input type="checkbox"/> Special Project		
Comments:		<input type="checkbox"/> Metals Analysis Matrix: Method: Analytes:		

Silica in Air  w/Gravimetry  
 Quartz Only

Sample ID	Date / Time	Sample Location / Description	FOR AIR SAMPLES ONLY				Sample Area / Air Volume
			Type	Time On/Off	Avg LPM	Total Time	
JG020421-4H	2/4/21	Room 407, NW Ceiling, Acoustic Ceiling Tile	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-4I		Room 407, NE Ceiling, Acoustic Ceiling Tile	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-5A		Room 402, NW Floor, Vinyl Floor Tile/Mastic (Green Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-5B		Room 402, Center Floor, Vinyl Floor Tile/Mastic (Green Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-5C		Room 406, SW Floor, Vinyl Floor Tile/Mastic (Green Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-5D		Room 406, Center Floor, Vinyl Floor Tile/Mastic (Green Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-5E		Room 406, East Floor, Vinyl Floor Tile/Mastic (Green Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-6A		Room 406, South Floor, Vinyl Floor Tile/Mastic (Beige Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-6B		Room 406, Center Floor, Vinyl Floor Tile/Mastic (Beige Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-6C		Room 406, North Floor, Vinyl Floor Tile/Mastic (Beige Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				

Sampled By: John Gibson Date/Time: 2/3/21 Shipped Via:  Fed Ex  UPS  US Mail  Courier  Drop Off  Other:

Relinquished By:	Relinquished By:	Relinquished By:
Date / Time: 2/3/21 4:30pm	Date / Time:	Date / Time:

Received By:	Received By:	Received By:
Date / Time: 2-8-21 8:55am FUE	Date / Time:	Date / Time:
Condition Acceptable? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No



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Analysis Request Form (COC)

Client Name & Address: Advanced Environmental Group, Inc. 1530 Via Tulipan, San Clemente CA 92673		Client No.:	PO / Job#: 2K20051	Date: 2/4/21
Contact: Matt Michaelian		Phone: (949) 361-7797	Turn Around Time: Same Day / 1Day / 2Day / 3Day / 4Day / 5Day <input checked="" type="checkbox"/>	
E-mail: mmichaelian@aegconsultants.com		<input type="checkbox"/> PCM: <input type="checkbox"/> NIOSH 7400A / <input type="checkbox"/> NIOSH 7400B <input type="checkbox"/> Rotometer <input checked="" type="checkbox"/> PLM: <input checked="" type="checkbox"/> Standard / <input type="checkbox"/> Point Count 400-1000 / <input type="checkbox"/> CARB 435		
Site Name: MiraCosta College San Elijo - Building 400		<input type="checkbox"/> TEM Air: <input type="checkbox"/> AHERA / <input type="checkbox"/> Yamate2 / <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> TEM Bulk: <input type="checkbox"/> Quantitative / <input type="checkbox"/> Qualitative / <input type="checkbox"/> Chatfield <input checked="" type="checkbox"/> TEM Water: <input checked="" type="checkbox"/> Potable / <input type="checkbox"/> Non-Potable / <input type="checkbox"/> Weight % <input checked="" type="checkbox"/> TEM Microvac: <input checked="" type="checkbox"/> Qual / <input type="checkbox"/> D5755(str/area) / <input type="checkbox"/> D5756(str/mass)		
Site Location: 3333 Manchester Ave, Cardiff, CA 92007		<input type="checkbox"/> IAQ Particle Identification (PLM LAB) <input type="checkbox"/> PLM Opaques/Soot <input type="checkbox"/> Particle Identification (TEM LAB) <input type="checkbox"/> Special Project <input type="checkbox"/> Metals Analysis Matrix: Method: Analytes:		

Comments:  Silica in Air  w/Gravimetry  Quartz Only

Sample ID	Date / Time	Sample Location / Description	FOR AIR SAMPLES ONLY				Sample Area / Air Volume
			Type	Time On/Off	Avg LPM	Total Time	
JG020421-7A	2/4/21	Room 402A, NE Floor, Vinyl Sheet Flooring/Mastic (Green Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-7B		Room 404, East Floor, Vinyl Sheet Flooring/Mastic (Green Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-7C		Room 404, North Floor, Vinyl Sheet Flooring/Mastic (Green Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-7D		Room 406A, SE Floor, Vinyl Sheet Flooring/Mastic (Green Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-7E		Room 406B, SE Floor, Vinyl Sheet Flooring/Mastic (Green Sock)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-8A		Room 401, Floor @ Door, Carpet Adhesive	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-8B		Room 403, Floor @ Door, Carpet Adhesive	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-8C		Room 405, Floor @ Door, Carpet Adhesive	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-8D		Room 407, Floor @ Door, Carpet Adhesive	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-8E		Room 407, North Floor, Carpet Adhesive	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				

Sampled By: John Gibson	Date/Time: 2/3/21	Shipped Via: <input checked="" type="checkbox"/> Fed Ex <input type="checkbox"/> UPS <input type="checkbox"/> US Mail <input type="checkbox"/> Courier <input type="checkbox"/> Drop Off <input type="checkbox"/> Other:
Relinquished By:	Relinquished By:	Relinquished By:
Date / Time: 2/5/21 4:30pm	Date / Time:	Date / Time:
Received By:	Received By:	Received By:
Date / Time: 2-8-21 8:35am FUE	Date / Time:	Date / Time:
Condition Acceptable? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No



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Analysis Request Form (COC)

Client Name & Address: Advanced Environmental Group, Inc. 1530 Via Tulipan, San Clemente CA 92673		Client No.:	PO / Job#: 2K20051	Date: 2/4/21
Contact: Matt Michaelian		Phone: (949) 361-7797	Turn Around Time: <input type="checkbox"/> Same Day / <input type="checkbox"/> 1Day / <input type="checkbox"/> 2Day / <input type="checkbox"/> 3Day / <input type="checkbox"/> 4Day / <input checked="" type="checkbox"/> 5Day	
E-mail: mmichaelian@aegconsultants.com		<input type="checkbox"/> PCM: <input type="checkbox"/> NIOSH 7400A / <input type="checkbox"/> NIOSH 7400B <input type="checkbox"/> Rotometer <input checked="" type="checkbox"/> PLM: <input checked="" type="checkbox"/> Standard / <input type="checkbox"/> Point Count 400-1000 / <input type="checkbox"/> CARB 435		
Site Name: MiraCosta College San Elijo - Building 400		<input type="checkbox"/> TEM Air: <input type="checkbox"/> AHERA / <input type="checkbox"/> Yamate2 / <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> TEM Bulk: <input type="checkbox"/> Quantitative / <input type="checkbox"/> Qualitative / <input type="checkbox"/> Chatfield <input type="checkbox"/> TEM Water: <input type="checkbox"/> Potable / <input type="checkbox"/> Non-Potable / <input type="checkbox"/> Weight % <input type="checkbox"/> TEM Microvac: <input type="checkbox"/> Qual / <input type="checkbox"/> D5755(str/area) / <input type="checkbox"/> D5756(str/mass)		
Site Location: 3333 Manchester Ave, Cardiff, CA 92007		<input type="checkbox"/> IAQ Particle Identification (PLM LAB) <input type="checkbox"/> PLM Opaques/Soot <input type="checkbox"/> Particle Identification (TEM LAB) <input type="checkbox"/> Special Project <input type="checkbox"/> Metals Analysis Matrix: Method: Analytes:		

Comments:  Silica in Air  w/Gravimetry  Quartz Only

Sample ID	Date / Time	Sample Location / Description	FOR AIR SAMPLES ONLY				Sample Area / Air Volume
			Type	Time On/Off	Avg LPM	Total Time	
JG020421-9A	2/4/21	Room 406, SW Lower Floor, Vinyl Cove Base/Adhesive (Grey)	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-9B		Room 406, NW Lower Floor, Vinyl Cove Base/Adhesive (Grey)	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-9C		Room 406, East Lower Floor, Vinyl Cove Base/Adhesive (Grey)	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-10A		Room 402B, North Lower Floor, Vinyl Cove Base/Adhesive (Dark Green)	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-10B		Room 404, NE Lower Floor, Vinyl Cove Base/Adhesive (Dark Green)	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-10C		Room 406B, West Lower Floor, Vinyl Cove Base/Adhesive (Dark Green)	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-11A		Room 402, NE Lower Floor, Vinyl Cove Base/Adhesive (Light Green)	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-11B		Room 402, North Lower Floor, Vinyl Cove Base/Adhesive (Light Green)	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-11C		Room 402, SE Lower Floor, Vinyl Cove Base/Adhesive (Light Green)	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-12A		Room 401, North Lower Floor, Vinyl Cove Base/Adhesive (Tan)	<input checked="" type="checkbox"/> IA <input type="checkbox"/> P <input type="checkbox"/> F				

Sampled By: John Gibson	Date/Time: 2/3/21	Shipped Via: <input checked="" type="checkbox"/> Fed Ex <input type="checkbox"/> UPS <input type="checkbox"/> US Mail <input type="checkbox"/> Courier <input type="checkbox"/> Drop Off <input type="checkbox"/> Other:
Relinquished By:	Relinquished By:	Relinquished By:
Date / Time: 2/5/21 4:30pm	Date / Time:	Date / Time:
Received By:	Received By:	Received By:
Date / Time: 2-8-21 8:35am FIE	Date / Time:	Date / Time:
Condition Acceptable? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No

Client Name & Address: Advanced Environmental Group, Inc. 1530 Via Tulipan, San Clemente CA 92673		Client No.:	PO / Job#: 2K20051	Date: 2/4/21
Contact: Matt Michaelian		Phone: (949) 361-7797	Turn Around Time: Same Day / 1Day / 2Day / 3Day / 4Day / <input checked="" type="checkbox"/> 5Day	
E-mail: mmichaelian@aegconsultants.com		<input type="checkbox"/> PCM: <input type="checkbox"/> NIOSH 7400A / <input type="checkbox"/> NIOSH 7400B <input type="checkbox"/> Rotometer <input checked="" type="checkbox"/> PLM: <input checked="" type="checkbox"/> Standard / <input type="checkbox"/> Point Count 400-1000 / <input type="checkbox"/> CARB 435		
Site Name: MiraCosta College San Elijo - Building 400		<input type="checkbox"/> TEM Air: <input type="checkbox"/> AHERA / <input type="checkbox"/> Yamate2 / <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> TEM Bulk: <input type="checkbox"/> Quantitative / <input type="checkbox"/> Qualitative / <input type="checkbox"/> Chatfield <input type="checkbox"/> TEM Water: <input type="checkbox"/> Potable / <input type="checkbox"/> Non-Potable / <input type="checkbox"/> Weight % <input type="checkbox"/> TEM Microvac: <input type="checkbox"/> Qual / <input type="checkbox"/> D5755(str/area) / <input type="checkbox"/> D5756(str/mass)		
Site Location: 3333 Manchester Ave, Cardiff, CA 92007		<input type="checkbox"/> IAQ Particle Identification (PLM LAB) <input type="checkbox"/> PLM Opaques/Soot <input type="checkbox"/> Particle Identification (TEM LAB) <input type="checkbox"/> Special Project <input type="checkbox"/> Metals Analysis Matrix: Method: Analytes:		

Comments:  Silica in Air  w/Gravimetry  Quartz Only

Sample ID	Date / Time	Sample Location / Description	FOR AIR SAMPLES ONLY				Sample Area / Air Volume
			Type	Time On/Off	Avg LPM	Total Time	
JG020421-12B	2/4/21	Room 403, North Lower Floor, Vinyl Cove Base/Adhesive (Tan)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-12C		Room 407, North Lower Floor, Vinyl Cove Base/Adhesive (Tan)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-13A		Exterior, South Wall @ SE Door, Stucco	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-13B		Exterior, West Wall @ SW Window, Stucco	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-13C		Exterior, West Wall @ NW Window, Stucco	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-13D		Exterior, North Wall @ New West Door Proneal Stucco	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-13E		Exterior, North Wall @ New East Door Proneal Stucco	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-13F		Exterior, SE Roof, North Parapet, Stucco	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-13G		Exterior, SE Roof, NE Parapet, Stucco	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-14A		Exterior, Main Roof, South, Built-up Roofing Material	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				

Sampled By: John Gibson	Date/Time: 2/3/21	Shipped Via: <input checked="" type="checkbox"/> Fed Ex <input type="checkbox"/> UPS <input type="checkbox"/> US Mail <input type="checkbox"/> Courier <input type="checkbox"/> Drop Off <input type="checkbox"/> Other:	
Relinquished By:	Date / Time: 2/5/21 4:30pm	Relinquished By:	Date / Time:
Received By:	Date / Time: 2-8-21 8:35am FIE	Received By:	Date / Time:
Condition Acceptable? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No





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Client Name & Address: Advanced Environmental Group, Inc. 1530 Via Tulipan, San Clemente CA 92673		Client No.:	PO / Job#: 2K20051	Date: 2/4/21
Contact: Matt Michaelian		Phone: (949) 361-7797	Turn Around Time: Same Day / 1Day / 2Day / 3Day / 4Day / 5Day	
E-mail: mmichaelian@aegconsultants.com		<input type="checkbox"/> PCM: <input type="checkbox"/> NIOSH 7400A / <input type="checkbox"/> NIOSH 7400B <input type="checkbox"/> Rotometer <input checked="" type="checkbox"/> PLM: <input checked="" type="checkbox"/> Standard / <input type="checkbox"/> Point Count 400 - 1000 / <input type="checkbox"/> CARB 435		
Site Name: MiraCosta College San Elijo - Building 400		<input type="checkbox"/> TEM Air: <input type="checkbox"/> AHERA / <input type="checkbox"/> Yamate2 / <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> TEM Bulk: <input type="checkbox"/> Quantitative / <input type="checkbox"/> Qualitative / <input type="checkbox"/> Chatfield <input type="checkbox"/> TEM Water: <input type="checkbox"/> Potable / <input type="checkbox"/> Non-Potable / <input type="checkbox"/> Weight % <input type="checkbox"/> TEM Microvac: <input type="checkbox"/> Qual / <input type="checkbox"/> D5755(str/area) / <input type="checkbox"/> D5756(str/mass)		
Site Location: 3333 Manchester Ave, Cardiff, CA 92007		<input type="checkbox"/> IAQ Particle Identification (PLM LAB) <input type="checkbox"/> PLM Opaques/Soot <input type="checkbox"/> Particle Identification (TEM LAB) <input type="checkbox"/> Special Project <input type="checkbox"/> Metals Analysis Matrix: Method: Analytes:		

Comments:  Silica in Air  w/Gravimetry  Quartz Only

Sample ID	Date / Time	Sample Location / Description	FOR AIR SAMPLES ONLY				Sample Area / Air Volume
			Type	Time On/Off	Avg LPM	Total Time	
JG020421-14B	2/4/21	Exterior, Main Roof, East, Built-up Roofing Material	A P E				
JG020421-14C		Exterior, Main Roof, North, Built-up Roofing Material	A P E				
JG020421-14D		Exterior, Main Roof, West, Built-up Roofing Material	A P E				
JG020421-14E		Exterior, Main Roof, Center, Built-up Roofing Material	A P E				
JG020421-15A		Exterior, Main Roof @ East Skylight, Penetration Mastic (Black)	A P E				
JG020421-15B		Exterior, Main Roof @ West Skylight, Penetration Mastic (Black)	A P E				
JG020421-15C		Exterior, Main Roof @ Round Vent, Penetration Mastic (Black)	A P E				
JG020421-15D		Exterior, Main Roof @ Drainage Perimeter, Penetration Mastic (Black)	A P E				
JG020421-15E		Exterior, Main Roof @ Vertical Vent System, Penetration Mastic (Black)	A P E				
JG020421-16A		Exterior, SW Tile Roof, Roofing Fall	A P E				

Sampled By: John Gibson	Date/Time: 2/3/21	Shipped Via: <input checked="" type="checkbox"/> Fed Ex <input type="checkbox"/> UPS <input type="checkbox"/> US Mail <input type="checkbox"/> Courier <input type="checkbox"/> Drop Off <input type="checkbox"/> Other:			
Relinquished By:	Date / Time: 2/5/21 4:30pm	Relinquished By:	Date / Time:	Relinquished By:	Date / Time:
Received By:	Date / Time: 2-8-21 8:35am FIE	Received By:	Date / Time:	Received By:	Date / Time:
Condition Acceptable? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No



FORENSIC  
LABORATORIES

Client Name & Address: Advanced Environmental Group, Inc. 1530 Via Tulipan, San Clemente CA 92673		Client No.:	PO / Job#: 2K20051	Date: 2/4/21
Contact: Matt Michaelian		Phone: (949) 361-7797	Turn Around Time: Same Day / <input type="checkbox"/> 1Day / <input type="checkbox"/> 2Day / <input type="checkbox"/> 3Day / <input type="checkbox"/> 4Day / <input checked="" type="checkbox"/> 5Day	
E-mail: mmichaelian@aegconsultants.com		<input type="checkbox"/> PCM: <input type="checkbox"/> NIOSH 7400A / <input type="checkbox"/> NIOSH 7400B <input type="checkbox"/> Rotometer <input checked="" type="checkbox"/> PLM: <input checked="" type="checkbox"/> Standard / <input type="checkbox"/> Point Count 400-1000 / <input type="checkbox"/> CARB 435		
Site Name: MiraCosta College San Elijo - Building 400		<input type="checkbox"/> TEM Air: <input type="checkbox"/> AHERA / <input type="checkbox"/> Yamate2 / <input type="checkbox"/> NIOSH 7402 <input type="checkbox"/> TEM Bulk: <input type="checkbox"/> Quantitative / <input type="checkbox"/> Qualitative / <input type="checkbox"/> Chatfield <input checked="" type="checkbox"/> TEM Water: <input type="checkbox"/> Potable / <input type="checkbox"/> Non-Potable / <input type="checkbox"/> Weight % <input checked="" type="checkbox"/> TEM Microvac: <input type="checkbox"/> Qual / <input type="checkbox"/> D5755(str/area) / <input type="checkbox"/> D5756(str/mass)		
Site Location: 3333 Manchester Ave, Cardiff, CA 92007		<input type="checkbox"/> IAG Particle Identification (PLM LAB) <input type="checkbox"/> PLM Opaques/Soot <input type="checkbox"/> Particle Identification (TEM LAB) <input type="checkbox"/> Special Project <input type="checkbox"/> Metals Analysis Matrix: Method: Analytes:		

Comments:  Silica in Air  w/Gravimetry  Quartz Only

Sample ID	Date / Time	Sample Location / Description	FOR AIR SAMPLES ONLY				Sample Area / Air Volume
			Type	Time On/Off	Avg LPM	Total Time	
JG020421-16B	2/4/21	Exterior, SW Tile Roof, Roofina Felt	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-16C		Exterior, SW Tile Roof, Roofina Felt	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-16D		Exterior, SW Tile Roof, Roofina Felt	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-16E		Exterior, SW Tile Roof, Roofina Felt	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-17A		Exterior, East Tile Roof, Roofina Sealant (White)/Roofina Mastic (Black)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-17B		Exterior, East Tile Roof, Roofina Sealant (White)/Roofina Mastic (Black)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-17C		Exterior, East Tile Roof, Roofina Sealant (White)/Roofina Mastic (Black)	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-18A		Room 402, Floor, Concrete Slab	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-18B		Mechanical Room 408, Floor, Concrete Slab	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				
JG020421-18C		Mechanical Room 408, Floor, Concrete Slab	<input checked="" type="checkbox"/> A <input type="checkbox"/> P <input type="checkbox"/> F				

Sampled By: John Gibson	Date/Time: 2/3/21	Shipped Via: <input checked="" type="checkbox"/> Fed Ex <input type="checkbox"/> UPS <input type="checkbox"/> US Mail <input type="checkbox"/> Courier <input type="checkbox"/> Drop Off <input type="checkbox"/> Other:
Relinquished By:	Relinquished By:	Relinquished By:
Date / Time: 2/5/21 4:30pm	Date / Time:	Date / Time:
Received By:	Received By:	Received By:
Date / Time: 2-8-21 8:35am FIE	Date / Time:	Date / Time:
Condition Acceptable? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No	Condition Acceptable? <input type="checkbox"/> Yes <input type="checkbox"/> No

**APPENDIX B**

**POTENTIAL DISTURBANCE FACTORS**

<b>POTENTIAL DISTURBANCE FACTORS</b>			
<b>Disturbance Contact:</b>	<b>Hi</b>	<b>Rating Moderate</b>	<b>Lo</b>
Maintenance, custodial workers in vicinity more than once a week	X		
Maintenance, custodial workers in vicinity only once a month		X	
Maintenance or custodial workers in vicinity less than once a month			X
ACM in public area where tenants, public have access (hallway, lobby), corridor, public office, cafeteria	X		
ACM in room or office where tenant has access		X	
ACM is visible but not within reach of tenants			X
<b>Vibration</b>			
Loud motors engines (fan room)	X		
Intrusive noises, easily sensed vibrations (street traffic)		X	
Motors, engines present but not obtrusive (ducts vibrating)			X
None of above			X
<b><u>Any high</u></b> rating among contact, vibration or air erosion factors defines HIGH POTENTIAL FOR DISTURBANCE.			
<b><u>No high</u></b> rating but <b><u>any moderate</u></b> rating among these factors defines MODERATE POTENTIAL FOR DISTURBANCE.			
<b><u>Only low</u></b> ratings among those factors defines: LOW POTENTIAL FOR DISTURBANCE.			

**APPENDIX C**

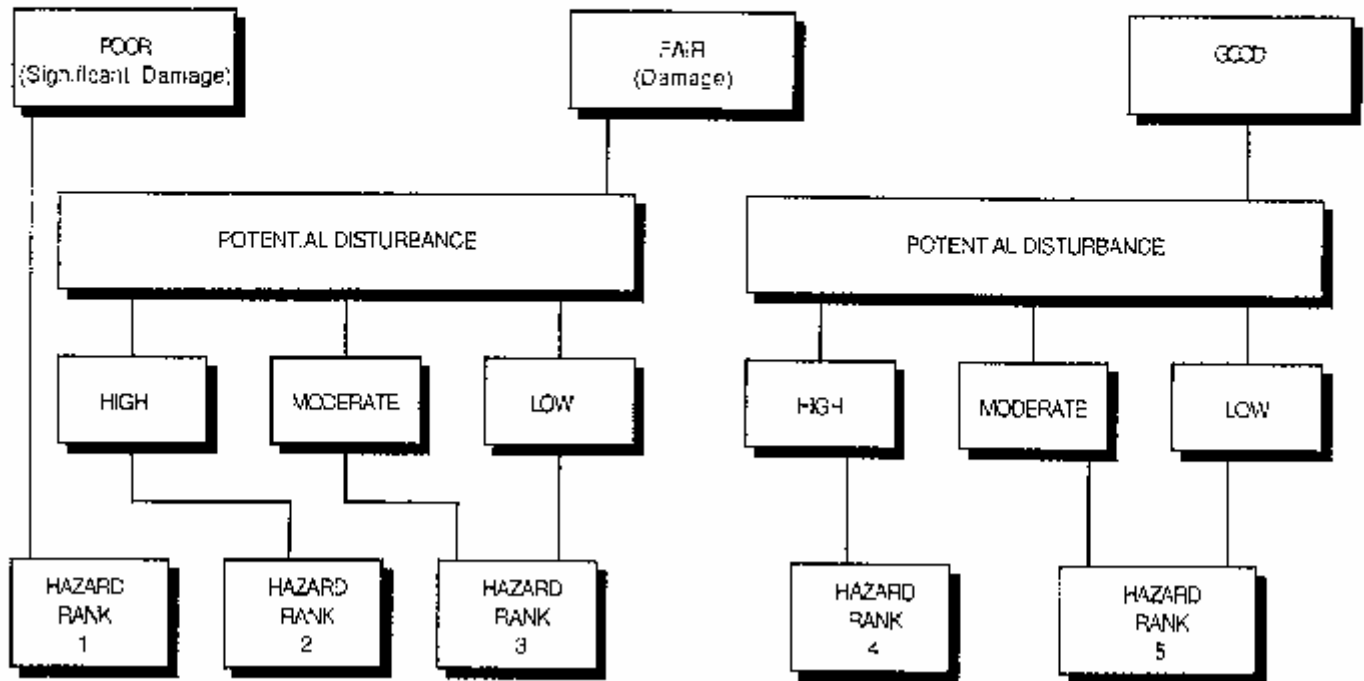
**CLASSIFICATION OF HAZARD POTENTIAL**



A decision tree display of classification for Hazard Potential follows.

### DECISION TREE DISPLAY

ACM CONDITION



**APPENDIX D**

**PRIORITY RESPONSE ACTIONS**

**PRIORITY RESPONSE ACTIONS BASED ON HAZARD RANKING**

Recommendation priority response actions are based on hazard ranking numbers that are derived by assessing ACM conditions as poor, fair, or good, and potential disturbance as high, moderate, or low, and assigning a value accordingly, thus,

Poor condition .....	ranks 1
Fair condition, high potential disturbance.....	ranks 2
Fair condition, moderate or low potential disturbance .....	ranks 3
Good condition, high potential disturbance .....	ranks 4
Good condition, moderate or low potential disturbance .....	ranks 5

Recommended response to these rankings follow:

**Hazard Rank**

**Recommended Response**

1

- Evacuate, isolate
- Remove, enclose or encapsulate ACM
- Develop and implement an Operations and Maintenance (O&M) program to manage ACM in place
- Periodic Surveillance and air monitoring
- Post OSHA warnings if friable asbestos remains.

2

- Reduce potential disturbance
- Remove, enclose or encapsulate ACM
- Develop and implement an Operations and Maintenance (O&M) program to manage ACM in place
- Periodic surveillance and air monitoring
- Post OSHA warnings if friable asbestos remains

Recommended response to these rankings follow: (Continued)

<u>Hazard Rank</u>	<u>Recommended Response</u>
3	<ul style="list-style-type: none"><li>• Reduce potential disturbance</li><li>• Develop and implement an Operations and Maintenance (O&amp;M) program to manage ACM in place</li><li>• Periodic surveillance and air monitoring</li><li>• Post OSHA warnings if friable asbestos remains.</li></ul>
4	<ul style="list-style-type: none"><li>• Develop and implement an Operations and Maintenance (O&amp;M) program to manage ACM in place</li><li>• Periodic surveillance and air monitoring</li><li>• Post OSHA warnings if friable asbestos remains</li></ul>
5	<ul style="list-style-type: none"><li>• Develop and implement an Operations and Maintenance (O&amp;M) program to manage ACM in place</li><li>• Periodic surveillance and air monitoring</li><li>• Post OSHA warnings if friable asbestos remaining</li></ul>

**APPENDIX E**  
**PHOTOGRAPHS**



MM-20-020 SAN B400/B900 Renovations  
Attachment 2 to Addendum 3 - B400



Photo 1 – MiraCosta College San Elijo Campus Building 400, located at 3333 Manchester Ave., Cardiff, CA.

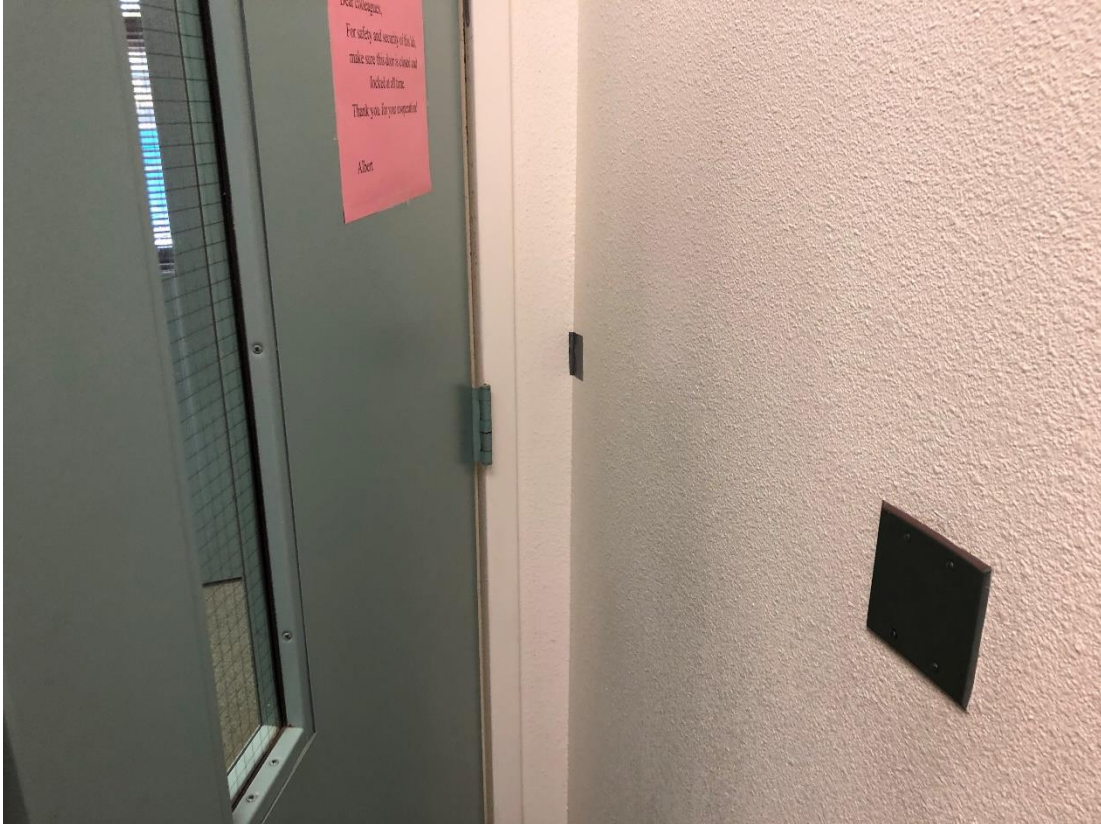


Photo 2 – Building 400 / Room 404, Drywall, Tape & Joint Compound at SE Door.



Photo 3 – Building 400 / Room 406, Drywall, Tape & Joint Compound at SE Soffit.



Photo 4 – Building 400 / Room 406, Fiberboard at North Wall.





Photo 5 – Building 400 / Room 402, 2' x 4' Rough Fissured Ceiling Tile.



Photo 6 – Building 400 / Room 406, 12" X 12" Vinyl Floor Tile (Green Speck) w/ Mastic & 4" Vinyl Cove Base (Grey) w/ Adhesive



MM-20-020 SAN B400/B900 Renovations  
Attachment 2 to Addendum 3 - B400



Photo 7 – Building 400 / Room 406, 12" X 12" Vinyl Floor Tile (Beige Speck) w/ Mastic.



Photo 8 – Building 400 / Room 404, Vinyl Sheet Flooring (Green Speck) w/ Mastic





Photo 9 – Building 400 / Room 405, Carpet Adhesive



Photo 10 – Building 400 / Room 402B, 4" Vinyl Cove Base (Dark Green) w/ Adhesive.



MM-20-020 SAN B400/B900 Renovations  
Attachment 2 to Addendum 3 - B400



Photo 11 – Building 400 / Room 402, 4" Vinyl Cove Base (Light Green) w/ Adhesive.



Photo 12 – Building 400 / Room 401, 4" Vinyl Cove Base (Tan) w/ Adhesive.





Photo 13 – Building 400 / Exterior, Stucco at North Wall New West Door Proposal.



Photo 14 – Building 400 / Exterior SE Roof, Stucco at NE Parapet.



MM-20-020 SAN B400/B900 Renovations  
Attachment 2 to Addendum 3 - B400



Photo 15 – Building 400 / Exterior Main Roof, Built-up Roofing Material.



Photo 16 – Building 400 / Exterior Main Roof, Penetration Mastic at East Skylight.





Photo 17 – Building 400 / Exterior SW Tile Roof, Roofing Felt under Tiles.



Photo 18 – Building 400 / Exterior East Tile Roof, Roofing Sealant (White)/ Roofing Mastic (Black).



MM-20-020 SAN B400/B900 Renovations  
Attachment 2 to Addendum 3 - B400



Photo 19 – Building 400 / Room 402, Concrete Slab under Vinyl Floor Tile.

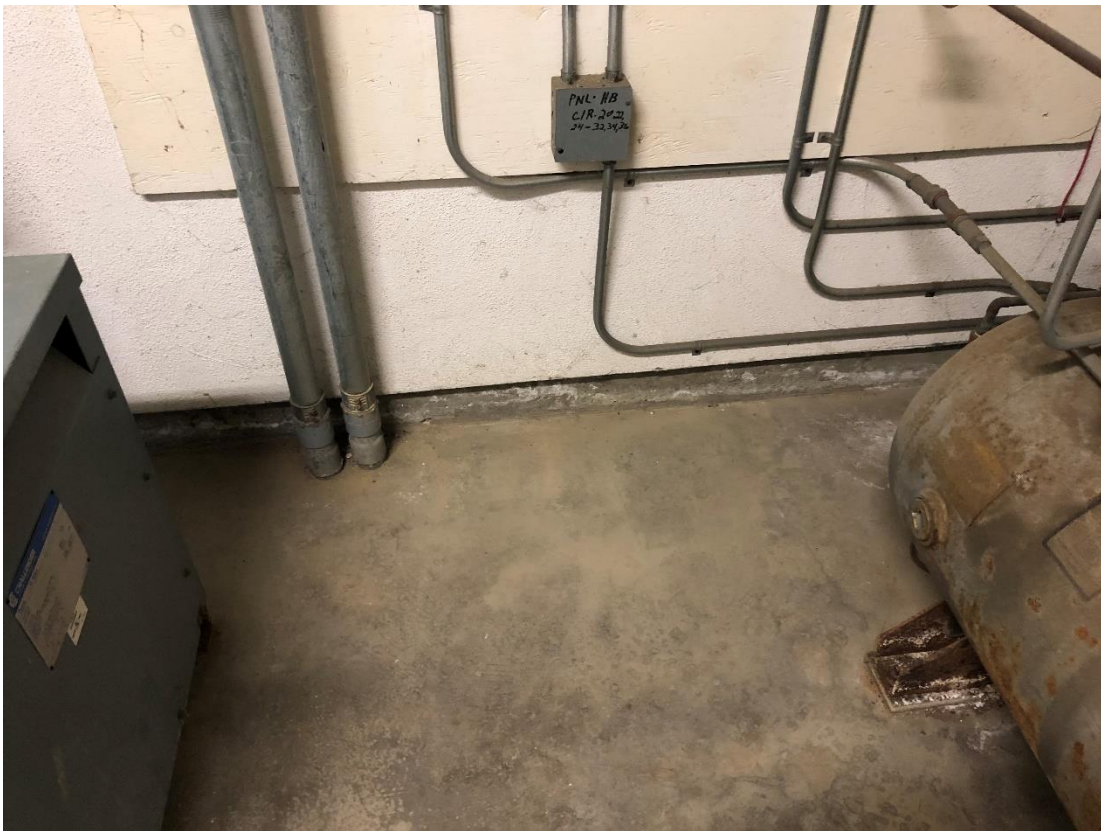


Photo 20 – Building 400 / Mechanical Room 408, Concrete Slab.





MM-20-020 - SAN B400/B900 Renovations Bid - Requests for Clarification and District Responses

RFI No.	Questions	Answers	Category
1	On page 3 of Front-End Bid Docs, it states "Due to the ongoing COVID-19 pandemic only general contractors and only one person per general contractor firm will be allowed to attend the Mandatory Pre-Bid Conference and Job Walk." Is it possible to have two persons per general contractor attend the job walk on Feb. 19?	We will now allow up to 3 individuals per GC firm for the walk this Friday. A different sub trade walk will be coordinated for a later date.	General
2	Can you confirm the year built of buildings 400?	The original B400 building was built 1986/1987.	Architectural
3	On the Greenhouse sheet A2.01 Detail 14 Wall Type A-1, it calls for a pony wall. What are the specifications for the wood stud framing, drywall, wall base, and tile?	Build per DSA approved Contract Documents. Refer to Structural sheet S2.0 for framing. Specifically Foundation Plan A and detail 11. Provide Dal-Tile, 3x6 Amity/Gray AM52 with Mapei grout/Pewter. 6" Base is Roppe 178/Pewter.	HPI
4	Currently the plans call for an aluminum greenhouse structure. Is it acceptable to provide a galvanized steel structure?	Build per DSA approved Contract Documents. No a galvanized steel structure is not acceptable	HPI
5	On the BID FORM Attachment "A", which line item does the Greenhouse cost fall into?	DISTRICT TO RESPOND	DISTRICT
6	Sheet A8.10 Keynote RF-1, Epoxy flooring calls for Flowcrete in the legend and then has Duraflex named on the bottom. Which is the used material?	Dura-Flex is basis of design with the color being Ocean.	HPI
7	Specs Sec section 033000 Sealed concrete calls for a densifier with a non-skid requirement, is it acceptable to 'grind and seal' for this area?	Install per DSA approved contract documents (keynote 7 on A0.01 and referenced on the Narrative as well in the Addendum)	HPI
8	The B400 FA drawings show a fiber optic cable is needed between B440 and B900. Will these terminate within the FA panels? If so, will they terminate to a small fiber enclosure with adapter plate and then utilize a patch cord to plug into the NIC in the FACP? Or will they terminate in the data rack in a rack mount enclosure and then have a fiber patch cord run over to the FACP and plug into the NIC? Or will this fiber be terminated in the FACP on both sides and plugged in directly to the NIC with the spare strands left hanging within the FACP?	Please refer to PBGI RFI 001 response. Reference Attachment 1 to Addendum 3-B400	HPI/PBK
9	There seems to be a discrepancy between the two drawing sets. B900 within the Wire Legend, shows a MM50um OM2 Corning fiber. This does not state how many strands. B400 shows a note stating to install a 6 strand OM4. To meet campus standards and Manufacturer standard. Shall we assume, installing a Corning 6 strand OM2 as OM4 seems to be overkill for a Fire Alarm Network?	Please refer to PBGI RFI 001 response. Reference Attachment 1 to Addendum 3-B400	HPI/PBK
10	Finish plan A810 shows room 410 student lounge hatched as Vs-vinyl sheet, finish schedule on page A810 shows that room as CP-1 carpet. Please clarify.	Student Lounge 410 to receive CARPET (roll). Provide Mannington Palma 2, SCENA, Eustatia - Broadloom / roll	HPI
11	Finish plan A810 shows CP-1 carpet as a modular carpet and the spec is for a modular carpet but the description calls for a 12'6" roll product. Please clarify if CP-1 is a carpet tile or roll product.	CP-1 is Roll per District Standards	HPI