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BUTLER HIGH SCHOOL HVAC CONTROLS UPGRADE

1810 MATTHEWS-MINT HILL ROAD
MATTHEWS, NC 28105
SEPTEMBER 29, 2022

PROJECT TEAM

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DRAWING LIST

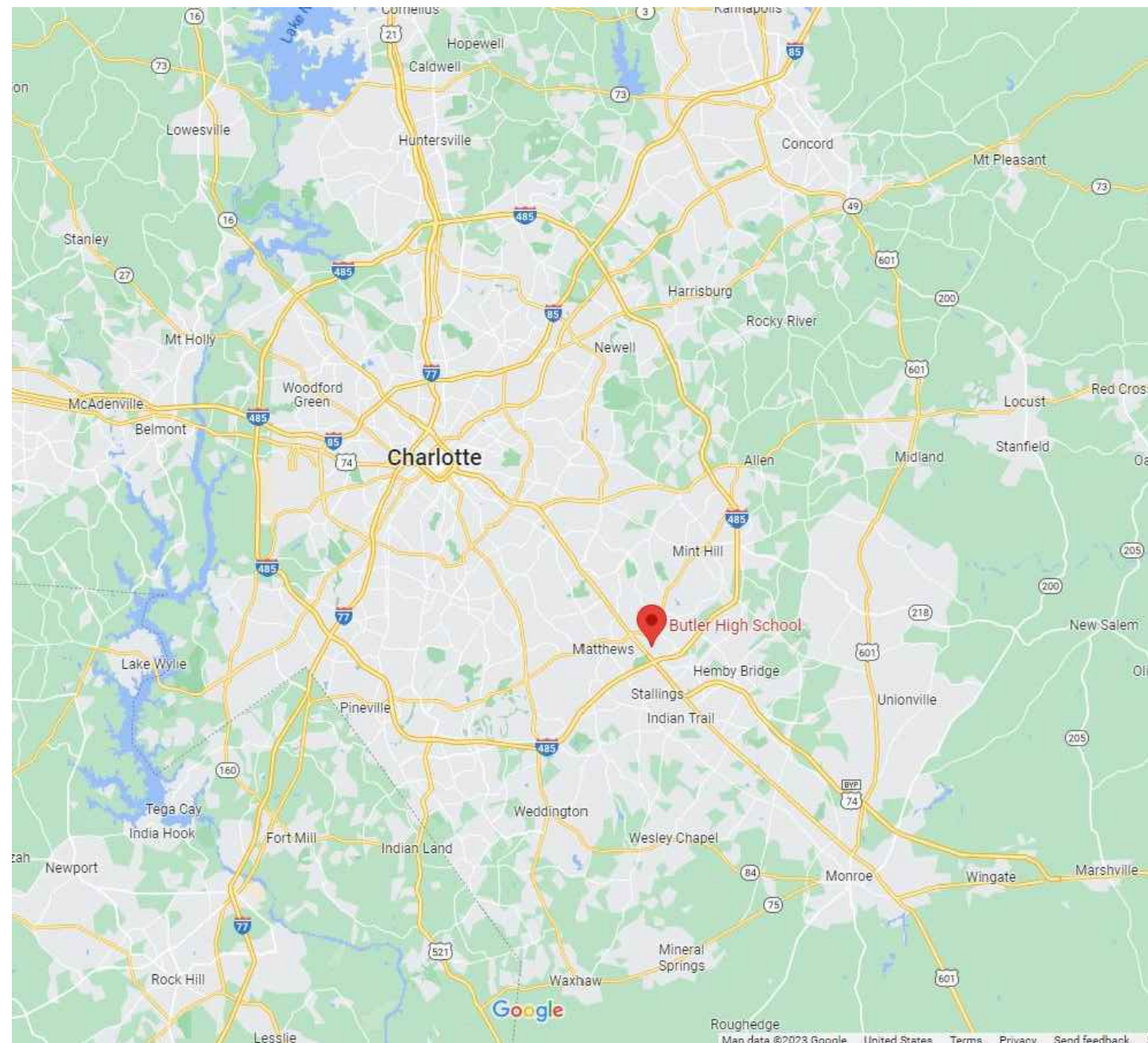
MECHANICAL

- M101 MECHANICAL SYMBOLS, LEGEND AND GENERAL NOTES
- M102 MECHANICAL POINTS LIST BUILDING #1
- M103 MECHANICAL POINTS LIST BUILDING #2
- M104 MECHANICAL SEQUENCE OF OPERATIONS BUILDING #1 AND BUILDING #2
- M105 MECHANICAL CONTROLS SCHEMATICS BUILDING #1
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- M107 MECHANICAL CHW/HW PIPING SCHEMATICS BUILDING #1 AND BUILDING #2
- M108 MECHANICAL SCHEDULES ***FOR INFORMATION ONLY***
- M301 MECHANICAL - FLOOR PLAN AREA -1
- M302 MECHANICAL - FLOOR PLAN AREA -2
- M303 MECHANICAL - FLOOR PLAN AREA -3
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- M313 MECHANICAL - ROOF PLAN BUILDING #2
- M361 MECHANICAL ROOM FLOOR PLANS
- M362 MECHANICAL - CHILLER AND BOILER ROOMS

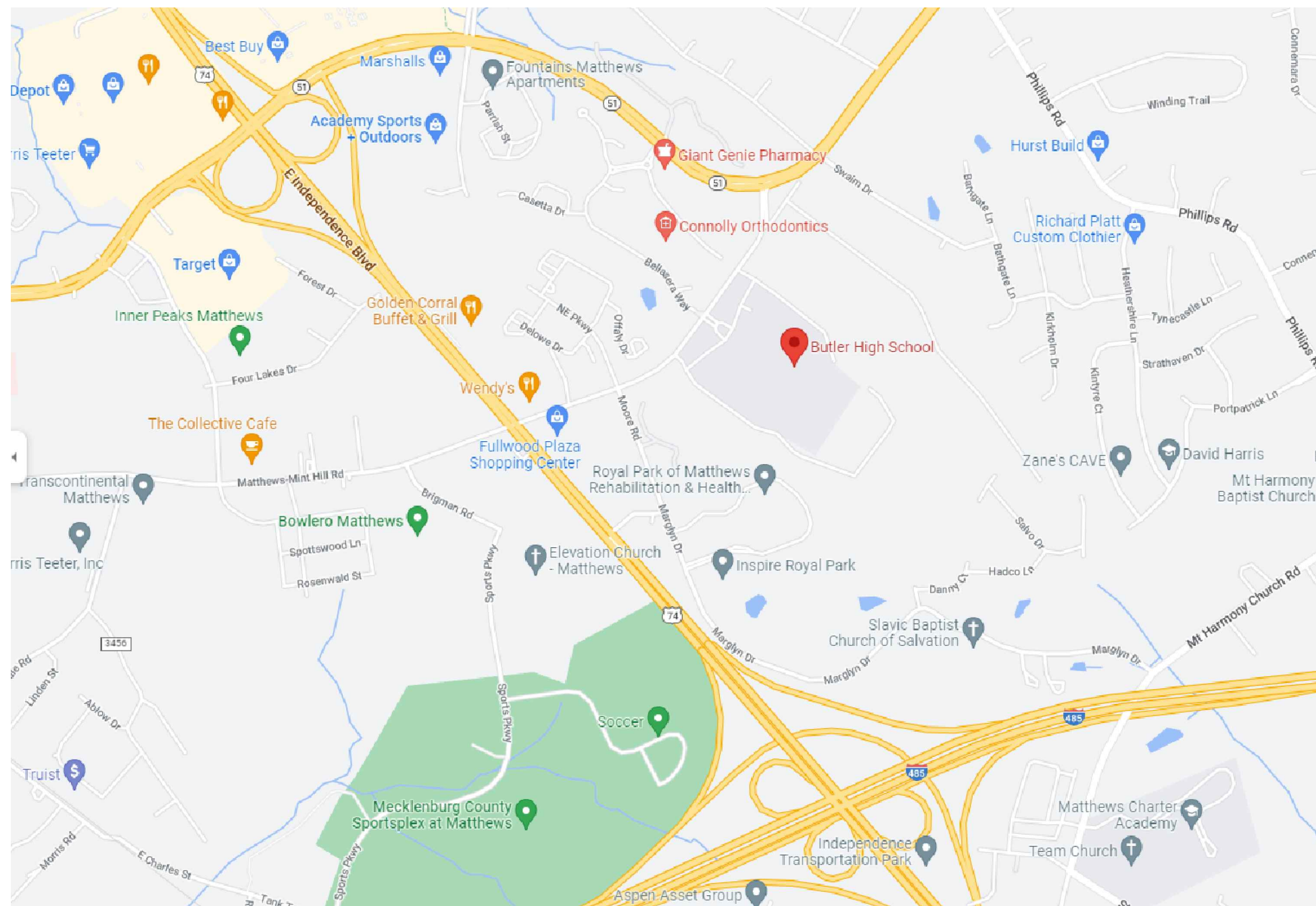
ELECTRICAL

- E001 ELECTRICAL NOTES, LEGENDS & SPECIFICATIONS
- E200 MAIN BUILDING ELECTRICAL FLOOR PLAN
- E201 AREA "1" ELECTRICAL FLOOR PLAN
- E202 AREA "2" ELECTRICAL FLOOR PLAN
- E203 AREA "3" ELECTRICAL FLOOR PLAN
- E204 AREA "4" ELECTRICAL FLOOR PLAN
- E205 AREA "5" ELECTRICAL FLOOR PLAN
- E206 AREA "6" ELECTRICAL FLOOR PLAN
- E207 AREA "7" ELECTRICAL FLOOR PLAN
- E208 AREA "8" ELECTRICAL FLOOR PLAN
- E209 BUILDING #2 FLOOR 1 ELECTRICAL FLOOR PLAN
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- E262 ELECTRICAL ENLARGED BOILER/MECH ROOM PLANS
- E601 ELECTRICAL DETAILS
- E701 POWER RISER DIAGRAM & SCHEDULES
- E702 2ND BUILDING POWER RISER DIAGRAM & SCHEDULES

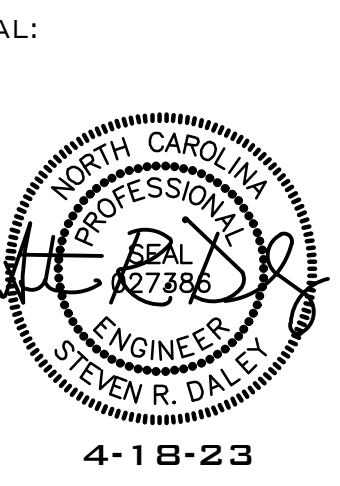
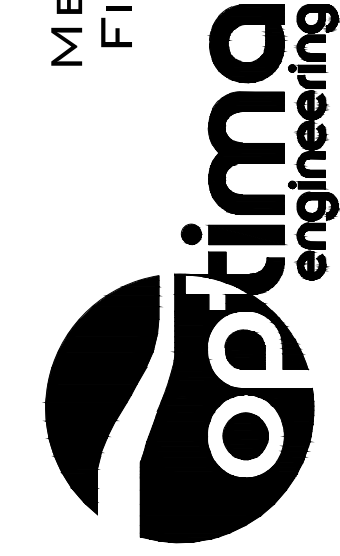
AREA MAP



LOCATION SITE MAP



MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • LIGHTING DESIGN



BUTLER HIGH SCHOOL HVAC CONTROLS UPGRADE

361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

REV #	DATE	DESCRIPTION
1	04/18/23	ADDENDUM 2

DATE:	09-29-2022
PROJECT #:	22-0151
DRAWN BY:	JMF
DESIGNED BY:	JMF
CHECKED BY:	SRD

SHEET TITLE:
COVER SHEET

DWG #:
C-1

SHEET NO: 01 OF 01

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MECHANICAL GENERAL NOTES

SEE SPECIFICATIONS FOR ADDITIONAL PROJECT REQUIREMENTS. THESE GENERAL NOTES ARE INTENDED TO SUPPLEMENT THE SPECIFICATIONS. IN THE EVENT THAT THE VERBAGE IS IN CONFLICT OR CONTRADICTS THE REQUIREMENTS LISTED HERE, THE QUESTION SHALL BE ASKED PRIOR TO BIDDING OR THE MORE STRINGENT SHALL APPLY AT THE ENGINEER'S DISCRETION.

- DO NOT SCALE DRAWINGS. SEE ARCHITECTURAL DRAWINGS AND REFLECTED CEILING PLANS FOR EXACT LOCATION OF DOORS, WINDOWS, CEILING DIFFUSERS, ETC.
- ALL COST ASSOCIATED WITH SUBSTITUTED EQUIPMENT TO COMPLY WITH BASIS OF DESIGN, INCLUDING PROVIDING MAINTENANCE ACCESS, CLEARANCE, PIPING, SHEET METAL, ELECTRICAL, REPLACEMENT OF OTHER SYSTEM COMPONENTS, BUILDING ALTERATIONS, ETC., SHALL BE INCLUDED IN THE ORIGINAL BASE BID. NO ADDITIONAL COST ASSOCIATED WITH SUBSTITUTED EQUIPMENT WILL BE APPROVED DURING CONSTRUCTION AND ALL COST WILL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR. THIS INCLUDES ANY MODIFICATIONS TO ANY ASSOCIATED MECHANICAL, PLUMBING, OR ELECTRICAL SYSTEMS REQUIRED BY THIS SPECIFIC MANUFACTURER'S INSTALLATION INSTRUCTIONS.
- UPON PROJECT COMPLETION, THE MECHANICAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE OWNER INSTALLATION INFORMATION INCLUDING RECORD SUBMITTALS (WITH ANY SUBMITTAL REVIEW COMMENTS ADDRESSED) AND O&M MANUALS FOR EACH PIECE OF EQUIPMENT INCLUDING ALL SELECTED OPTIONS, THE NAME AND ADDRESS OF AT LEAST ONE SERVICE AGENCY, FULL CONTROL SYSTEM O&M AND CALIBRATION INFORMATION INCLUDING WIRING DIAGRAMS, SCHEMATICS, FULL SEQUENCE OF OPERATION, AND PROGRAMMED SETPOINTS.
- PROVIDE A ONE YEAR WARRANTY FOR ALL WORK PERFORMED BEGINNING ON THE DAY THE SYSTEM IS COMPLETELY OPERATIONAL AND ACCEPTABLE BY THE OWNER.
- PROVIDE MANUFACTURER'S RECOMMENDED CLEARANCES AROUND ALL EQUIPMENT FOR MAINTENANCE.
- ANY DEVICE REQUIRING A THERMOSTAT FOR CONTROL SHALL BE FURNISHED WITH A THERMOSTAT WHETHER INDICATED ON THE DRAWINGS OR NOT.
- INSTALL THE TOP OF ALL THERMOSTATS, SENSORS, AND SWITCHES AT 4'-0" (MAXIMUM) ABOVE FINISH FLOOR. COORDINATE EXACT THERMOSTAT LOCATION WITH OWNER PRIOR TO INSTALLATION. ANY DEVICE ON A PERIMETER WALL SHALL BE MOUNTED ON A FOAM-FILLED ELECTRICAL BOX, WITH ALL GAPS BETWEEN BOX AND WALL SEALED TO PREVENT INFILTRATION.
- ALL MECHANICAL EQUIPMENT SHALL BE U.L. LISTED AND LABELED AS A COMPLETE PACKAGE, NOT THROUGH INDIVIDUAL COMPONENTS OR PARTS. PROVIDE REQUIRED 3RD PARTY FIELD UL LISTING SERVICES AS REQUIRED TO COMPLY.
- IT IS THE CONTRACTORS RESPONSIBILITY TO COORDINATE THE ACCURACY OF THE ROOM NAMES SHOWN ON THE DRAWINGS WITH THE ACTUAL NUMBERING SYSTEM USED BY BUTLER HIGH SCHOOL. IF ANY IRREGULARITIES EXIST THE CONTRACTOR SHALL UPDATE THE DRAWING NUMBERING, BAS GRAPHICS AND EQUIPMENT TAGGING AS NECESSARY.

MECHANICAL DEMOLITION NOTES

- THE MECHANICAL CONTRACTOR SHALL VISIT SITE PRIOR TO BEGINNING WORK TO DETERMINE THE LEVEL OF DEMOLITION REQUIRED AND INCLUDE ALL NECESSARY PRICING IN THEIR BID.
- IT IS THE MECHANICAL CONTRACTORS RESPONSIBILITY TO FIELD VERIFY ALL EXISTING DUCTWORK AND PIPING. ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND MECHANICAL PLANS SHOULD BE BROUGHT TO THE ATTENTION OF THE MECHANICAL ENGINEER.
- THE MECHANICAL CONTRACTOR SHALL FIELD VERIFY ALL EXISTING SMOKE DAMPERS ARE LOCATED WHERE INDICATED ON DRAWINGS.
- FOR ALL EXISTING HVAC EQUIPMENT AND DUCTWORK NOTED TO REMAIN AND SERVING AREA OF RENOVATION, MECHANICAL CONTRACTOR SHALL INSPECT EQUIPMENT (AND ANY ASSOCIATED CONTROLS, VALVES, DAMPERS, ETC.) TO VERIFY PROPER WORKING ORDER. MECHANICAL CONTRACTOR TO SERVICE AND CLEAN EXISTING HVAC UNITS TO ENSURE DESIGN AIRFLOW AND COOLING/HEATING CAPACITIES ARE OBTAINED. ANY EQUIPMENT FOUND TO BE INOPERABLE OR SHORT OF DESIGN CAPACITIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO PROJECT COMPLETION. PROVIDE CLEAN FILTERS IN ALL UNITS AT COMPLETION OF PROJECT.
- THE MECHANICAL CONTRACTOR IS RESPONSIBLE FOR PAINTING AND PATCHING EXISTING WALLS AFFECTED BY THE REMOVAL OF ANY EXISTING CONTROL DEVICES, I.E. WALL SWITCHES, SPEED SELECTORS, THERMOSTAT, ETC...

2018 NORTH CAROLINA
ENERGY CONSERVATION CODE
COMMERCIAL ENERGY EFFICIENCY – MECHANICAL SUMMARY

- C401 METHOD OF COMPLIANCE**
- 2018 NCECC CHAPTER 5
☐ ASHRAE 90.1-2013 PRESCRIPTIVE
☐ ASHRAE 90.1-2013 PERFORMANCE
☐ N/A (EXISTING LIGHTING, HVAC, AND DOM. WATER HEATING SYSTEMS TO REMAIN)
- ☐ COMCHECK PROVIDED (2018 NCECC)
☐ COMCHECK PROVIDED (90.1-2013)
☐ ENERGY MODELING DATA PROVIDED

- C406 ADDITIONAL EFFICIENCY PACKAGE OPTIONS**
- NOT APPLICABLE
MECHANICAL WORK WITHIN AN EXISTING BUILDING. BUILDING AUTOMATION SYSTEM RENOVATION, CHANGEOUT OF EXISTING PNEUMATIC CONTROLS WITH ELECTRONIC DDC.

C301 CLIMATE ZONE

3A – MECKLENBURG COUNTY, NORTH CAROLINA

DESIGN CONDITIONS

EXTERIOR (ASHRAE 90.1-2013 TABLE D-1)	
winter dry bulb	18° F.
summer dry bulb	91° F.
summer wet bulb	74° F.
INTERIOR (2018 NCECC SECTION C302.1)	
winter dry bulb	72° F.
summer dry bulb	75° F.

C403.2 HEATING & COOLING LOADS AND EQUIPMENT & SYSTEM SIZING

BUILDING HEATING LOAD	EXISTING TO REMAIN
BUILDING COOLING LOAD	EXISTING TO REMAIN
INSTALLED HEATING CAPACITY	EXISTING TO REMAIN
INSTALLED COOLING CAPACITY	EXISTING TO REMAIN

- C403.2.3 & C406.2 – REQUIRED & INCREASED HVAC EQUIPMENT PERFORMANCE**
- SYSTEM DESCRIPTION – BUILDING AUTOMATION SYSTEM RENOVATION, CHANGEOUT OF EXISTING PNEUMATIC CONTROLS WITH ELECTRONIC DDC.

C403.2.4 THRU C403.2.11

- NOT APPLICABLE THIS PROJECT
C403.2.12 – AIR SYSTEM DESIGN AND CONTROL

- NOT APPLICABLE THIS PROJECT
C403.3 – ECONOMIZERS (PRESCRIPTIVE)

- NOT APPLICABLE THIS PROJECT
C403.4 – HYDRONIC AND MULTIPLE-ZONE HVAC SYSTEMS CONTROL AND EQUIPMENT (PRESCRIPTIVE)

- NOT APPLICABLE THIS PROJECT
C405.6 – ELECTRICAL MOTORS (MANDATORY REQUIREMENTS).

- NOT APPLICABLE THIS PROJECT
C408 – SYSTEM COMMISSIONING

- ☐ BUILDING IS LESS THAN 10,000 SQUARE FEET AND IS EXEMPT FROM THE SYSTEM COMMISSIONING REQUIREMENTS OF SECTION C408.
■ BUILDING IS GREATER THAN 10,000 SQUARE FEET AND REQUIRES SYSTEM COMMISSIONING PER SECTION C408.

COMMISSIONING NOTE

THIS PROJECT INCLUDES A THIRD PARTY COMMISSIONING AGENT CONTRACTED BY THE OWNER. THE MECHANICAL CONTRACTOR SHALL COORDINATE WITH OWNER'S COMMISSIONING AGENT AND PROVIDE ALL NECESSARY TIME, MATERIALS, AND PROCEDURES REQUIRED FOR A FULLY COMMISSIONED PROJECT. SEE COMMISSIONING REQUIREMENTS IN THE PROJECT MANUAL FOR FURTHER INFORMATION.

EQUIVALENT MANUFACTURERS LISTING

LISTING OF MANUFACTURER'S NAME DOES NOT GUARANTEE APPROVAL. ALL EQUIPMENT MUST MEET OR EXCEED QUALITY AND CAPACITIES OF SPECIFIED EQUIPMENT. FINAL APPROVAL WILL BE BASED ON EQUIPMENT SUBMITTALS. ANY MANUFACTURER NOT LISTED BUT WISHING TO BID THIS PROJECT SHALL SUBMIT A WRITTEN REQUEST A MINIMUM OF 7 DAYS PRIOR TO BID DATE OR AS INDICATED IN THE SPECIFICATIONS. PRIOR APPROVAL IS REQUIRED FOR ALL MANUFACTURERS NOT LISTED.

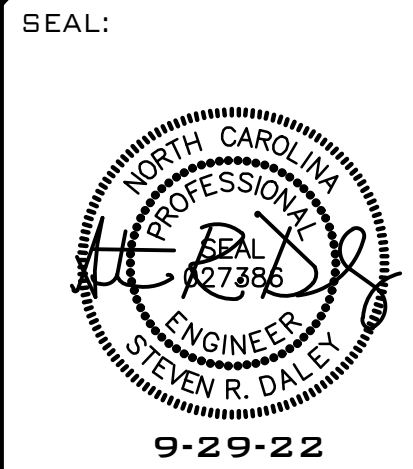
(ALPHABETICAL ORDER)
DDC CONTROLS: AUTOMATED LOGIC, TRANE TRACER, JOHNSON CONTROLS
METASYS, NIAGARA N4 SCHNEIDER, NIAGARA N4 PLATINUM, NIAGARA N4 WITH UNITED AUTOMATION.

NOTE:
ALL COST ASSOCIATED WITH SUBSTITUTED EQUIPMENT TO COMPLY WITH BASIS OF DESIGN, INCLUDING PROVIDING MAINTENANCE ACCESS, CLEARANCE, PIPING, SHEET METAL, ELECTRICAL, REPLACEMENT OF OTHER SYSTEM COMPONENTS, BUILDING ALTERATIONS, ETC., SHALL BE INCLUDED IN THE ORIGINAL BASE BID. NO ADDITIONAL COST ASSOCIATED WITH SUBSTITUTED EQUIPMENT WILL BE APPROVED DURING CONSTRUCTION AND ALL COST WILL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR.

MECHANICAL LEGEND

SYMBOL	DESCRIPTION	ABBR.
--- CHS ---	EX CHILLED WATER SUPPLY	CHS
--- CHR ---	EX CHILLED WATER RETURN	CHR
--- HWS ---	EX HOT WATER SUPPLY	HWS
--- HWR ---	EX HOT WATER RETURN	HWR
--- CS ---	EX CONDENSER WATER SUPPLY	CS
--- CR ---	EX CONDENSER WATER RETURN	CR
--- CW ---	EX COLD WATER MAKE-UP	CW
--- BV ---	EX BUTTERFLY VALVE	
--- 3P ---	EX 3-PIECE BALL VALVE	
--- CV ---	EX CHECK VALVE	
--- ST ---	EX STRAINER WITH BLOWDOWN	
--- BV ---	EX BALANCING VALVE	
--- B&G ---	EX B&G CIRCUIT SETTER	
--- UN ---	EX UNION	
--- TM ---	EX THERMOMETER	
--- PG ---	EX PRESSURE GAGE & COCK	
--- GC ---	EX GAGE COCK	
--- FS ---	EX FLOW SWITCH	
--- DI ---	EX SUPPLY AIR DIFFUSER	
--- RG ---	EX RETURN AIR GRILLE	
--- EG ---	EX EXHAUST AIR GRILLE	
--- DL ---	EXISTING DOUBLE LINE DUCTWORK	
--- SL ---	EXISTING SINGLE LINE DUCTWORK	
--- ME ---	EXISTING MECHANICAL TO BE REMOVED	
--- 20'x14" ---	20"x14" FLAT OVAL DUCT	
--- 20'x14" ---	20"x14" RECTANGULAR DUCT	
--- 8" ---	8" DIAMETER ROUND DUCT	
--- P ---	POINT OF EXISTING TO NEW CONNECTION	
--- FD ---	EX FIRE DAMPER	
--- C ---	EX COMBINATION FIRE/SMOKE DAMPER	
--- SD ---	EX SMOKE DAMPER	
--- S ---	SWITCH (4'-0" AFF TO TOP)	
--- M ---	MOTORIZED DAMPER	
--- TD ---	EX RETURN AIR DUCT DETECTOR	
--- TS ---	SPACE TEMPERATURE SENSOR	
--- RH ---	SPACE HUMIDITY SENSOR	
--- R ---	STAND ALONE CONTROL ELEMENT	
--- DIS ---	DISCHARGE AIR SENSOR	
--- MIX ---	MIXED AIR SENSOR	
--- RA ---	RETURN AIR SENSOR	
--- EA ---	ELECTRONIC ACTUATOR	
--- FS ---	FILTER STATUS	
--- CV ---	CHW CONTROL VALVE	
--- HW ---	HW CONTROL VALVE	
--- CO ---	COOLING ACTUATOR (0-10V)	
--- HE ---	HEATING ACTUATOR (0-10V)	
--- FS ---	FREEZE STAT	
--- FSS ---	FAN S/S	
--- SPD ---	SPEED	
--- FPR ---	FAN PROOF	
--- SPSS ---	SUPPLY FAN S/S LOW SPEED+ RELAY IN STARTER	
--- SPSS ---	SUPPLY FAN S/S HIGH SPEED+ RELAY IN STARTER	
--- CO2 ---	RETURN AIR CO2 SENSOR	
--- OAF ---	OUTSIDE AIRFLOW MONITOR	
--- SP ---	STATIC PRESSURE SENSOR	
--- BP ---	BUILDING PRESSURE SENSOR	
--- VFD ---	EX VARIABLE FREQUENCY DRIVE	
--- COOL1 ---	COMPRESSOR #1 RELAY	
--- COOL2 ---	COMPRESSOR #2 RELAY	
--- COOL3 ---	COMPRESSOR #3 RELAY	
--- COOL4 ---	COMPRESSOR #4 RELAY	
--- CO ---	CARBON MONOXIDE DETECTOR	
--- CV ---	CONTROL VALVE	
--- M.C. ---	MECHANICAL CONTRACTOR	
--- E.C. ---	ELECTRICAL CONTRACTOR	
--- P.C. ---	PLUMBING CONTRACTOR	
--- N.I.C. ---	NOT IN CONTRACT	
--- EX ---	EXISTING	
--- AFF ---	ABOVE FINISHED FLOOR	
--- DN ---	DOWN	
--- UP ---	UP	

MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • LIGHTING DESIGN



BUTLER HIGH SCHOOL
HVAC CONTROLS UPGRADE

361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

REV #	DATE	DESCRIPTION

DATE:	09-29-2022
PROJECT #:	22-0151
DRAWN BY:	JMF
DESIGNED BY:	JMF
CHECKED BY:	SRD

SHEET TITLE:
MECHANICAL
SYMBOLS, LEGEND
AND GENERAL
NOTES

OWB #:
M101
SHEET NO: 1 OF 23

GENERATOR/BOILER CHILLER ROOM EXHAUST											
Hardware Points				Software Points							
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Zone Temp					x				x	x	x
Fan Status			x								x

DUCTLESS FRID SYSTEM											
Hardware Points				Software Points							
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Space Temperature	x									x	

VARIABLE FREQUENCY DRIVE INTERFACE											
Hardware Points				Software Points							
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Start / Stop*				x					x		x
Speed**	x									x	x
Motor Current Amps					x				x		x
Motor Frequency Hertz					x				x		x
Motor Runtime					x						x
Motor Speed RPM					x				x		x
In Fault Condition					x				x	x	x
VFD Status				x						x	x

TOILET JANITOR GENERAL EXHAUST											
Hardware Points				Software Points							
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Fan Status			x							x	x
Fan Start/Stop				x						x	x
Schedule***								x			x
Fan Failure										x	x

Fire Alarm Interface											
Hardware Points				Software Points							
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
FA Remote Relay Status**			x						x	x	x
FA Remote Relay shutdown n command**						x			x	x	x

Smoke Detector Operation											
Hardware Points				Software Points							
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Smoke Detector Status*			x						x	x	x
Smoke shutdown n command						x			x	x	x

Indoor Lighting											
Hardware Points				Software Points							
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
TLO Input			x						x		x
Lighting Output				x					x		x
Schedule***								x	x		x

AIR TERMINAL UNIT											
Hardware Points				Software Points							
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Airflow	x								x		x
Discharge Air Temp	x								x		x
Zone Temp	x								x		x
Zone Setpoint Adjustment (where required)	x								x		x
Zone Override (where required)			x						x		x
Reheating Valve (w hen required)		x							x		x
Zone Damper		x							x		x
Airflow Setpoint					x				x		x
Cooling Setpoint					x				x		x
DAT Heating Limit					x						x
Heating Setpoint					x				x		x
Percent of Time Satisfied					x				x		x
Heating Mode						x			x		x
Schedule ***									x		x

Gas Meter											
Hardware Points				Software Points							
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Gas Flow Rate			x						x	x	x
Peak Month-to-Date									x		x
Peak Today									x		x
Peak Year-to-Date									x		x
Usage Month-to-Date									x		x
Usage Today									x		x
Usage Year-to-Date									x		x
Water Failure										x	

Electric Meter											
Hardware Points				Software Points							
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
kW Peak			x						x	x	x
kWh Demand									x		x
kWh Peak Month-to-Date									x		x
kWh Peak Today									x		x
kWh Peak Year-to-Date									x		x
kWh Today									x		x
kWh Month-to-Date									x		x
kWh Year-to-Date									x		x
Water Failure										x	

***"SCHEDULE" POINTS SHALL BE ASSOCIATED WITH A ZONE AS SHOWN ON GRAPHICAL PAGE.

BOILER PLANT											
Hardware Points				Software Points							
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Boiler 1 Hot Water Return Temp	x								x		x
Boiler 1 Hot Water Supply Temp	x								x		x
Boiler 2 Hot Water Return Temp	x								x		x
Boiler 2 Hot Water Supply Temp	x								x		x
Hot Water Differential Pressure 1	x								x		x
Primary Hot Water Return Temp	x								x		x
Primary Hot Water Supply Temp	x								x		x
Secondary Hot Water Supply Temp	x								x		x
Secondary Hot Water Return Temp	x								x		x
Boiler 1 Hot Water Supply Temp Setpoint Reset		x							x		x
Boiler 2 Hot Water Supply Temp Setpoint Reset		x							x		x
Hot Water Pump BBR1 VFD Speed	x								x		x
Hot Water Pump BBR2 VFD Speed	x								x		x
Boiler 1 Alarm Status			x						x	x	x
Boiler 1 Status			x						x		x
Boiler 2 Alarm Status			x						x	x	x
Boiler 2 Status			x						x		x
Hot Water Pump BBR1 VFD Status			x						x		x
Hot Water Pump BBR2 VFD Status			x						x		x
Boiler 1 Enable				x					x		x
Boiler 2 Enable				x					x		x
Hot Water Pump BBR1 VFD Fault				x					x	x	x
Hot Water Pump BBR2 VFD Fault				x					x	x	x
Hot Water Differential Pressure Setpoint					x				x		x
Outside Air Temp (alarm for out of range)					x				x		x
Boiler 1 Failure									x		x
Boiler 1 High Hot Water Supply Temp									x		x
Boiler 1 Low Hot Water Supply Temp									x		x
Boiler 1 Running in Hand									x		x
Boiler 2 Failure									x		x
Boiler 2 High Hot Water Supply Temp									x		x
Boiler 2 Low Hot Water Supply Temp									x		x
Boiler 2 Running in Hand									x		x
Hot Water Pump BBR1 Failure									x		x
Hot Water Pump BBR1 Running in Hand									x		x
High Hot Water Differential Pressure									x		x
High Primary Hot Water Supply Temp									x		x
Hot Water Pump BBR2 Failure									x		x
Hot Water Pump BBR2 Running in Hand									x		x
Lowest Boiler Failure									x		x
Low Primary Hot Water Supply Temp									x		x
Emergency Shutdown n						x			x		x
Automatic Isolation Valve (typ 2)			x	x					x		x

VAV AHU- DX											
Hardware Points				Software Points							
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic
Mixed Air Temp					x				x		x
Outside Air Humidity	x								x		x
Outside Air Temp	x								x		x
Return Air Carbon Dioxide PPM					x				x		x
Return Air Humidity					x				x		x
Return Air Temp					x				x		x
Supply Air Temp					x				x		x
Zone Setpoint Adjust	x										x
Outside Air Dampers (qty 2)		x							x		x
Zone Temp	x				x				x		x
Supply Air Dampers (qty 2)		x							x		x
Mixed Air Dampers (qty 2)		x							x		x
Return Air Dampers (qty 2)		x							x		x
Building Static Pressure	x								x		x
Smoke Detector			x						x	x	x
Fan Status (dependent on number / type of fans)						x			x		x
Zone Override			x						x		x
Cooling Stage 1					x				x		x
Cooling Stage 2					x				x		x
Cooling Stage 3					x				x		x
Cooling Stage 4					x				x		x
Supply Fan Start/Stop					x				x		x
Cooling Setpoint					x				x		x
Economizer Zone Temp Setpoint					x				x		x
Return Air Carbon Dioxide PPM Setpoint					x	x			x		x
Emergency Shutdown n						x					x
High Return Air Carbon Dioxide Concentration					x						x
High Return Air Humidity									x		x
Dehumidification Setpoint					x				x		x
Supply Fan Failure					x				x		x
Supply Fan In Hand					x				x		x
Exhaust Air Damper (qty 2)					x				x		x
Return Fan VFD Speed					x				x		x
Return Fan Status					x				x		x
Return Fan Start/Stop					x				x		x
Supply Fan Start/Stop					x				x		x
Supply Fan VFD Fault					x				x		x
Supply Fan Status					x				x		x

DAVID BUTLER HIGH SCHOOL BUILDING #2 SEQUENCE OF OPERATIONS

VARIABLE AIR VOLUME DX AIR HANDLING UNIT (RTU-1,2)

RTU-1 and RTU-2 will normally operate as one unit. The DDC system can shut-down either RTU-1 or RTU-2. If an RTU is shut down, the other RTU will operate in accordance with the following sequence. Note: Whenever one RTU is shut down, the minimum outdoor ventilation air flowrate will increase to 7.226 CFM.

- A. Each VAV Commercial Rooftop Unit shall have a microprocessor-based controller which shall monitor and control the rooftop unit in a stand-alone mode or as directed by the building automation system. The rooftop unit shall have a backseat interface to enable incorporation to a building automation system (BAS).
- Controller shall have a human interface panel with a 2.2-inch 40-character clear English LCD display and a 16-button keypad for monitoring, setting, and controlling.
- B. The BAS shall perform the following rooftop control strategies, provide the points listed on the point list and provide the specified monitoring and diagnostics.

1. Unoccupied Mode
- When the BAS initiates the Unoccupied mode, the rooftop unit shall be off. If the unoccupied sensors are exceeded, the unit shall circulate air for heating by the VAV boxes with hydronic heat or cool until the zone temperature is within the unoccupied setpoints.

2. Transition from Unoccupied to Occupied
- When the unit transitions from the unoccupied operation to occupied operation, start-up or morning warm-up or cool down mode shall be activated.

- a. Stump Mode
- The rooftop unit can be controlled to the Stump mode by the BAS for Optimal Start purposes. The outdoor air return shall be closed, unless economizing, until the zone's scheduled occupied time. EC02 levels are above setpoint, unit shall open outside air and relief air dampers and close air dampers in proportion to outside air and relief air.

- b. Morning Warmup
- When the rooftop unit shall change from the Unoccupied to the Occupied mode, the unit may enter the Morning Warmup mode. The Morning Warmup mode shall be initiated if the return Air Temperature value is less than the Morning Warmup setpoint of 70°F (adjustable) over from the BAS. The outside air damper shall be kept closed and the selected zone VAV boxes shall operate at the maximum occupied setpoints.

- c. Morning Cutdown
- When the Rooftop shall change from the Unoccupied to the Occupied mode, the unit may enter the Morning Cutdown mode. The Morning Cutdown mode shall be initiated if the Return Air Temperature value is more than the Morning Cutdown setpoint of 75°F (adjustable) over from the BAS. The outside air damper shall be kept closed and the selected zone VAV boxes shall operate at the occupied setpoints.

3. Occupied Operation
- When the rooftop unit is controlled to the Occupied mode, all rooftop unit functions shall be enabled and shall operate as supply temperature control mode. The rooftop unit shall default to this mode in the event the communications with the BAS are lost.

- a. Cooling/Economizer
- During the occupied mode of operation, the economizer, if available, and mechanical cooling will be used to control the supply temperature. If the enthalpy of the outdoor air is less than the enthalpy of the return air, then the economizer shall be used to satisfy the supply air sequence through a mixed air low limit. If more cooling is required, compressors shall be staged as necessary. Minimum cooling/venting of the compressors shall prevent rapid cycling. At outdoor air conditions above the enthalpy control setting, mechanical cooling only will be used and the fresh air dampers will remain in minimum position.

- b. Dehumidification (Occupied and Unoccupied operation)
- Should the return air relative humidity reach 60% (adjustable), the supply air temperature reset program shall be suspended and the supply air temperature shall be decreased (adjustable) until the return air relative humidity falls to 50% (adjustable).

- Shutdown
- The following shall alarm the BAS, once reset the BAS may resume its intended control sequence: Duct detector, low limit thermostat activation, high pressure switch (4" P" adjustable).

- c. Space Pressure Control
- The BAS shall have no lockouts or resets that would require operator intervention to correct but shall only alarm. Unit dampers D-3 and D-4 will allow excess pressure.

6. Supply Air Pressure Control
- The BAS shall send supply air pressure setpoints to the rooftop air modulate the Variable Frequency Drives (VFD) based on the static pressure sensors located in the supply air duct. The BAS shall also read the status on the supply air sensor and display the pressure reading on the operators graphic interfaces screen. Supply fan VFDs will be controlled by either SP1 or SP7-2. The static pressure transmitter that senses the lowest pressure will control the speed of the VFDs. Static pressure transmitters will alarm the DDC system whenever measured pressure is too high or too low (adj). A high static pressure measured by SP7-2 or SP7-4 will shut-down the supply fans. Supply fans shall stop when the pressure is too high. Provide demand side static pressure control. Should a demand for cooling exist as sensed through VAV box dampers greater than minimum.

7. Return Air Control
- Airflow monitor AM-3 will control the speed of RTU-1's return air fan. Airflow through AM-3 shall match the airflow through AM-5. Airflow monitor AM-4 will control the speed of RTU-2's return air fan. AM-4 will match the airflow through AM-6. Static pressure sensors will alarm the DDC system whenever measured airflow is too low. A low static pressure measured by SP7-5 or SP7-6 will de-energize the return air fans. Return air fans will not energize until both supply and return air dampers are open.

8. Outdoor Air Control
- The Ventilation Control Module shall be linked to the rooftop microprocessor-based unit controller. Using a thermal displacement type airflow monitor, the ventilation control module shall monitor and control the quantity of fresh air entering the unit by modulating the return air dampers and outside air dampers, automation system shall send the CFM setpoint to the unit and shall then monitor that setpoint is never less than is maintained.

- The fresh outdoor air enter the rooftop unit through the air flow monitoring/dampers sensor assembly. Outdoor air CFM will be controlled at the indicated minimum airflow.
- If the return air CO2 concentration increases above the CO2 Reset Start Value of 1100 ppm (adjustable), unit shall open outside air and relief air dampers and close return air dampers in proportion to outside air and relief air.

9. Rooftop Sequencing Control
- With only the lead rooftop unit running, should the compressor capacity and supply fan speed exceed 95% (adjustable) for 30 minutes (adjustable), the lag unit fan speed shall be reduced to minimum, the lag unit shall allow its outdoor air, and return discharge dampers to open, the lag unit shall be sealed at minimum speed, the minimum outdoor CFM setpoint shall be shared by each unit from the load required. After a time delay (adjustable), the fan speeds shall be raised to the required value to maintain the common duct static pressure.

- With both units running, should both compressor capacity and supply fan speed fall below 40% (adjustable) for 30 minutes (adjustable), the lag unit shall be stopped, the lag unit discharge, outdoor air and return dampers closed, the minimum outdoor air CFM setpoint shall be the total required, and the lead unit shall carry the load.

10. Emergency Shutdown
- A high-pressure alarm (Measured by SP5-2 or SP5-4) or a low-pressure alarm (Measured by SP5-5 OR SP5-6) will de-energize the unit. Activation of the Emergency Off Switch will de-energize the unit. Duct mounted smoke detector activation will de-energize the unit and close dampers D-1, D-2, D-9 & D-10.

AIR TERMINAL UNIT OPERATION (VAV)

Direct Digital Controls: DDC controls, actuators and costs to mount, calibrate and test the system shall be the responsibility of controls Contractor.

Terminal Unit Control:

The terminal box units shall be individually controlled by a DDC terminal controller per terminal unit.

The BAS shall perform the following terminal unit control strategies and provide the points listed on the DDC terminal point list and the specified monitoring and diagnostics.

- Set Point Control: The BAS shall edit the zone space temperature set-point of each terminal box. The zone temperature set-point shall be operator adjustable. Individual zone set-point and control logic shall reside at the zone level and shall not be dependent upon the BAS for control. In the event of communication loss, the BAS shall continue to control to current set-points.
- Cooling Valve Control: The BAS shall control the cooling air valve to a fully open, fully closed, maximum CFM or minimum CFM position based on operator commands. The operator shall also have the capability to adjust the maximum and minimum airflow limits of the air valve through the BAS.

- Operating Mode: The BAS shall place the box in either the occupied or unoccupied mode based on an operator adjustable time schedule. Separate heating and cooling setpoints shall be provided for each VAV. Other modes available for over ride shall include full open, full closed, maximum flow minimum flow.
- Occupied Mode: As the space temperature rises above the cooling set-point, the terminal unit shall modulate to its maximum CFM set-point. As the space temperature falls below cooling set-point, the terminal unit shall modulate to its minimum CFM set-point. Upon a further decrease in space temperature, the terminal unit shall modulate to heating CFM and the heating coil (when provided) shall modulate.

- Unoccupied Mode: During this mode, the air valve on the terminal unit shall be closed. When required by the unoccupied set-point, the heat shall cycle to maintain a reduced space temperature. Unit shall be at minimum heating CFM when heat is required.
- Morning warm-up Mode: The air valve on the terminal unit shall operate at their maximum heating CFM and the heating coil shall cycle to maintain the occupied heating set-point.

- The building automation system shall provide the ability to automatically calibrate and calibrate the terminal Air System. The following tasks shall be performed, at a minimum: Calibration of the air volume/gang. Verification of air flow through the terminal box. Verification of local reset performance.
- The building automation system (BAS) shall provide the ability to initiate the auto-calibrating/auto-calibration command directly from the user interface. Special service tools shall not be required. The terminal boxes shall allow the operator to perform on an individual or group basis auto-calibrating/report for the terminal Air System which contains the results of the auto-calibrating/auto-calibration tests which is printable and remains in memory until the next auto-calibrating test is initiated. This report shall contain, at a minimum, the following information for each terminal box in the system: Name of terminal box. Date and time the terminal box was tested. Presence of any alarms. Space temperature and set-point. Active alarm (in CFM). Air valve/damper position at every 5% increment. Discharge air temperature of the terminal box when the box heat is active.

- Zone Thermostats:
- The zone thermostats shall be accurate to within 1.0 degrees F. The thermostats shall be provided by the controls contractor and shall be as noted in section 2.0000 space thermostats (2.020).
- The zone thermostat shall be installed to avoid relying false temperatures (i.e. not close to heating/cooling sources).

- Heating HOT WATER BOILER SYSTEM (with Variable Primary Pumps)
- The boiler shall have a minimum of two (2) independent, but synchronized combustion systems. Boiler staging shall equalize boiler run time by rotating load boiler on a weekly basis. Boiler Heat Exchanger 1 combustion system shall fire first. When the demand cannot be met by one (1) combustion system, the same sequence of operation shall be followed to bring the Boiler Heat Exchanger 2 system on line. Each boiler has a dedicated automatic isolation valve. Enabling the boiler valve shall open this valve is normally CLOSED, full spring CLOSED, once open the end switch shall enable each dedicated boiler pump VFD followed by activation of the load boiler. This is a parallel variable primary pumping system, each primary pump (BP-1, BP-2) will pump thru the boiler and system, controlled by a dip meter (see below).

- The heating system shall be enabled when there is a call for heat or on a command for dehumidification. When heating is disabled, the hot water pumps and boilers shall be controlled to OFF and the boiler automatic isolation valve shall modulate closed. The BAS controller shall ensure the load boiler supply setpoint. In addition a LDR minimum flow thru each boiler shall be set at TDB to 10 GPM for each boiler (20 GPM each). The boiler pump VFDs shall be set internally to not allow the operating pump to fall below this GPM (H). Contractor to verify the minimum H setting on the boiler pump VFD to allow for a minimum of 10 GPM flow at each pump.

- Heating shall be disabled when no space is calling for heat and there is no command for dehumidification. When heating is disabled, the hot water pumps and boilers shall be controlled to OFF and the boiler automatic isolation valve shall modulate closed. The BAS controller shall ensure the load boiler supply setpoint. In addition a LDR minimum flow thru each boiler shall be set at TDB to 10 GPM for each boiler (20 GPM each). The boiler pump VFDs shall be set internally to not allow the operating pump to fall below this GPM (H). Contractor to verify the minimum H setting on the boiler pump VFD to allow for a minimum of 10 GPM flow at each pump.

- Heating shall be disabled when no space is calling for heat and there is no command for dehumidification. When heating is disabled, the hot water pumps and boilers shall be controlled to OFF and the boiler automatic isolation valve shall modulate closed. The BAS controller shall ensure the load boiler supply setpoint. In addition a LDR minimum flow thru each boiler shall be set at TDB to 10 GPM for each boiler (20 GPM each). The boiler pump VFDs shall be set internally to not allow the operating pump to fall below this GPM (H). Contractor to verify the minimum H setting on the boiler pump VFD to allow for a minimum of 10 GPM flow at each pump.

- Upon the boilers cycling off, continue running the hot water pumps for 15 minutes (adj). Boiler pumps shall remain running 10 minutes (adj) after enable is released from the BAS via the integral timer on the VFD status relay (default 5M100) Status for the boiler pump shall come directly from the VFD run output rather than CT, a dry signal interlock on VFD shall be wired in series with the boiler enable relay (the same as shown for AUX on motor starter) to prevent the boiler from overriding without proof from VFD.

- Boiler Control:
- The boiler loading sequence shall be based on an automatic weekly schedule. From the BAS controller human-interface panel or a BAS workstation, an operator shall be able to manually change the loading sequence.
- If the enabled hot water heater system supply temperature falls more than 5.0 deg. F (adj) below setpoint for a period longer than 15 minutes (adj), or if an active boiler signals a failure alarm, the BAS controller shall enable the lag boiler. The BAS controller shall read an alarm in the BAS workstation. When a boiler failure exists, loading automation shall be disabled and the currently running boiler shall become the lead boiler. Once the problem is corrected locally, the BAS controller shall enable the loading sequence.

- Once the lead boiler is enabled, the add sequence of additional boilers shall be disabled for a period of 30 minutes (adj). Additional boilers are added if the hot water distribution system supply temperature falls 5.0 deg. F (adj) below the hot water setpoint for a period of 10 minutes (adj) or more.
- The last boiler enabled shall be disabled when the distribution system hot water temperature reaches the hot water setpoint for a period of 10 minutes (adj) or more.

- Boiler Control:
- The boiler loading sequence shall be based on an automatic weekly schedule. From the BAS controller human-interface panel or a BAS workstation, an operator shall be able to manually change the loading sequence.
- If the enabled hot water heater system supply temperature falls more than 5.0 deg. F (adj) below setpoint for a period longer than 15 minutes (adj), or if an active boiler signals a failure alarm, the BAS controller shall enable the lag boiler. In addition, the BAS controller shall send an alarm to the BAS workstation. When a boiler failure exists, loading automation shall be disabled and the currently running boiler shall become the lead boiler. Once the problem is corrected locally, the BAS controller shall enable the loading sequence.

- Once the lead boiler is enabled, the add sequence of additional boilers shall be disabled for a period of 30 minutes (adj). Additional boilers are added if the hot water distribution system supply temperature falls 5.0 deg. F (adj) below the hot water setpoint for a period of 10 minutes (adj) or more.
- The last boiler enabled shall be disabled when the distribution system hot water temperature reaches the hot water setpoint for a period of 10 minutes (adj) or more.

- Boiler Control:
- The boiler loading sequence shall be based on an automatic weekly schedule. From the BAS controller human-interface panel or a BAS workstation, an operator shall be able to manually change the loading sequence.
- If the enabled hot water heater system supply temperature falls more than 5.0 deg. F (adj) below setpoint for a period longer than 15 minutes (adj), or if an active boiler signals a failure alarm, the BAS controller shall enable the lag boiler. In addition, the BAS controller shall send an alarm to the BAS workstation. When a boiler failure exists, loading automation shall be disabled and the currently running boiler shall become the lead boiler. Once the problem is corrected locally, the BAS controller shall enable the loading sequence.

- Once the lead boiler is enabled, the add sequence of additional boilers shall be disabled for a period of 30 minutes (adj). Additional boilers are added if the hot water distribution system supply temperature falls 5.0 deg. F (adj) below the hot water setpoint for a period of 10 minutes (adj) or more.
- The last boiler enabled shall be disabled when the hot water temperature rises to the hot water setpoint for a period of 10 minutes (adj) or more.

- Hot Water Reserve:
- Upon outside air temperature rising above 40 deg. F (adj), the hot water distribution system supply temperature setpoint shall linearly reset from 180.0 deg. F (adj) to 120.0 deg. F (adj) at 60 deg. F (adj) and above, based on hot water distribution system temperature. Reset shall occur either directly from the Furnace relay or triggered via the BAS.

- Hot Water Boiler Pump Start/Stop:
- The BAS controller shall start and stop hot water pumps through a contact closure of the end switch on boiler automatic isolation valve and run-enable contacts.
- Hot Water Boiler Pump Status:
- The BAS controller shall monitor the hot water pump run status by a VFD output.

- Hot Water Boiler Pump Load/Log:
- The hot water pump loading sequence shall follow the boiler loading sequence: pumps shall be dedicated to the respective boilers.
- Hot Water Boiler Pump Failure:
- If the lead boiler HDA enable start/stop is enabled and the boiler automatic isolation switch status is open for more than 30 seconds (adj) and run status indication is OFF, the BAS controller shall announce a hot water pump failure alarm to the BAS workstation and status the lag boiler. When a boiler pump VFD failure exists, loading logic automation shall be disabled and the lag boiler becomes the lead. Once the problem has been corrected, the system shall reset automatically. This action shall re-enable the loading sequence, if the boiler has not been enabled or the BAS and pump is showing status as running a "pump in heat" operation shall be indicated on the BAS.

- Hot Water Distribution Pump Setup:
- The BAS controller shall monitor the hot water system differential pressure sensor. When the pump VFD is enabled, the BAS controller shall control the analog speed signal sent to the pump VFD to maintain a hot water differential pressure setpoint of 15.0 psig (adj), minimum flow for each pump is 10 gpm.

- Freeze Protection:
- When the outdoor air temperature falls below 35.0 deg. F (adj), the hot water supply temperature setpoint continuously to provide heat circulation to all associated hot water coils.
- The BAS should have no lockouts or resets that would require operator intervention to correct but shall only alarm. Field equipment with manual reset shall alarm in the BAS and when reset shall allow the BAS to resume the intended control sequence. Tread logs shall be created to record and retain all boiler alarms.

- Hot Water Reserve:
- Upon outside air temperature rising above 40 deg. F (adj), the hot water supply temperature setpoint shall linearly reset from 180.0 deg. F (adj) to 120.0 deg. F (adj) at 60 deg. F (adj) and above, based on hot water supply temp, refer to piping schematic on dwg 1M102.
- The reset steps listed above are for the secondary distribution loop. The primary loop (boiler recirculation loop) temperature shall not fall below 140 deg. F (adj) to prevent condensation in the boiler from occurring.

- Hot Water BPP Pump Start/Stop:
- The BAS controller shall start building boiler hot water pumps VFDs via an enable RIB relay at the pump VFD. All VFDs shall have safety devices wired directly to the VFD with indication to the BAS. All VFDs shall have a local RIB capabilities. (see detail 6M105)
- Hot Water BPP Pump Status:
- The BAS controller shall direct hot water pump run status by a VFD run output. (see detail 6M105)

- Hot Water BPP Pump Load/Log:
- The hot water pump loading sequence shall be based on a weekly schedule. From the BAS controller human-interface panel or a BAS workstation, an operator shall be able to manually change the loading sequence.
- If the lead pump speed falls below 40% (adj) for five minutes (adj) the lag pump shall be disabled.

- Hot Water BPP Pump Failure:
- If the lead start/stop is enabled and the pump VFD status is off for more than 30 seconds (adj) and no VFD fault, the BAS controller shall announce a BPP water pump failure alarm to the BAS workstation and status the lag pump. When a pump failure exists, loading automation shall be disabled and the currently running pump shall become the lead pump. Once the problem has been corrected, the operator shall system shall reset automatically. This action shall re-enable the loading sequence.

- Hot Water BPP Pump Setup:
- The BAS controller shall monitor the hot water system differential pressure sensor. When the pump VFD is enabled, the BAS controller shall control the analog speed signal sent to the pump VFD to maintain a hot water differential pressure setpoint of 15.0 psig (adj).
- BPP Freeze Protection:
- When the outdoor air temperature falls below 35.0 deg. F (adj), the lead pump shall operate continuously to provide heat circulation to all associated hot water coils. The BAS shall automatically announce which pump is energized weekly in order to equalize run time between the two pumps.

- MULTI-ZONE AIR HANDLER (AHU-8)
- UNIT SHALL BE STOPPED/STARTED ON A PROGRAMMED BASIS THROUGH THE BAS. SUPPLY FAN SHALL RUN CONTINUOUSLY WHILE THE UNIT IS IN THE OCCUPIED MODE. EACH ZONE SHALL BE PROVIDED WITH A SPACE TEMPERATURE SENSOR TO CONTROL ZONE DAMPERS, CHILLED WATER AND HOT WATER CONTROL VALVES SHALL CONTROL TO THE ZONE. WITH THE HIGHEST DEMAND FOR COOLING OR HEATING, UNIT ZONE DAMPERS SHALL MODULATE BETWEEN HOT, DUCK, COOL DUCK, AND BY-PASS AS REQUIRED TO MAINTAIN SPACE TEMPERATURE. NO PUSH BUTTON OVERRIDE SHALL BE PROVIDED. EXISTING PUSH BUTTON OVERRIDE SHALL BE DEMOLISHED.

- SMOKE DETECTOR SHALL BE PROVIDED IN THE RETURN DUCT PRIOR TO THE OUTSIDE AIR DUCT CONNECTION. DETECTOR SHALL SHUT-DOWN SUPPLY FAN UPON ACTIVATION.
- Freeze Protection:
- A freeze stat shall be located upstream of the cooling coil, and shall alarm the central BAS if the temperature is below 38°F.

- Once the freeze stat is reset the BAS may resume its intended control sequence.
- The secondary hot water pumps shall start, and the heating coil valve shall modulate to maintain 70 degrees, hot water valve fail position 100% open.
- The unit shall only be reset manually. The manual reset button shall be located as such to be easily accessible by the technician.

- Safety Interlock: The following shall alarm the BAS, once reset the BAS may resume its intended control sequence: Duct detector, low limit thermostat activation, high pressure switch (4" P" adjustable).
- The BAS should have no lockouts or resets that would require operator intervention to correct but shall only alarm.

DAVID BUTLER HIGH SCHOOL BUILDING #1 SEQUENCE OF OPERATIONS

SINGLE ZONE CONSTANT VOLUME CHILLED WATER AIR HANDLING UNIT OPERATION (AHU-1,2,3,4,5,6,7,9,10,11,12,13,14,15,16)

The Building Automation System (BAS) shall perform the following Single Zone System (CV) control strategies, appropriate to the given occupancy mode of the system, as determined by the use-adjustable time-of-day schedule for the system. Optimal start and occupancy mode applies only to HVAC-1 with time of day scheduled operation. Verify time schedule during Owner's training.

Optimal Start Mode:

- The BAS shall initiate the Optimal Start mode such that the CV air handler is started prior to when the space being served by the CV is scheduled to be occupied, to allow the zone temperature to reach the predicted occupied heating or cooling set-point. The system shall wait as long as possible before starting, so that the temperature in each zone reaches the occupied set-point just in time for scheduled occupancy. Ventilation functions shall be disabled when the AHU is in Optimal Start mode and outside air dampers shall be closed.
- The BAS shall use a self-adjusting algorithm to calculate the actual time to initiate Optimal Start for the CV Air System based on the occupied set-point, space temperature, current temperature, internal optical start performance data and the associated heating or cooling optimal start rate.
- As safety start limit shall be provided to prevent the CV from starting prior to 120 minutes (adjustable) before scheduled occupancy.

- The AHU shall transition from Optimal Start mode to occupied mode when the current time is equal to the scheduled start time.
1. Cooling
- a. The BAS shall initiate the Optimal Start - Cooling mode when Optimal Start mode has been initiated and the temperature of the space is warmer than the occupied cooling set-point. All ventilation functions are disabled while operating in Optimal Start mode and the outside air dampers shall be closed.
- b. The BAS shall determine the length of time required to lower the space temperature to the occupied cooling set-point when the mode of the CV AHU is cooling and the space temperature is above the occupied cooling set-point.
- c. The cooling coil control valve shall fully open and the air handler fan shall energize until the space temperature is satisfied.

2. Heating
- a. The BAS shall initiate the Optimal Start - Heating mode when Optimal Start mode has been initiated and the space temperature is cooler than the occupied heating set-point. All ventilation functions are disabled while operating in Optimal Start mode and the outside air dampers shall be closed.
- b. The BAS shall determine the length of time required to raise the space temperature to the occupied heating set-point when the mode of the CV AHU is heating and the space temperature is below the set-point.
- c. The reheat coil control valve shall fully open and the air handler fan shall energize. Upon a further drop in space temperature, the reheat coil control valve shall modulate open.

- Unoccupied Mode:
- The BAS shall place the members of the CV AHU Air System into Off/Standby mode as determined by the use-adjustable time-of-day schedule for the system. The AHU shall control the individual unoccupied temperature set-point, and all ventilation functions shall be disabled and outside air dampers shall be closed.
- After the zone has been commanded to unoccupied, the CV AHU shall command the associated AHU to Unoccupied mode. Supply fan shall be shut down, heating coil control valve shall close, cooling coil control valve shall close, outdoor air damper shall be closed, and all ventilation functions shall be disabled.

- Single Spoke Mode: During scheduled unoccupied hours, the CV AHU Air System shall be controlled by the BAS to maintain the unoccupied heating and cooling set-points, as appropriate. Ventilation functions are disabled, the outdoor air damper shall remain closed. Unless otherwise stated, the AHU supply fan shall operate in the automatic control mode, cycling on only when heating or cooling is needed.

- Heating
1. AHU supply fan energized, reheat coil control valve shall fully open.
2. The BAS shall initiate the Night Heating mode when the temperature for the space being served by the CV AHU is less than 55 degrees F (adjustable). Night heating shall terminate when the space temperature rises above the Unoccupied Heating set-point plus the unoccupied heating differential (4 degrees F, adjustable).

- Cooling
1. AHU supply fan energized, cooling coil control valve shall fully open.
2. The BAS shall initiate the Night Cooling mode when the temperature for the space being served by the CV AHU is greater than 85 degrees F (adjustable). Night cooling shall terminate when the space temperature falls below the Unoccupied Cooling set-point plus the unoccupied cooling differential (4 degrees F, adjustable).

- Occupied Mode Cooling Control: The cooling coil control valve shall modulate open, and the fan shall energize to maintain the space temperature. Upon a further drop in space temperature, the reheat coil control valve shall modulate open, and the fan shall energize to maintain the space temperature. Upon a further drop in space temperature, the reheat coil control valve shall modulate open, and the fan shall energize to maintain the space temperature.

- Occupied Mode Heating Control: The reheat coil control valve shall modulate open, and the fan shall energize to maintain the space temperature. Upon a further drop in space temperature, the reheat coil control valve shall modulate open, and the fan shall energize to maintain the space temperature. Upon a further drop in space temperature, the reheat coil control valve shall modulate open, and the fan shall energize to maintain the space temperature.

- Dehumidification:
- Provide all necessary sensors for dehumidification control at each air handler.
- The controller shall measure the return air humidity and override the cooling sequence to maintain a return air humidity setpoint of 60% rh (adj.). The dehumidification shall turn off whenever the return air humidity drops below 50% rh (adj.).
1. When dehumidification mode is engaged per the requirements above, the cooling coil control valve shall be drive fully open, and the reheat coil control valve shall modulate to maintain space temperature control. **AHU-11 enable due electric heat (EDH-317) is loss of FHW reheat coil. Duct coil shall stop to maintain space temperature.**

- Dehumidification shall be enabled whenever:
1. Fan status is on
2. Zone humidity exceeds 60% (adj) relative humidity in occupied or unoccupied mode.
- Alarms shall be provided as follows:
1. High Return Air Humidity: If the return air humidity is 10% (adj) greater than setpoint.

- Damper and Valve Fail Positions:
1. FHW valve shall fail OPEN
2. CFW valve shall fail 50%
3. Outside and Relief air dampers shall fail closed.
4. Return air dampers shall fail open.

- Freeze Protection:
- A freeze stat shall be located upstream of the cooling coil, and shall alarm the central BAS if the temperature is below 38°F.
- Once the freeze stat is reset the BAS may resume its intended control sequence.
- The secondary hot water pumps shall start, and the heating coil valve shall modulate to maintain 70 degrees, hot water valve fail position 100% open.
- The unit shall only be reset manually. The manual reset button shall be located as such to be easily accessible by the technician.

- Safety Interlock: The following shall alarm the BAS, once reset the BAS may resume its intended control sequence: Duct detector, low limit thermostat activation, high pressure switch (4" P" adjustable).
- The BAS should have no lockouts or resets that would require operator intervention to correct but shall only alarm.

- Hot Water BPP Pump Start/Stop:
- The BAS controller shall start building boiler hot water pumps VFDs via an enable RIB relay at the pump VFD. All VFDs shall have safety devices wired directly to the VFD with indication to the BAS. All VFDs shall have a local RIB capabilities. (see detail 6M105)
- Hot Water BPP Pump Status:
- The BAS controller shall direct hot water pump run status by a VFD run output. (see detail 6M105)

- Hot Water BPP Pump Load/Log:
- The hot water pump loading sequence shall be based on a weekly schedule. From the BAS controller human-interface panel or a BAS workstation, an operator shall be able to manually change the loading sequence.
- If the lead pump speed falls below 40% (adj) for five minutes (adj) the lag pump shall be disabled.

- Hot Water BPP Pump Failure:
- If the lead start/stop is enabled and the pump VFD status is off for more than 30 seconds (adj) and no VFD fault, the BAS controller shall announce a BPP water pump failure alarm to the BAS workstation and status the lag pump. When a pump failure exists, loading automation shall be disabled and the currently running pump shall become the lead pump. Once the problem has been corrected, the operator shall system shall reset automatically. This action shall re-enable the loading sequence.

- Hot Water BPP Pump Setup:
- The BAS controller shall monitor the hot water system differential pressure sensor. When the pump VFD is enabled, the BAS controller shall control the analog speed signal sent to the pump VFD to maintain a hot water differential pressure setpoint of 15.0 psig (adj).
- BPP Freeze Protection:
- When the outdoor air temperature falls below 35.0 deg. F (adj), the lead pump shall operate continuously to provide heat circulation to all associated hot water coils. The BAS shall automatically announce which pump is energized weekly in order to equalize run time between the two pumps.

- MULTI-ZONE AIR HANDLER (AHU-8)
- UNIT SHALL BE STOPPED/STARTED ON A PROGRAMMED BASIS THROUGH THE BAS. SUPPLY FAN SHALL RUN CONTINUOUSLY WHILE THE UNIT IS IN THE OCCUPIED MODE. EACH ZONE SHALL BE PROVIDED WITH A SPACE TEMPERATURE SENSOR TO CONTROL ZONE DAMPERS, CHILLED WATER AND HOT WATER CONTROL VALVES SHALL CONTROL TO THE ZONE. WITH THE HIGHEST DEMAND FOR COOLING OR HEATING, UNIT ZONE DAMPERS SHALL MODULATE BETWEEN HOT, DUCK, COOL DUCK, AND BY-PASS AS REQUIRED TO MAINTAIN SPACE TEMPERATURE. NO PUSH BUTTON OVERRIDE SHALL BE PROVIDED. EXISTING PUSH BUTTON OVERRIDE SHALL BE DEMOLISHED.

- SMOKE DETECTOR SHALL BE PROVIDED IN THE RETURN DUCT PRIOR TO THE OUTSIDE AIR DUCT CONNECTION. DETECTOR SHALL SHUT-DOWN SUPPLY FAN UPON ACTIVATION.
- Freeze Protection:
- A freeze stat shall be located upstream of the cooling coil, and shall alarm the central BAS if the temperature is below 38°F.

- Once the freeze stat is reset the BAS may resume its intended control sequence.
- The secondary hot water pumps shall start, and the heating coil valve shall modulate to maintain 70 degrees, hot water valve fail position 100% open.
- The unit shall only be reset manually. The manual reset button shall be located as such to be easily accessible by the technician.

- Safety Interlock: The following shall alarm the BAS, once reset the BAS may resume its intended control sequence: Duct detector, low limit thermostat activation, high pressure switch (4" P" adjustable).
- The BAS should have no lockouts or resets that would require operator intervention to correct but shall only alarm.

PARALLEL CHILLERS WITH PRIMARY/SECONDARY FLOW

General: The chiller plant control system shall monitor and control the chilled water system including the chillers, pumps, cooling tower, heat exchanger and variable speed drives as appropriate.

The chiller plant control system shall have fully adjustable auto interface set-up via point and click on a standard windows screen. It shall not require special software tools or a building automation system technician to operate.

- The chiller plant control system shall include the following functions:
- Operator interface
- System Start/Stop
- Chiller pump sequencing
- Chiller minimum flow by-pass valve control
- System soft start
- Automatic isolation of chillers and pumps
- Failure recovery diagnostics/protection
- Energy optimization routines
- System and chiller status reports
- Demand limiting

- System Control Configuration Overview - Control of the system components shall be as follows:
- The chillers shall receive enable and disable signals through a command via a communication link with the BAS.
- A chiller binary output shall control the operation of the chiller evaporator isolation valve and/or call for pump operation. The call for the chillers shall work in conjunction with the BAS to sequence pump and isolation valve opening/closing for smooth start operation.

- The system minimum flow by-pass valve shall be a normally open valve.
- The system minimum flow by-pass valve shall be modulated to the fully open position whenever the system is shutdown to ensure minimum flow and prevent the possibility of water hammer whenever a pump is started.
- The system minimum flow by-pass valve position shall be modulated to ensure operating chiller flow does not drop below the manufacturer's minimum recommended flow. Control shall be based on flow through the chiller evaporator direct measurement using a calibrated expensive water flow meter.

- Operator interface: The chiller plant control system shall include the following operator interface elements:
- Operational status screen to include:
- Chiller System Status (On/Off, Start/Normal/Alarm, Lockout/Shutdown, in Progress).
- Chiller Plant Supply Water Set-point
- Chilled Water Supply Water Temperature
- Chilled Water System Return Water Temperature
- Predictive chiller addition / subtraction status messages (i.e. "Next Chiller shall be added when the system supply water temperature (42 degrees F) reaches 44 degrees F for 10 minutes.")

- Individual Chiller Failure Reset (Push Button)
- All Chiller Failure Reset (Push Button)
- System Pump Failure Reset (Push Button)
- Manual Addition of Chiller (Push Button)
- Manual Subtraction of Chiller (Push Button)
- Manual Isolation of Chiller Sequence (Push Button)

- Screen has editing of the following data (to be performed without entering program code edit):
- Supply Water Set-point
- System Soft Loading Parameters
- Anticlock Lockout Parameters
- Chiller Addition Parameters
- Chiller Subtraction Parameters
- Auto Restart Parameters
- Alarm Holding Setup
- Security Setup

- Individual Chiller Graphics to include all data listed on the supplementary Chiller System Point List, including:
- Chiller Name
- Chiller Operating Mode
- Chilled Water Set-point
- Chiller W/L-A pressure
- Entering Chiller Water Temperature
- Leaving Chiller Water Temperature
- Evaporator Flow Rate
- Evaporator Flow status

- Automatic isolation of chillers and pumps:
- Chiller rotation shall be initiated based on an operator event interval or by the cycling of a binary point. The method of sequence shall be operator selectable.
- Chiller cycling caused by normal system load fluctuations shall cause the chillers to change rotation sequence or at the operator's option chillers may be forced into the new rotation sequence at the time of sequence change.

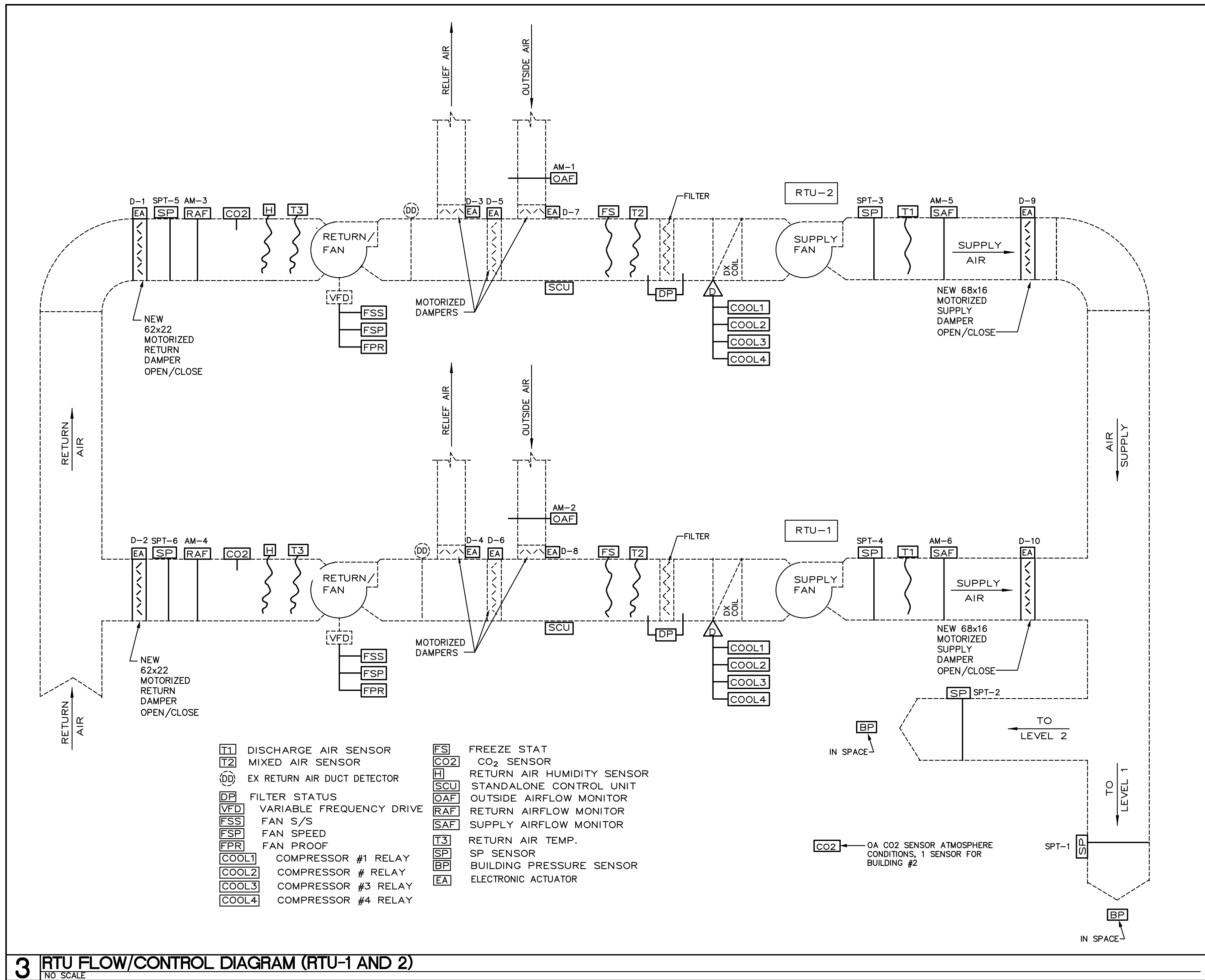
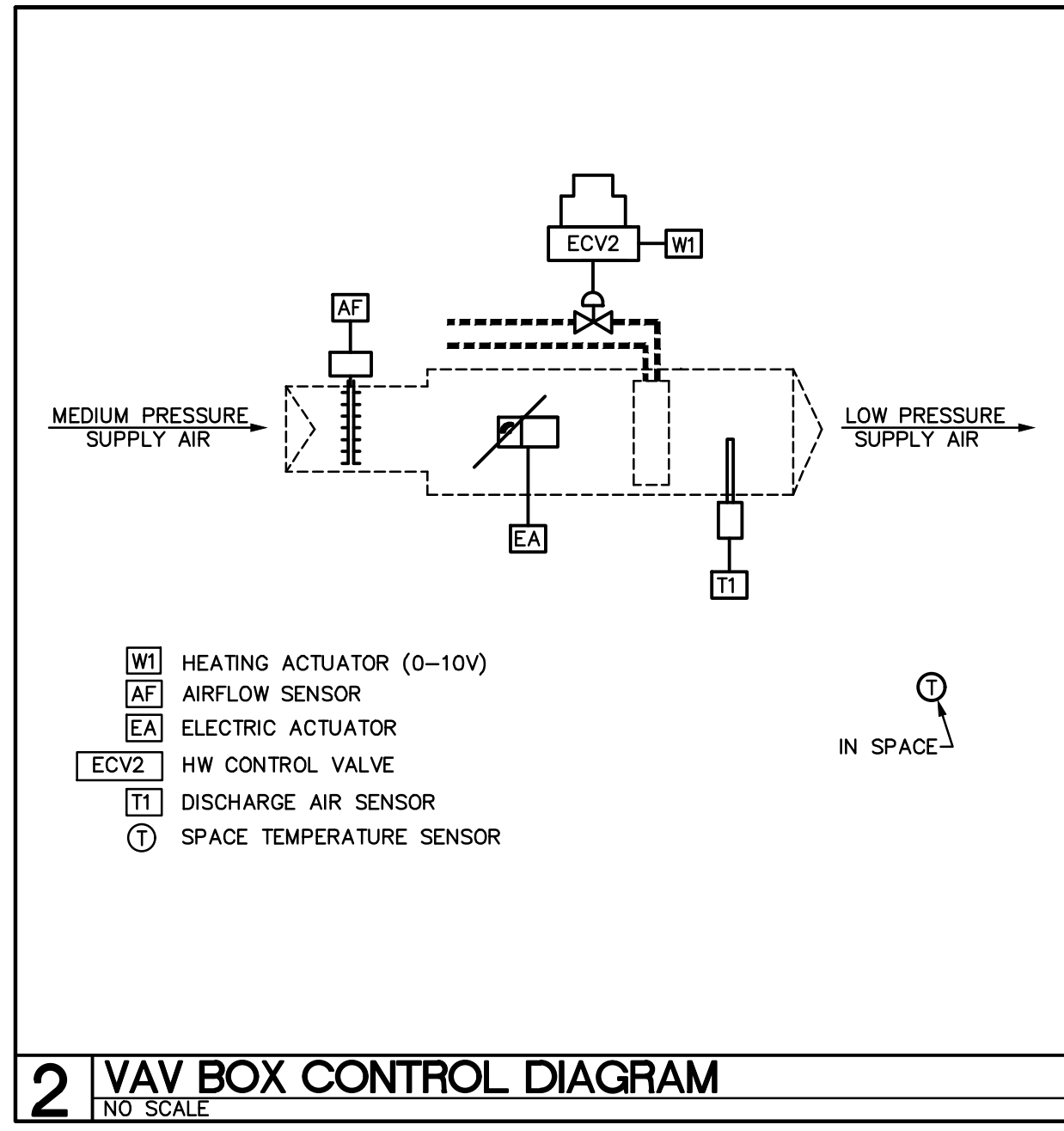
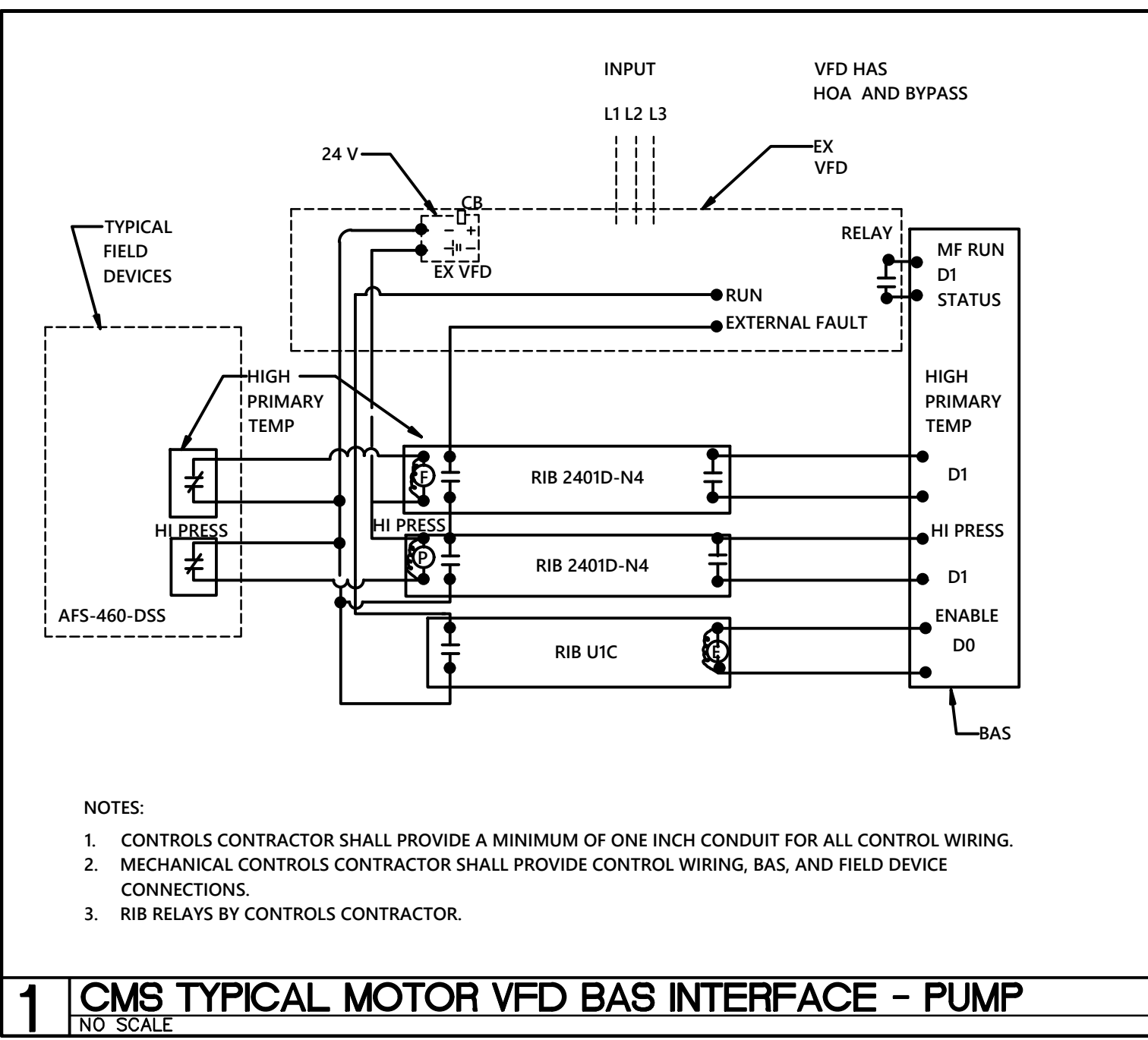
- Pump rotation shall be initiated by the BAS, 1 day cycle (adj).
- Entering Chiller Water Temperature
- Leaving Chiller Water Temperature
- Evaporator Flow Rate
- Evaporator Flow status

- Automatic isolation of chillers and pumps:
- Chiller rotation shall be initiated based on an operator event interval or by the cycling of a binary point. The method of sequence shall be operator selectable.
- Chiller cycling caused by normal system load fluctuations shall cause the chillers to change rotation sequence or at the operator's option chillers may be forced into the new rotation sequence at the time of sequence change.

- Pump rotation shall be initiated by the BAS, 1 day cycle (adj).
- Entering Chiller Water Temperature
- Leaving Chiller Water Temperature
- Evaporator Flow Rate
- Evaporator Flow status

- Automatic isolation of chillers and pumps:
- Chiller rotation shall be initiated

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BUILDING #2

EX ROOFTOP UNIT SCHEDULE - (DX COOLING - VAV)

SYMBOL	QFM	NOMINAL TONNAGE	O.A. CFM	E.S.P.	COOLING CAPACITY			EFFICIENCY			HEATING CAPACITY			EFFICIENCY			COMPRESSOR (EA)			QCM	IFM	COMB. FAN	RETURN FAN		POWER SUPPLY		OPERATING WEIGHT	MANUFACTURER	
					1% (BTU/H)	5% (BTU/H)	SHC (BTU/H)	SEER	SEER	IP/LV	INPUT (BTU/H)	OUTPUT (BTU/H)	AFUE	NO.	BLA	LRA	QTY.	FLA	HP				EXP	HP	MCA	MOCP			VOLTAGE
RTU-1	12,000	50	3,610	1.75"	597,000	412,000	9.7	—	—	—	—	—	—	4	—	—	4	—	—	15	—	—	0.75"	7.5	138	150	460V-3ø	825 LBS	CARRIER
RTU-2	12,000	50	3,610	1.75"	597,000	412,000	9.7	—	—	—	—	—	—	4	—	—	4	—	—	15	—	—	0.75"	7.5	138	150	460V-3ø	825 LBS	CARRIER

FOR INFORMATION ONLY

EX PUMP SCHEDULE

FOR INFORMATION ONLY

SYMBOL	SERVICE	GPM	HEAD	DESIGN EFFICIENCY	R.E.M.	H.P.	VOLTAJE	MANUFACTURER
BBP-1A	HW LOOP	36	59'	—	1750	2	460V-3ø	E-1510 1.258C
BBP-1A	HW LOOP	36	59'	—	1750	2	460V-3ø	E-1510 1.258C

EX BOILER SCHEDULE

FOR INFORMATION ONLY

BOILER #1 (B-1)	FULTON PHW 500 (CONDENSING)	500 MBH INPUT; 470 MBH OUTPUT; NATURAL GAS, 97% THERMAL EFFICIENCY; 36 GPM, 10' PD MAX.; 120V-1ø, 15 MCOIP;
BOILER #2 (B-2)	FULTON PHW 500 (CONDENSING)	500 MBH INPUT; 470 MBH OUTPUT; NATURAL GAS, 97% THERMAL EFFICIENCY; 36 GPM, 10' PD MAX.; 120V-1ø, 15 MCOIP;

VAV BOX SCHEDULE

FOR INFORMATION ONLY

IPS/VAV SYMBOL	PRIMARY CFM	FAN MIN/MAX CFM	TOTAL HEATING (MBH)	WOT WATER GPM	VAV TYPE
VAV-1-101	330	340	N/A	20.1	1.1 SINGLE DUCT
VAV-1-108	705	235	N/A	14.0	.8 SINGLE DUCT
VAV-1-106	705	235	N/A	14.0	.8 SINGLE DUCT
VAV-1-104	705	235	N/A	14.0	.8 SINGLE DUCT
VAV-1-102	1020	275	N/A	18.5	.9 SINGLE DUCT
VAV-1-105	1800	540	N/A	21.8	1.2 SINGLE DUCT
VAV-1-103	150	50	N/A	2.1	1.0 SINGLE DUCT
VAV-1-109	835	311	N/A	20.1	1.0 SINGLE DUCT
VAV-1-121	780	220	N/A	17.3	.9 SINGLE DUCT
VAV-1-122	1095	365	N/A	28.3	1.3 SINGLE DUCT
VAV-1-125	800	286	N/A	17.7	.9 SINGLE DUCT
VAV-1-127	865	280	N/A	10.9	.6 SINGLE DUCT
VAV-1-126	800	286	N/A	17.7	.9 SINGLE DUCT
VAV-1-128	800	286	N/A	17.7	.9 SINGLE DUCT
VAV-1-129	1120	305	N/A	17.7	.9 SINGLE DUCT
VAV-1-131	90	30	N/A	5.2	.2 SINGLE DUCT
VAV-1-134	880	285	N/A	18.5	.9 SINGLE DUCT
VAV-1-135	680	205	N/A	14.0	.7 SINGLE DUCT
VAV-2-210	1095	400	N/A	27.4	1.4 SINGLE DUCT
VAV-2-208	1050	508	N/A	21.7	1.1 SINGLE DUCT
VAV-2-202	1440	965	N/A	28.0	1.4 SINGLE DUCT
VAV-2-205	450	135	N/A	7.5	.4 SINGLE DUCT
VAV-2-211	1065	784	N/A	26.7	1.3 SINGLE DUCT
VAV-2-212	1165	962	N/A	26.7	1.3 SINGLE DUCT
VAV-2-213	1125	375	N/A	26.2	1.3 SINGLE DUCT
VAV-2-223	1245	955	N/A	28.0	1.4 SINGLE DUCT
VAV-2-224	800	275	N/A	15.9	.8 SINGLE DUCT
VAV-2-226	1400	800	N/A	26.7	1.3 SINGLE DUCT
VAV-2-228	90	30	N/A	5.2	.2 SINGLE DUCT
VAV-2-230	950	315	N/A	20.1	1.0 SINGLE DUCT
VAV-2-231	750	250	N/A	17.3	.9 SINGLE DUCT
VAV-2-203	150	50	N/A	—	— SINGLE DUCT
VAV-2-212	450	135	N/A	7.58	.3 SINGLE DUCT

FOR INFORMATION ONLY

FAN SCHEDULE

SYMBOL	AREA SERVED/AHU ZONE	TYPE	QFM	APPROX. S.F.	DRIVE	MAX RPM	ELECTRICAL DATA
EE-1	MAIN TOILETS/RTU-1/2	EXHAUST	3220	0.50"	BELT	824	--- 1/2 120V-1ø
EE-2	ELEC RM 114/QAD-114	EXHAUST	700	0.50"	DIRECT	1100	--- 1/6 120V-1ø
EE-3	ELEC RM 115/QAD-114	EXHAUST	700	0.50"	DIRECT	1100	--- 1/6 120V-1ø
EE-4	WORKROOM 224/RTU-1	EXHAUST	450	0.30"	DIRECT	1625	--- 1/8 120V-1ø
EE-5	ELEC RM 208/RTU-2	EXHAUST	148	.0375"	DIRECT	1075	--- 1/25 120V-1ø
EEF-1	PREP RM 204/RTU-2	EXHAUST	800	.025"	BELT	1550	--- 1/4 120V-1ø
EEF-2	PREP RM 208/RTU-2	EXHAUST	800	.025"	BELT	1550	--- 1/4 120V-1ø
EEF-3	PREP RM 223/RTU-2	EXHAUST	800	.025"	BELT	1550	--- 1/4 120V-1ø
EEF-4	SCIENCE 202/RTU-2	EXHAUST	2700	0.375"	BELT	1300	--- 1/2 120V-1ø
EEF-5	SCIENCE 209/RTU-2	EXHAUST	2700	0.375"	BELT	1300	--- 1/2 120V-1ø
EEF-6	SCIENCE 211/RTU-2	EXHAUST	2700	0.375"	BELT	1300	--- 1/2 120V-1ø
EEF-7	SCIENCE 212/RTU-2	EXHAUST	2700	0.375"	BELT	1300	--- 1/2 120V-1ø
EEF-8	SCIENCE 223/RTU-2	EXHAUST	2700	0.375"	BELT	1300	--- 1/2 120V-1ø
EEF-9	SCIENCE 226/RTU-2	EXHAUST	2700	0.375"	BELT	1300	--- 1/2 120V-1ø
HEE-1	FUME HOOD/RTU-2	EXHAUST	375	0.375"	DIRECT	1680	--- 1/8 120V-1ø
HEE-2	FUME HOOD/RTU-2	EXHAUST	375	0.375"	DIRECT	1680	--- 1/8 120V-1ø
HEE-3	FUME HOOD/RTU-2	EXHAUST	375	0.375"	DIRECT	1680	--- 1/8 120V-1ø
HEE-4	FUME HOOD/RTU-2	EXHAUST	375	0.375"	DIRECT	1680	--- 1/8 120V-1ø
HEE-5	FUME HOOD/RTU-2	EXHAUST	375	0.375"	DIRECT	1680	--- 1/8 120V-1ø
HEE-6	FUME HOOD/RTU-2	EXHAUST	375	0.375"	DIRECT	1680	--- 1/8 120V-1ø

FOR INFORMATION ONLY

PUMP SCHEDULE

SYMBOL	SERVICE	QFM	HEAD	R.P.M.	H.P.	VOLTAJE	MANUFACTURER
QUBP-1	CHILLED WATER	660	80	1750	25	460V-3ø	FE4010
QUBP-1A	CHILLED WATER	660	80	1750	25	460V-3ø	FE4010
QUBP-1	CHILLED WATER	660	35	1750	10	460V-3ø	N/A
QUBP-2	CHILLED WATER	660	35	1750	10	460V-3ø	N/A
QWP-1	CONDENSER WATER	850	55	1750	15	460V-3ø	TA1224
QWP-2	CONDENSER WATER	850	55	1750	15	460V-3ø	TA1224
BBP-1	HOT WATER	200	75	1750	7.5	460V-3ø	FE2508
BBP-1A	HOT WATER	200	75	1750	7.5	460V-3ø	FE2508
BP-1	HOT WATER	200	20	1750	2	460V-3ø	FE2508
BP-2	HOT WATER	200	20	1750	2	460V-3ø	FE2508

NEW PUMP VFD'S:

DEMOLISH EXISTING DISCONNECTS/STARTERS AND INSTALL NEW VFD'S AND GROUNDING RINGS FOR CHILLED AND HOT WATER SECONDARY PUMPS (BBP-1A, BBP-1, CHBP-1A AND CHBP-1) FIELD VERIFY PUMP VFD HP PRIOR TO ORDER. REFER TO SEQUENCE, POINTS LIST AND CHILLER/BOILER ROOM DRAWINGS M102, M104 AND M362. INSTALL NEW DP SENSORS IN CHW/HW MAINS LOCATED ABOVE ENGLISH 728 (REFER TO DWG M307). REFER TO SEQUENCES FOR DP SENSOR OPERATION.

PUMP RE-BALANCE:

PUMPS, CHBP-1, CHBP-1A AND BBP-1 AND BBP-1A SHALL ALL RECEIVE NEW VFD'S AS DESCRIBED ON THE NOTE ABOVE. AFTER VFD INSTALLATION ALL PUMPS LISTED ON THIS NOTE SHALL BE RE-BALANCED TO GPM INDICATED ON SCHEDULE.

FINNED TUBE SCHEDULE

SYMBOL	ELEMENT LENGTH	EXPOSURE LENGTH	BTU/H	QFM	RUNOUT
FT	4'-0"	5'-0"	45,000	3.0	3/4"
FT	8'-0"	9'-0"	90,000	3.0	3/4"

FT-XX -- REFER TO DRAWINGS FOR FT DESIGNATION

BUILDING #1

FOR INFORMATION ONLY

EX AIR HANDLING UNIT SCHEDULE

FOR INFORMATION ONLY

UNIT NUMBER	LOCATION	TOTAL AIR FLOW (CFM)	OUTSIDE AIR FLOW (CFM)	EXT. STATIC PRESSURE (IN. Hg.)	COOLING COIL								HEATING COIL (REHEAT POSITION)								ELECTRICAL DATA				MANUFACTURER & MODEL NO.
					TOTAL CAPACITY	SENSIBLE CAPACITY	GPM	E.W.T. (°F)	L.W.T. (°F)	MAX. P.D.	MAX. S.P.	RUNOUT SIZE	TOTAL CAP.	GPM	E.W.T. (°F)	L.W.T. (°F)	MAX. P.D.	MAX. S.P.	RUNOUT SIZE	FAN (H.P.)	VOLTS	PHASE	Hz		
AHU-1	AUXILIARY GYM	5000	1250	0.50"	180,000	130,000	30.0	44	56	10'	.65"	2"	225,000	10.9	180	140	5'	.25"	11/4"	5	460	3	60	McQUAY LSL-108	
AHU-2	ATHLETIC COMMONS	9500	600	0.75"	335,000	245,000	55.8	44	56	10'	.65"	2 1/4"	415,000	20.8	180	140	5'	.25"	11/4"	10	460	3	60	McQUAY LSL-122	
AHU-3	MEDIA CENTER	11,550	2650	1.0"	405,000	295,000	79.0	44	56	10'	.65"	2 1/4"	520,000	25.3	180	140	5'	.25"	2"	10	460	3	60	McQUAY LSL-122	
AHU-4	LOCKER CORRIDOR	4000	400	0.50"	140,000	102,500	25.0	44	56	10'	.65"	1 1/4"	180,000	8.8	180	140	5'	.25"	11/4"	3	460	3	60	McQUAY LSL-108	
AHU-5	LOCKER CORRIDOR	4000	---	0.50"	140,000	102,500	25.0	44	56	10'	.65"	1 1/4"	180,000	8.8	180	140	5'	.25"	11/4"	3	460	3	60	McQUAY LSL-108	
AHU-6	LOCKER CORRIDOR	2500	---	0.50"	90,000	65,000	15.0	44	56	10'	.65"	1 1/4"	115,000	5.5	180	140	5'	.25"	1"	2	460	3	60	McQUAY LSL-106	
AHU-7	LOCKER CORRIDOR	3500	---	0.50"	125,000	92,000	20.8	44	56	10'	.65"	1 1/4"	160,000	8.0	180	140	5'	.25"	11/4"	3	460	3	60	McQUAY LSL-108	
AHU-8	ADMINISTRATION	6000	500	0.75"	215,000	155,000	37.0	44	56	10'	.65"	2"	215,000	13.1	180	140	5'	.25"	11/4"	7 1/4	460	3	60	McQUAY LSL-114	
AHU-9	AUDITORIUM COMMONS	9500	600	0.75"	335,000	245,000	55.8	44	56	10'	.65"	2 1/4"	415,000	20.8	180	140	5'	.25"	11/4"	7 1/4	460	3	60	McQUAY LSL-122	
AHU-10	LOCKER CORRIDOR	4000	---	0.50"	140,000	102,500	25.0	44	56	10'	.65"	1 1/4"	180,000	8.8	180	140	5'	.25"	11/4"	3	460	3	60	McQUAY LSL-108	
AHU-11	AUDITORIUM	6000	1500	0.50"	225,000	160,000	54.0	44	56	10'	.65"	2"	275,000	13.1	180	140	5'	.25"	11/4"	5	460	3	60	McQUAY LSL-114	
AHU-12	AUDITORIUM	6000	1500	0.50"	225,000	160,000	54.0	44	56	10'	.65"	2"	275,000	13.1	180	140	5'	.25"	11/4"	5	460	3	60	McQUAY LSL-114	
AHU-13	STAGE	3700	500	0.50"	125,000	92,500	20.8	44	56	10'	.65"	1 1/4"	165,000	8.1	180	140	5'	.25"	11/4"	3	460	3	60	McQUAY LSL-108	
AHU-14	CAFETERIA	17,000	3500	0.75"	590,000	430,000	113.0	44	56	10'	.65"	2 1/4"	760,000	37.2	180	140	5'	.25"	2"	15	460	3	60	McQUAY LSL-137	
AHU-15	VOCAL MUSIC	2700	500	0.50"	105,500	80,500	17.6	44	56	10'	.65"	1 1/4"	130,000	6.5	180	140	5'	.25"	1"	3	460	3	60	McQUAY LSL-106	
AHU-16	INSTRUMENTAL MUSIC	3200	500	0.50"	115,000	85,000	19.2	44	56	10'	.65"	1 1/4"	140,000	8.0	180	140	5'	.25"	1"	3	460	3	60	McQUAY LSL-108	
AHU-17	GYMNASIUM	DX COOLING SPLIT SYSTEM																							

AHU RE-BALANCE:

ALL AIR HANDLING UNITS SHALL HAVE THEIR EXISTING PIPING KITS REPLACED INCLUDING CIRCUIT SETTERS. REFER TO DETAIL 10/ANOS. HOT AND CHILLED WATER COILS ON ALL AIR HANDLERS LISTED ABOVE SHALL BE RE-BALANCED AS PER THE GPM LISTED ON THIS SCHEDULE.

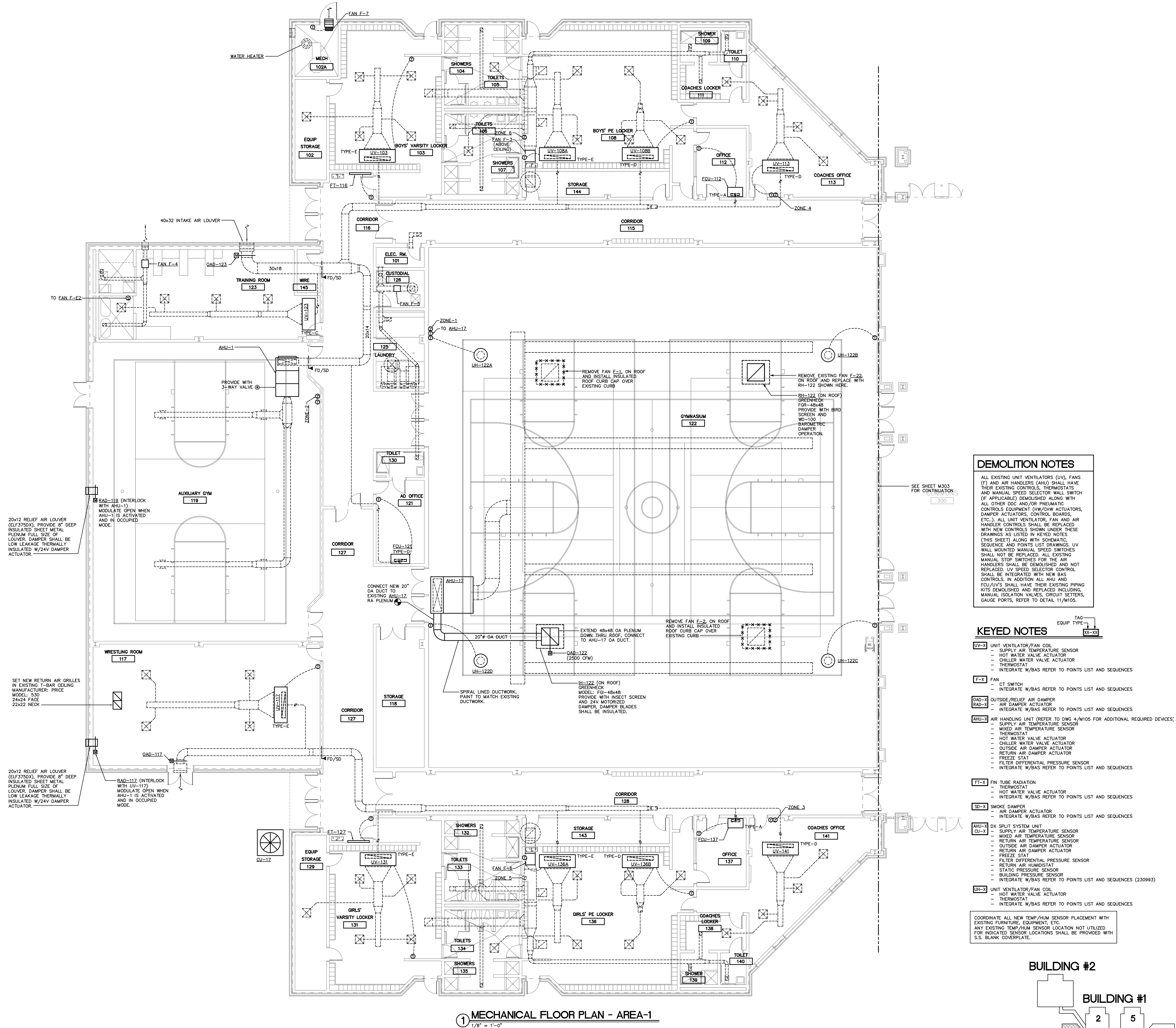
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EX UNIT VENTILATOR + FAN COIL UNIT SCHEDULE

FOR INFORMATION ONLY

UV/FCU TYPE	LOCATION	TOTAL AIR FLOW (CFM)	OUTSIDE AIR FLOW (CFM)	EXT. STATIC PRESSURE (IN. W.G.)	COOLING COIL					HEATING COIL				
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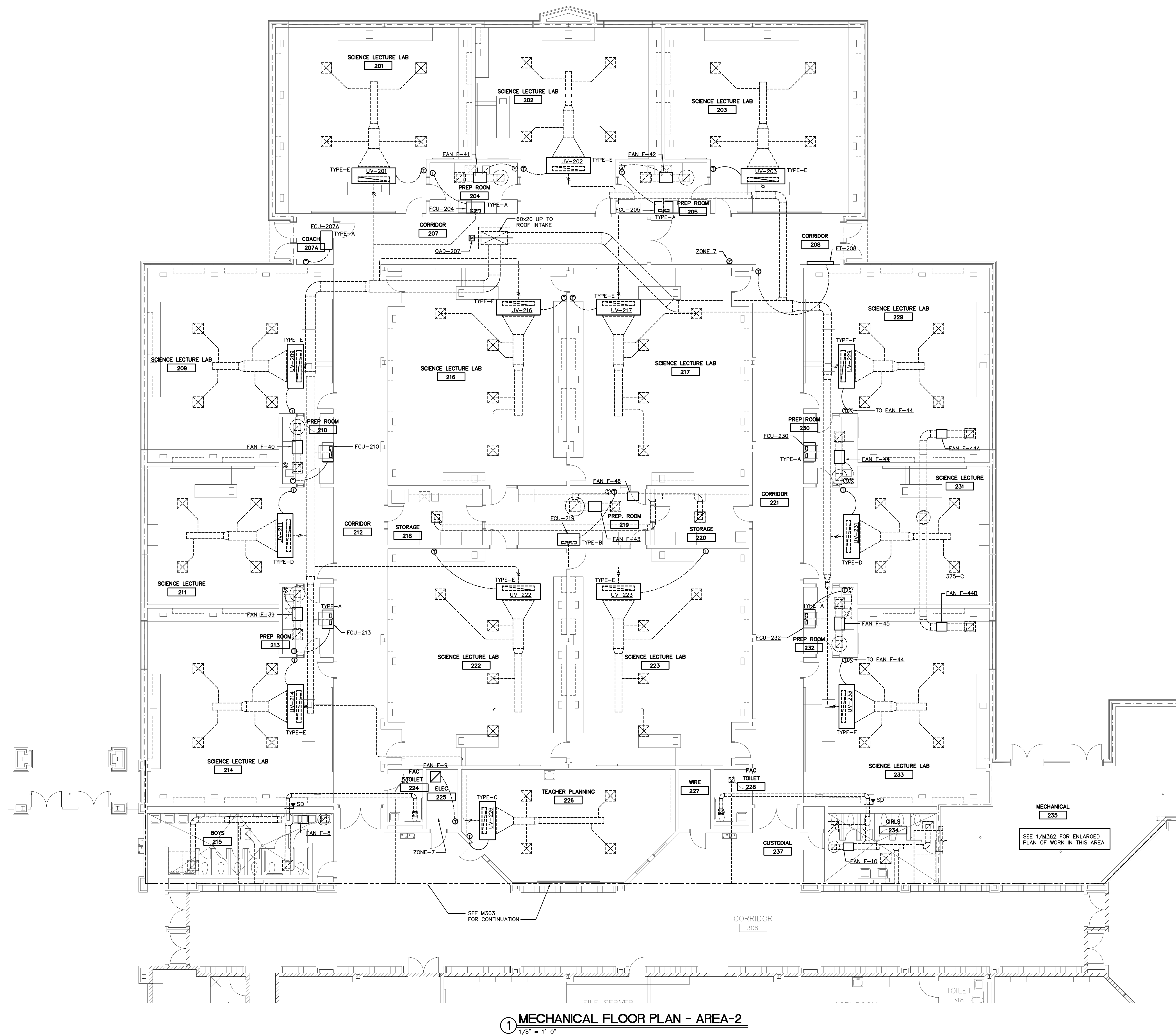
REV #	DATE	DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

SHEET TITLE:
MECHANICAL -
FLOOR PLAN
AREA - 1

DWG #:
M301
SHEET NO: 9 OF 23

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① MECHANICAL FLOOR PLAN - AREA-2
1/8" = 1'-0"

DEMOLITION NOTES

ALL EXISTING UNIT VENTILATORS (UV), FANS (F) AND AIR HANDLERS (AHU) SHALL HAVE THEIR EXISTING CONTROLS, THERMOSTATS AND MANUAL SPEED SELECTOR WALL SWITCH (IF APPLICABLE) DEMOLISHED ALONG WITH ALL OTHER DDC AND/OR PNEUMATIC CONTROLS EQUIPMENT (HW/CHW ACTUATORS, DAMPER ACTUATORS, CONTROL BOARDS, ETC.). ALL UNIT VENTILATOR, FAN AND AIR HANDLER CONTROLS SHALL BE REPLACED WITH NEW CONTROLS SHOWN UNDER THESE DRAWINGS AS LISTED IN KEYED NOTES (THIS SHEET) ALONG WITH SCHEMATIC, SEQUENCE AND POINTS LIST DRAWINGS. UV WALL MOUNTED MANUAL SPEED SWITCHES SHALL NOT BE REPLACED. ALL EXISTING MANUAL STOP SWITCHES FOR THE AIR HANDLERS SHALL BE DEMOLISHED AND NOT REPLACED. UV SPEED SELECTOR CONTROL SHALL BE INTEGRATED WITH NEW BAS CONTROLS. IN ADDITION, ALL AHU AND UV'S SHALL HAVE THEIR EXISTING PIPING KITS DEMOLISHED AND REPLACED INCLUDING MANUAL ISOLATION VALVES, CIRCUIT SETTERS, GAUGE PORTS, REFER TO DETAIL 11/M105.

KEYED NOTES

UV-X UNIT VENTILATOR/FAN COIL
- SUPPLY AIR TEMPERATURE SENSOR
- HOT WATER VALVE ACTUATOR
- CHILLER WATER VALVE ACTUATOR
- THERMOSTAT
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

F-X FAN
- CT SWITCH
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

OAD-X OUTSIDE AIR DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

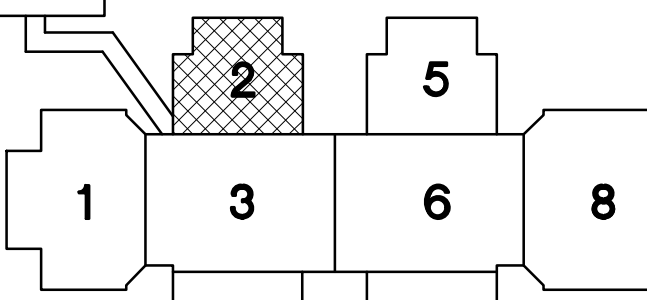
FT-X FIN TUBE RADIATION
- THERMOSTAT
- HOT WATER VALVE ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

SD-X SMOKE DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

COORDINATE ALL NEW TEMP/HUM SENSOR PLACEMENT WITH EXISTING FURNITURE, EQUIPMENT, ETC.
ANY EXISTING TEMP/HUM SENSOR LOCATION NOT UTILIZED FOR INDICATED SENSOR LOCATIONS SHALL BE PROVIDED WITH S.S. BLANK COVERPLATE.

BUILDING #2

BUILDING #1



KEY MAP

REV #	DATE	DESCRIPTION

DATE:	09-29-2022
PROJECT #:	22-0151
DRAWN BY:	JMF
DESIGNED BY:	JMF
CHECKED BY:	SRD

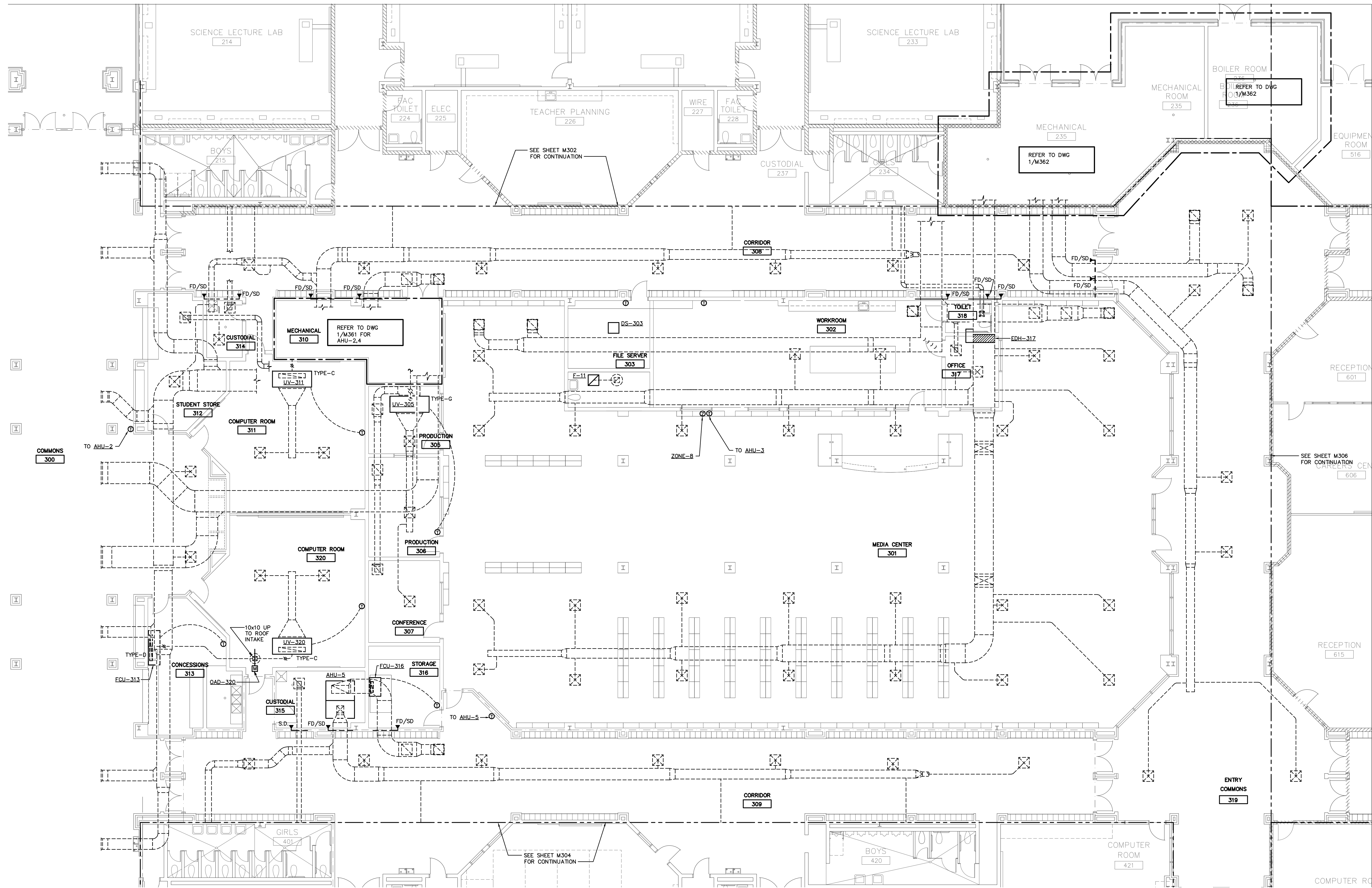
SHEET TITLE:
MECHANICAL -
FLOOR PLAN
AREA - 2

OWB #:

M302

SHEET NO: 10 OF 23

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1 MECHANICAL FLOOR PLAN - AREA-3
1/8" = 1'-0"

DEMOLITION NOTES

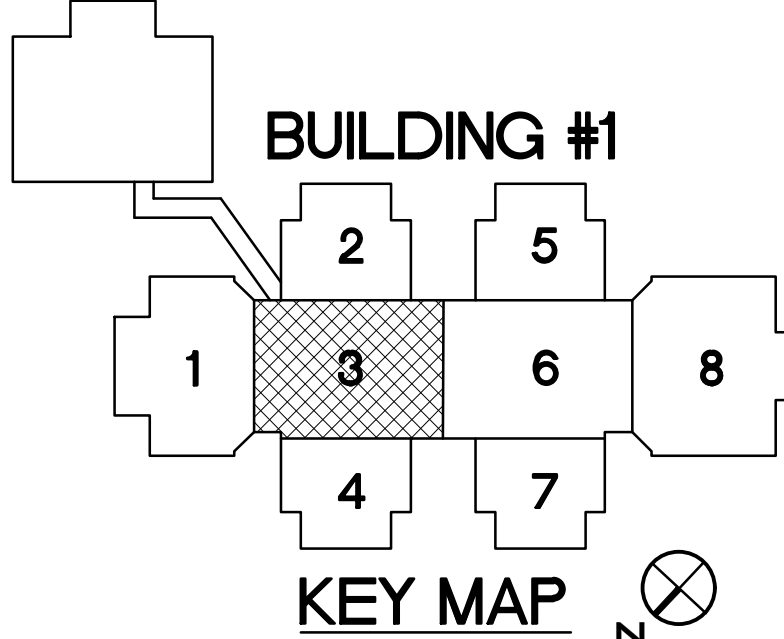
ALL EXISTING UNIT VENTILATORS (UV), FANS (F) AND AIR HANDLERS (AHU) SHALL HAVE THEIR EXISTING CONTROLS, THERMOSTATS AND MANUAL SPEED SELECTOR WALL SWITCH (IF APPLICABLE) DEMOLISHED ALONG WITH ALL OTHER DDC AND/OR PNEUMATIC CONTROLS EQUIPMENT (W/OHW ACTUATORS, DAMPER ACTUATORS, CONTROL BOARDS, ETC.). ALL UNIT VENTILATOR, FAN AND AIR HANDLER CONTROLS SHALL BE REPLACED WITH NEW CONTROLS SHOWN UNDER THESE DRAWINGS AS LISTED IN KEYED NOTES (THIS SHEET) ALONG WITH SCHEMATIC, SEQUENCE AND POINTS LIST DRAWINGS. UV WALL MOUNTED MANUAL SPEED SWITCHES SHALL NOT BE REPLACED. ALL EXISTING MANUAL STOP SWITCHES FOR THE AIR HANDLERS SHALL BE DEMOLISHED AND NOT REPLACED. UV SPEED SELECTOR CONTROL SHALL BE INTEGRATED WITH NEW BAS CONTROLS. IN ADDITION ALL AHU AND UV'S SHALL HAVE THEIR EXISTING PIPING KITS DEMOLISHED AND REPLACED INCLUDING MANUAL ISOLATION VALVES, CIRCUIT SETTERS, GAUGE PORTS. REFER TO DETAIL 11/M105.

KEYED NOTES

- UV-3 UNIT VENTILATOR/FAN COIL
- SUPPLY AIR TEMPERATURE SENSOR
- HOT WATER VALVE ACTUATOR
- CHILLER WATER VALVE ACTUATOR
- THERMOSTAT
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- F-X FAN
- CT SWITCH
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- OAD-3 OUTSIDE AIR DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- AHU-3 AIR HANDLING UNIT (REFER TO DWG 4/M105 FOR ADDITIONAL REQUIRED DEVICES)
- SUPPLY AIR TEMPERATURE SENSOR
- MIXED AIR TEMPERATURE SENSOR
- THERMOSTAT
- HOT WATER VALVE ACTUATOR
- CHILLER WATER VALVE ACTUATOR
- OUTSIDE AIR DAMPER ACTUATOR
- RETURN AIR DAMPER ACTUATOR
- FREEZE STAT
- FILTER DIFFERENTIAL PRESSURE SENSOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- EDH-3 ELECTRIC DUCT HEATER
- SUPPLY AIR TEMPERATURE SENSOR
- STAGE HEATING RELAY
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- SD-3 SMOKE DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

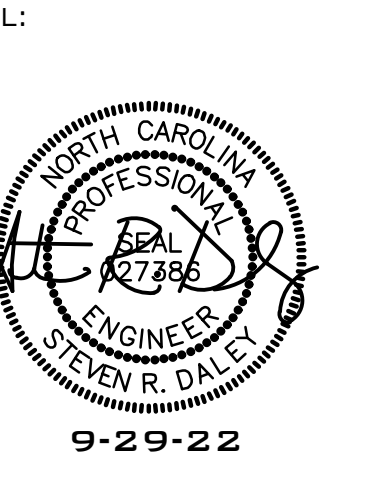
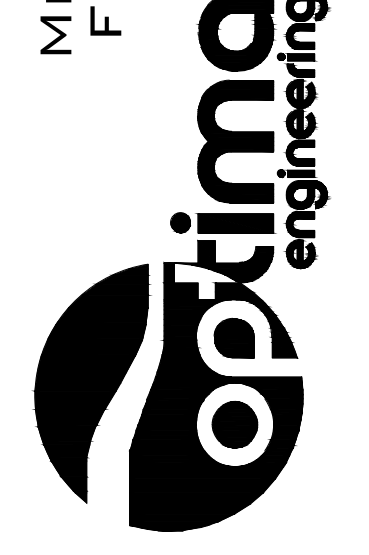
COORDINATE ALL NEW TEMP/AHM SENSOR PLACEMENT WITH EXISTING FURNITURE, EQUIPMENT, ETC.
ANY EXISTING TEMP/AHM SENSOR LOCATION NOT UTILIZED FOR INDICATED SENSOR LOCATIONS SHALL BE PROVIDED WITH S.S. BLANK COVERPLATE.

BUILDING #2



KEY MAP

MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • LIGHTING DESIGN



BUTLER HIGH SCHOOL HVAC CONTROLS UPGRADE

361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

REV # DATE DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

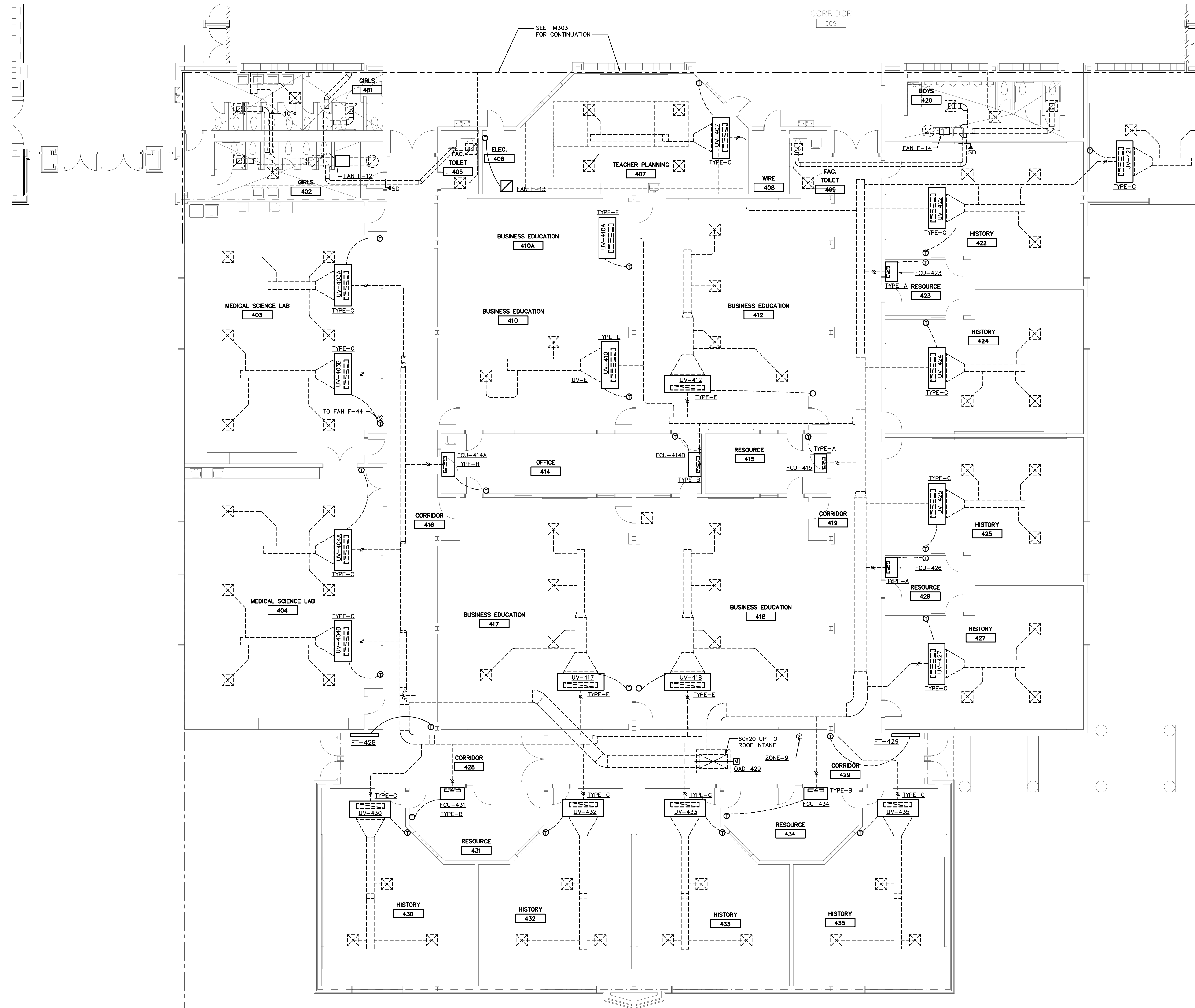
SHEET TITLE:
MECHANICAL -
FLOOR PLAN
AREA - 3

DWG #:

M303

SHEET NO: 11 of 23

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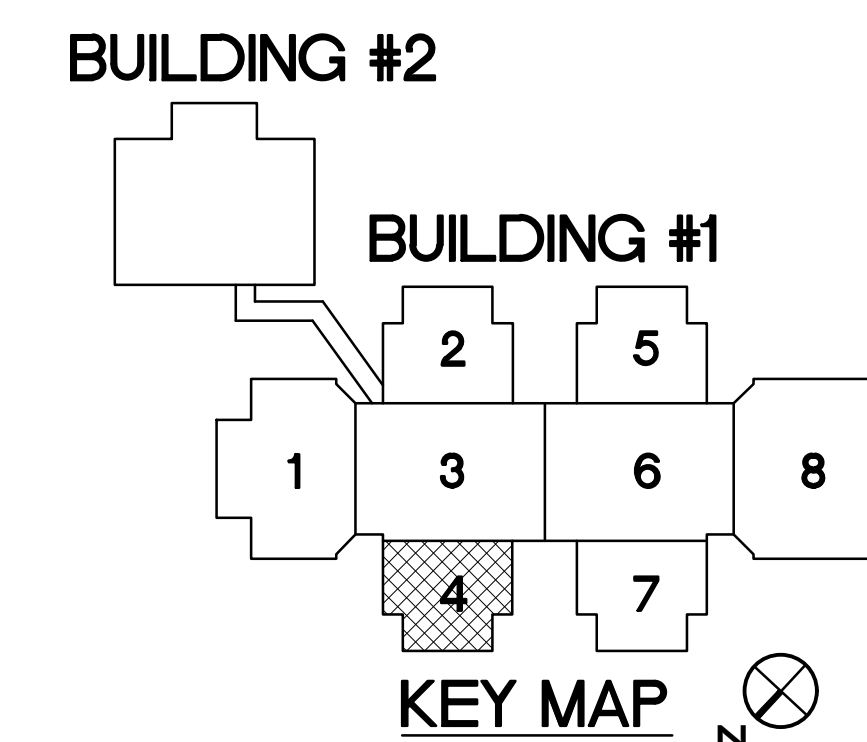
1 MECHANICAL FLOOR PLAN - AREA-4
1/8" = 1'-0"

DEMOLITION NOTES

ALL EXISTING UNIT VENTILATORS (UV), FANS (F) AND AIR HANDLERS (AHU) SHALL HAVE THEIR EXISTING CONTROLS, THERMOSTATS AND MANUAL SPEED SELECTOR WALL SWITCH (IF APPLICABLE) DEMOLISHED ALONG WITH ALL OTHER IDC AND/OR PNEUMATIC CONTROLS EQUIPMENT (HW/CHW ACTUATORS, DAMPER ACTUATORS, CONTROL BOARDS, ETC.). ALL UNIT VENTILATOR, FAN AND AIR HANDLER CONTROLS SHALL BE REPLACED WITH NEW CONTROLS SHOWN UNDER THESE DRAWINGS AS LISTED IN KEYED NOTES (THIS SHEET) ALONG WITH SCHEMATIC, SEQUENCE AND POINTS LIST DRAWINGS. UV WALL MOUNTED MANUAL SPEED SWITCHES SHALL NOT BE REPLACED. ALL EXISTING MANUAL STOP SWITCHES FOR THE AIR HANDLERS SHALL BE DEMOLISHED AND NOT REPLACED. UV SPEED SELECTOR CONTROL SHALL BE INTEGRATED WITH NEW BAS CONTROLS. IN ADDITION ALL AHU AND UV'S SHALL HAVE THEIR EXISTING PIPING KITS DEMOLISHED AND REPLACED INCLUDING: MANUAL ISOLATION VALVES, CIRCUIT SETTERS, GAUGE PORTS, REFER TO DETAIL 11/M105.

- KEYED NOTES**
- UV-X** UNIT VENTILATOR/FAN COIL
= SUPPLY AIR TEMPERATURE SENSOR
= HOT WATER VALVE ACTUATOR
= CHILLER WATER VALVE ACTUATOR
= THERMOSTAT
= INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- F-X** FAN
= CT SWITCH
= INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- DMD-X** OUTSIDE AIR DAMPER
= AIR DAMPER ACTUATOR
= INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- FT-X** FIN TUBE RADIATION
= THERMOSTAT
= HOT WATER VALVE ACTUATOR
= INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- SD-X** SMOKE DAMPER
= AIR DAMPER
= INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

COORDINATE ALL NEW TEMP/HUM SENSOR PLACEMENT WITH EXISTING FURNITURE, EQUIPMENT, ETC.
ANY EXISTING TEMP/HUM SENSOR LOCATION NOT UTILIZED FOR INDICATED SENSOR LOCATIONS SHALL BE PROVIDED WITH S.S. BLANK COVERPLATE.



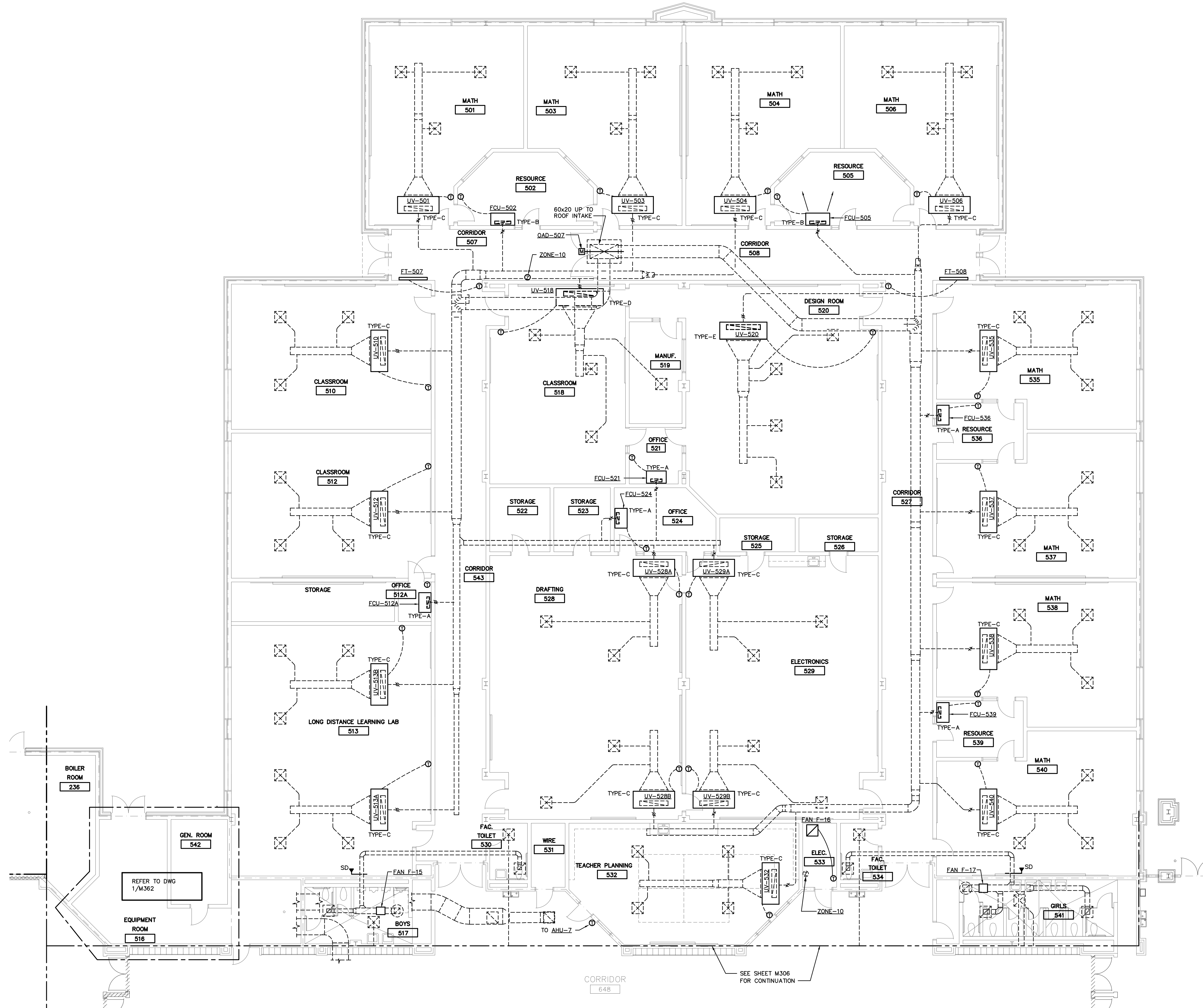
REV #	DATE	DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

SHEET TITLE:
**MECHANICAL -
FLOOR PLAN
AREA - 4**

OWB #:
M304
SHEET NO: 12 OF 23

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1 MECHANICAL FLOOR PLAN - AREA-5
1/8" = 1'-0"

DEMOLITION NOTES

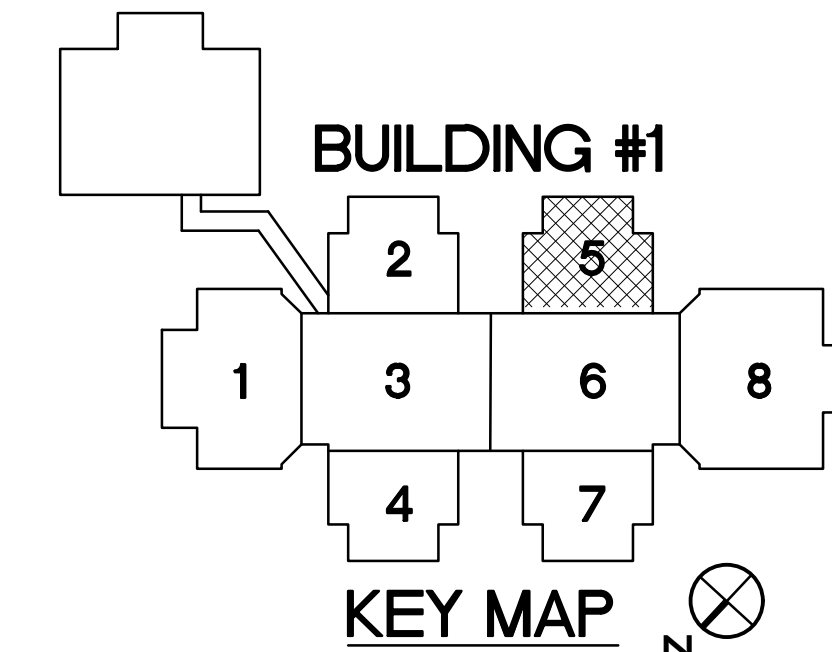
ALL EXISTING UNIT VENTILATORS (UV), FANS (F) AND AIR HANDLERS (AHU) SHALL HAVE THEIR EXISTING CONTROLS, THERMOSTATS AND MANUAL SPEED SELECTOR WALL SWITCH (IF APPLICABLE) DEMOLISHED ALONG WITH ALL OTHER DDC AND/OR PNEUMATIC CONTROLS EQUIPMENT (W/W/OHV ACTUATORS, DAMPER ACTUATORS, CONTROL BOARDS, ETC.). ALL UNIT VENTILATOR, FAN AND AIR HANDLER CONTROLS SHALL BE REPLACED WITH NEW CONTROLS SHOWN UNDER THESE DRAWINGS AS LISTED IN KEYED NOTES (THIS SHEET) ALONG WITH SCHEMATIC SEQUENCE AND POINTS LIST DRAWINGS. UV WALL MOUNTED MANUAL SPEED SWITCHES SHALL NOT BE REPLACED. ALL EXISTING MANUAL STOP SWITCHES FOR THE AIR HANDLERS SHALL BE DEMOLISHED AND NOT REPLACED. UV SPEED SELECTOR CONTROL SHALL BE INTEGRATED WITH NEW BAS CONTROLS. IN ADDITION ALL AHU AND UV'S SHALL HAVE THEIR EXISTING PIPING KITS DEMOLISHED AND REPLACED INCLUDING MANUAL ISOLATION VALVES, CIRCUIT SETTERS, GAUGE PORTS, REFER TO DETAIL 11/M105.

KEYED NOTES

- UV-X UNIT VENTILATOR/FAN COIL
- SUPPLY AIR TEMPERATURE SENSOR
- HOT WATER VALVE ACTUATOR
- CHILLER WATER VALVE ACTUATOR
- THERMOSTAT
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- F-X FAN
- CT SWITCH
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- OAD-X OUTSIDE AIR DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- FT-X FIN TUBE RADIATION
- THERMOSTAT
- HOT WATER VALVE ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- SD-X SMOKE DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

COORDINATE ALL NEW TEMP/HUM SENSOR PLACEMENT WITH EXISTING FURNITURE, EQUIPMENT, ETC.
ANY EXISTING TEMP/HUM SENSOR LOCATION NOT UTILIZED FOR INDICATED SENSOR LOCATIONS SHALL BE PROVIDED WITH S.S. BLANK COVERPLATE.

BUILDING #2



KEY MAP

BUTLER HIGH SCHOOL HVAC CONTROLS UPGRADE

361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

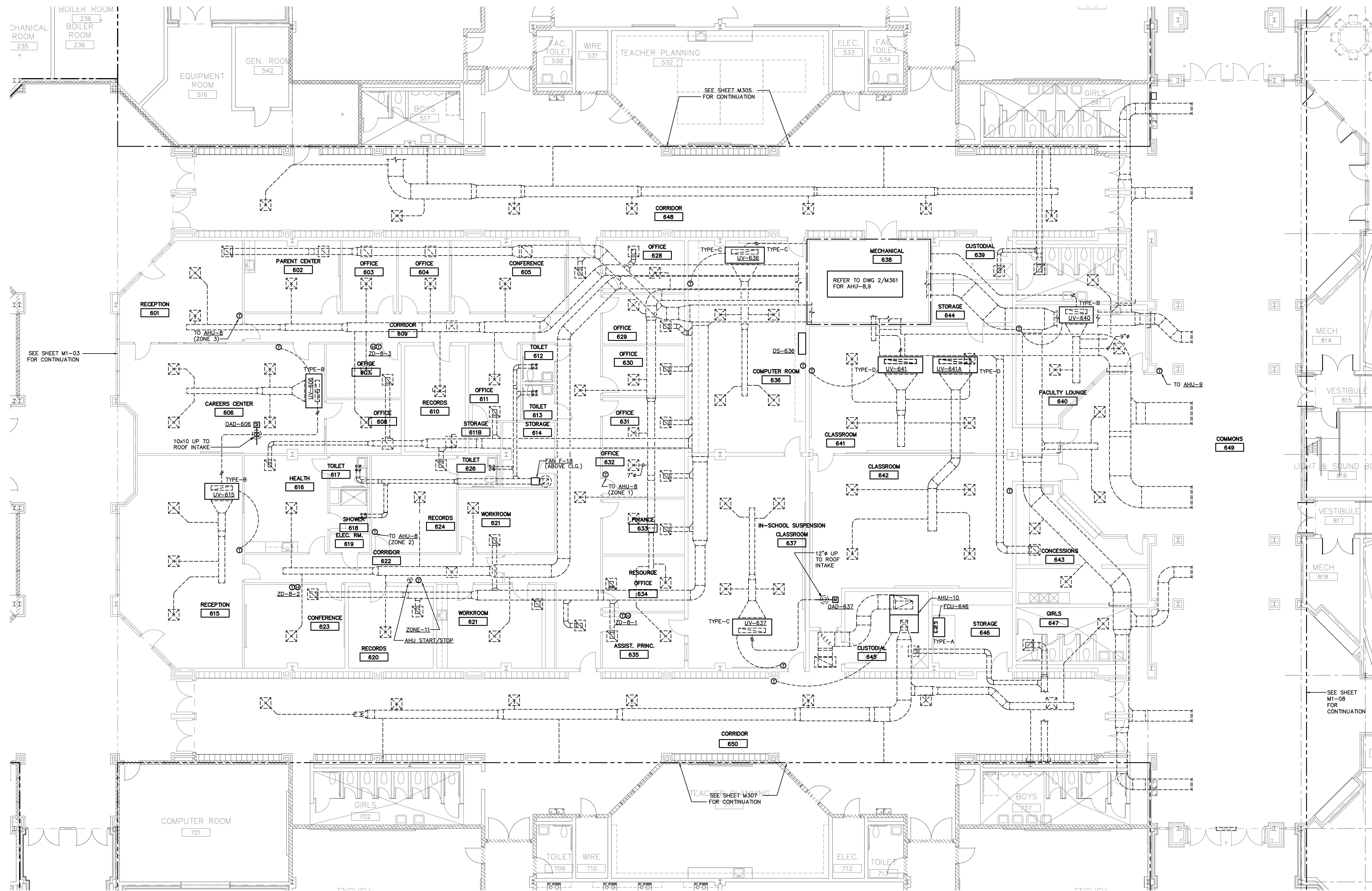
REV #	DATE	DESCRIPTION

DATE:	09-29-2022
PROJECT #:	22-0151
DRAWN BY:	JMF
DESIGNED BY:	JMF
CHECKED BY:	SRD

SHEET TITLE:
MECHANICAL -
FLOOR PLAN
AREA - 5

DWG #:
M305
SHEET NO: 13 OF 23

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1 MECHANICAL FLOOR PLAN - AREA-6
1/8" = 1'-0"

DEMOLITION NOTES

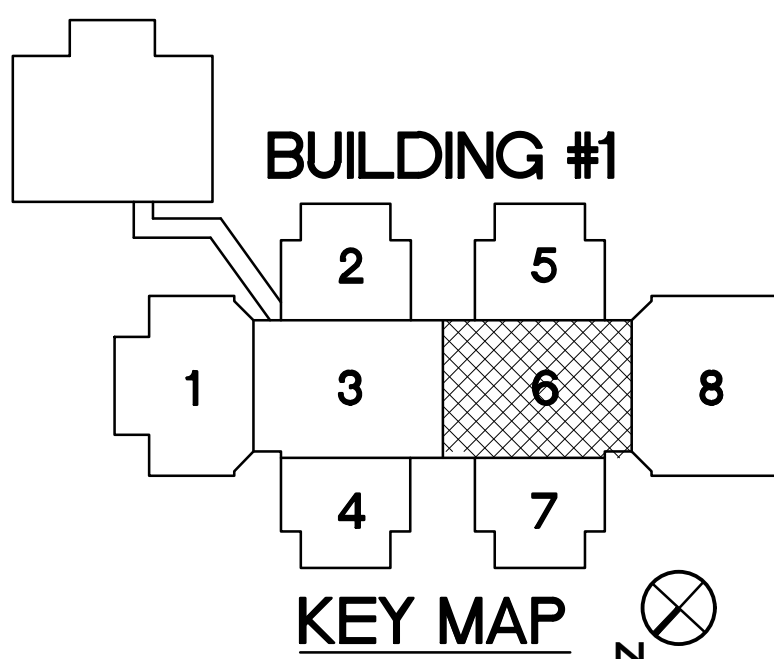
ALL EXISTING UNIT VENTILATORS (UV), FANS (F) AND AIR HANDLERS (AHU) SHALL HAVE THEIR EXISTING CONTROLS, THERMOSTATS AND MANUAL SPEED SELECTOR WALL SWITCH (IF APPLICABLE) DEMOLISHED ALONG WITH ALL OTHER DDC AND/OR PNEUMATIC CONTROLS EQUIPMENT (HW/CHW ACTUATORS, DAMPER ACTUATORS, CONTROL BOARDS, ETC.). ALL UNIT VENTILATOR, FAN AND AIR HANDLER CONTROLS SHALL BE REPLACED WITH NEW CONTROLS SHOWN UNDER THESE DRAWINGS AS LISTED IN KEYED NOTES (THIS SHEET) ALONG WITH SCHEMATIC SEQUENCE AND POINTS LIST DRAWINGS. UV WALL MOUNTED MANUAL SPEED SWITCHES SHALL NOT BE REPLACED. ALL EXISTING MANUAL STOP SWITCHES FOR THE AIR HANDLERS SHALL BE DEMOLISHED AND NOT REPLACED. UV SPEED SELECTOR CONTROL SHALL BE INTEGRATED WITH NEW BAS CONTROLS. IN ADDITION ALL AHU AND UV'S SHALL HAVE THEIR EXISTING SPRING RITS DEMOLISHED AND REPLACED INCLUDING MANUAL ISOLATION VALVES, CIRCUIT SETTERS, GAUGE PORTS, REFER TO DETAIL 11/M105.

KEYED NOTES

- EQIP TYPE
- UV-X UNIT VENTILATOR/FAN COIL
- SUPPLY AIR TEMPERATURE SENSOR
 - HOT WATER VALVE ACTUATOR
 - CHILLER WATER VALVE ACTUATOR
 - THERMOSTAT
 - INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- F-X FAN
- CT SWITCH
 - INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- OAD-X OUTSIDE AIR DAMPER
- AIR DAMPER ACTUATOR
 - INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- AHU-X AIR HANDLING UNIT (REFER TO DWG 4/M105 FOR ADDITIONAL REQUIRED DEVICES)
- SUPPLY AIR TEMPERATURE SENSOR
 - MIXED AIR TEMPERATURE SENSOR
 - THERMOSTAT
 - HOT WATER VALVE ACTUATOR
 - CHILLER WATER VALVE ACTUATOR
 - OUTSIDE AIR DAMPER ACTUATOR
 - RETURN AIR DAMPER ACTUATOR
 - FREEZE STAT
 - FILTER DIFFERENTIAL PRESSURE SENSOR
 - SPACE HUMIDISTAT (AHU-8)
 - INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES
- DS-X DUCTLESS SPLIT SYSTEM
- SPACE TEMPERATURE SENSOR

COORDINATE ALL NEW TEMP/HUM SENSOR PLACEMENT WITH EXISTING FURNITURE, EQUIPMENT, ETC.
ANY EXISTING TEMP/HUM SENSOR LOCATION NOT UTILIZED FOR INDICATED SENSOR LOCATIONS SHALL BE PROVIDED WITH S.S. BLANK COORDINATE.

BUILDING #2



KEY MAP

REV #	DATE	DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

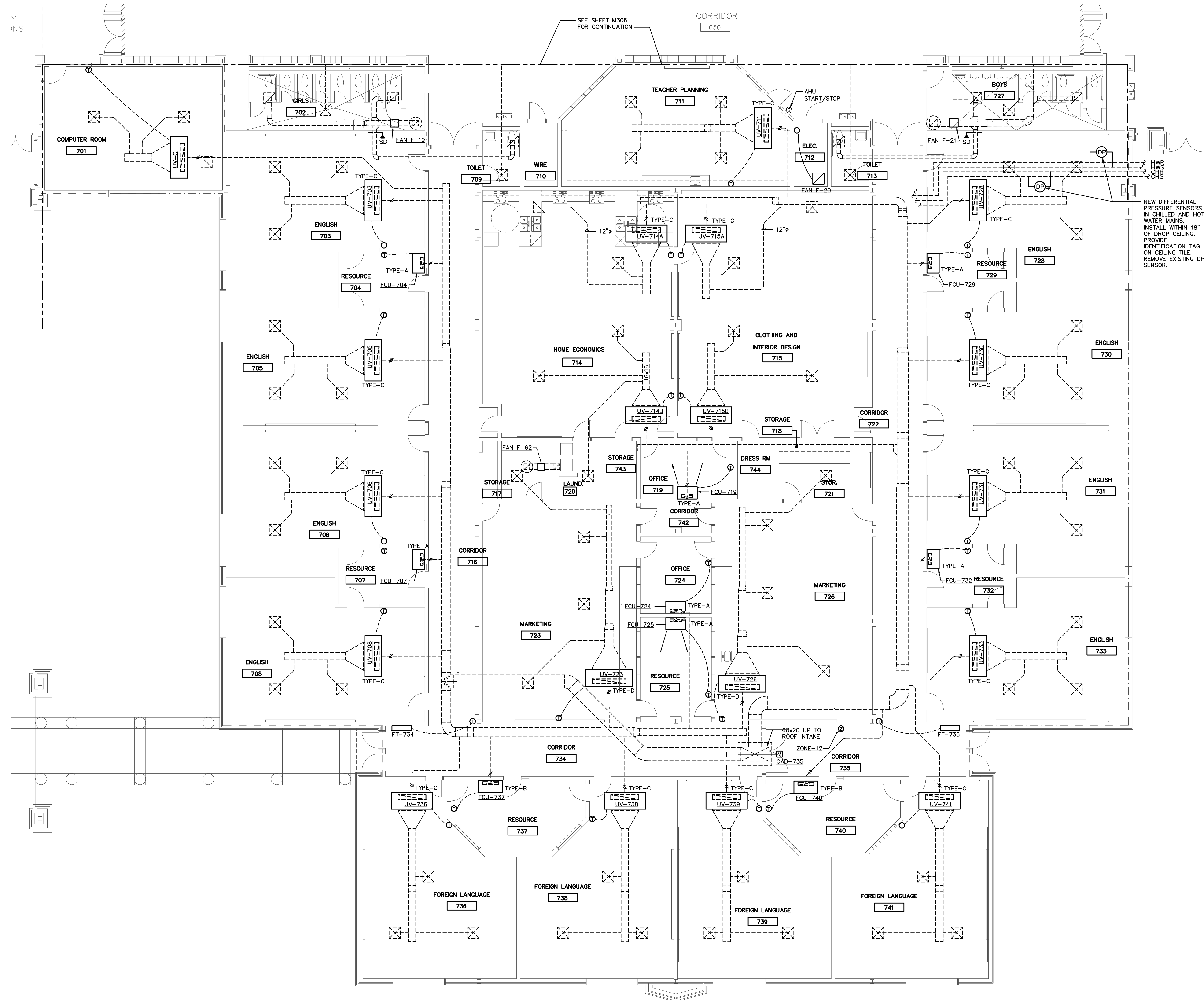
SHEET TITLE:
MECHANICAL -
FLOOR PLAN
AREA - 6

OWB #:

M306

SHEET NO: 14 OF 23

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1 MECHANICAL FLOOR PLAN - AREA-7
1/8" = 1'-0"

DEMOLITION NOTES

ALL EXISTING UNIT VENTILATORS (UV), FANS (F) AND AIR HANDLERS (AHU) SHALL HAVE THEIR EXISTING CONTROLS, THERMOSTATS AND MANUAL SPEED SELECTOR WALL SWITCH (IF APPLICABLE) DEMOLISHED ALONG WITH ALL OTHER EOC AND/OR PNEUMATIC CONTROLS EQUIPMENT (HW/CHW ACTUATORS, DAMPER ACTUATORS, CONTROL BOARDS, ETC.). ALL UNIT VENTILATOR, FAN AND AIR HANDLER CONTROLS SHALL BE REPLACED WITH NEW CONTROLS SHOWN UNDER THESE DRAWINGS AS LISTED IN KEYED NOTES (THIS SHEET) ALONG WITH SCHEMATIC SEQUENCE AND POINTS LIST DRAWINGS. UV WALL MOUNTED MANUAL SPEED SWITCHES SHALL NOT BE REPLACED. ALL EXISTING MANUAL STOP SWITCHES FOR THE AIR HANDLERS SHALL BE DEMOLISHED AND NOT REPLACED. UV SPEED SELECTOR CONTROL SHALL BE INTEGRATED WITH NEW BAS CONTROLS. IN ADDITION ALL AHU AND UV'S SHALL HAVE THEIR EXISTING PIPING KITS DEMOLISHED AND REPLACED INCLUDING MANUAL ISOLATION VALVES, CIRCUIT SETTERS, GAUGE PORTS, REFER TO DETAIL 11/M105.

KEYED NOTES

UV-X UNIT VENTILATOR/FAN COIL
- SUPPLY AIR TEMPERATURE SENSOR
- HOT WATER VALVE ACTUATOR
- CHILLER WATER VALVE ACTUATOR
- THERMOSTAT
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

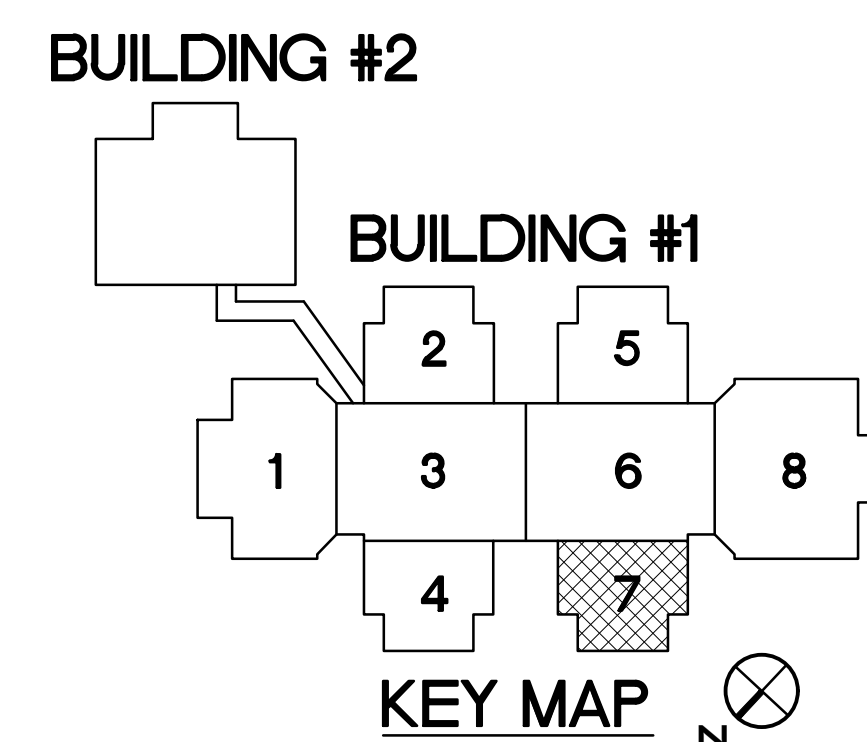
F-X FAN
- CT SWITCH
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

DAD-X OUTSIDE AIR DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

FT-X FIN TUBE RADIATION
- THERMOSTAT
- HOT WATER VALVE ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

SD-X SMOKE DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES

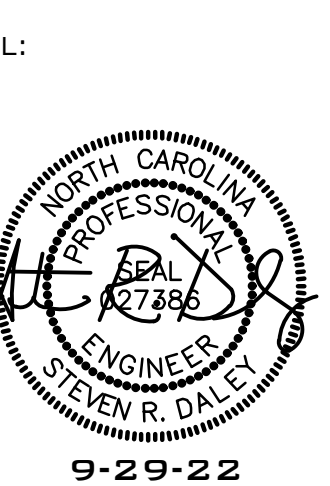
COORDINATE ALL NEW TEMP/HUM/CO2 SENSOR PLACEMENT WITH EXISTING FURNITURE, EQUIPMENT, ETC.
ANY EXISTING TEMP/HUM/CO2 SENSOR LOCATION NOT UTILIZED FOR INDICATED SENSOR LOCATIONS SHALL BE PROVIDED WITH S.S. BLANK COVERPLATE.



MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • LIGHTING DESIGN

Optima
engineering

1007 G. TOWN CT. SUITE 200 CHARLOTTE NC 28203
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WWW.OPTIMA-ENGINEERING.COM NORTH CAROLINA LICENSE NUMBER C-05114



**BUTLER HIGH SCHOOL
HVAC CONTROLS UPGRADE**

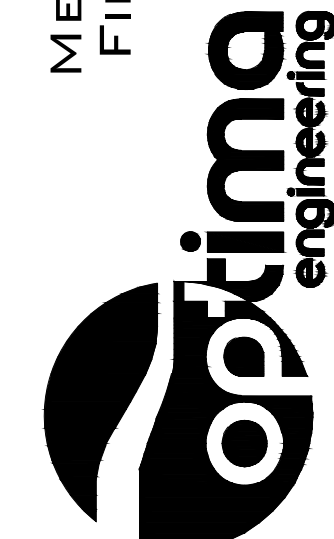
361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

REV #	DATE	DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

SHEET TITLE:
MECHANICAL -
FLOOR PLAN
AREA - 7

OWB #:
M307
SHEET NO: 15 OF 23



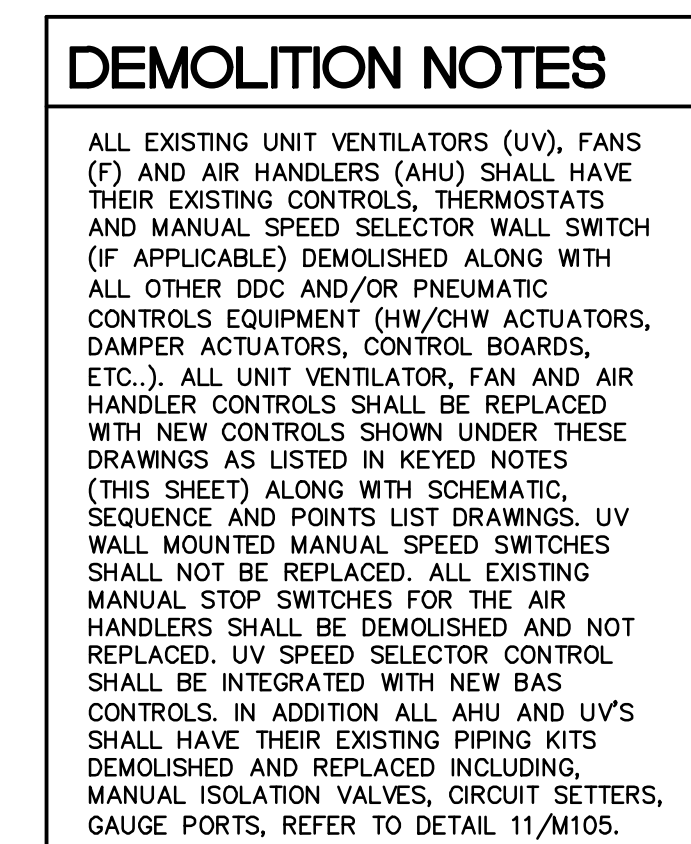
361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

DWG #

M308

SHEET NO: 16 OF 23

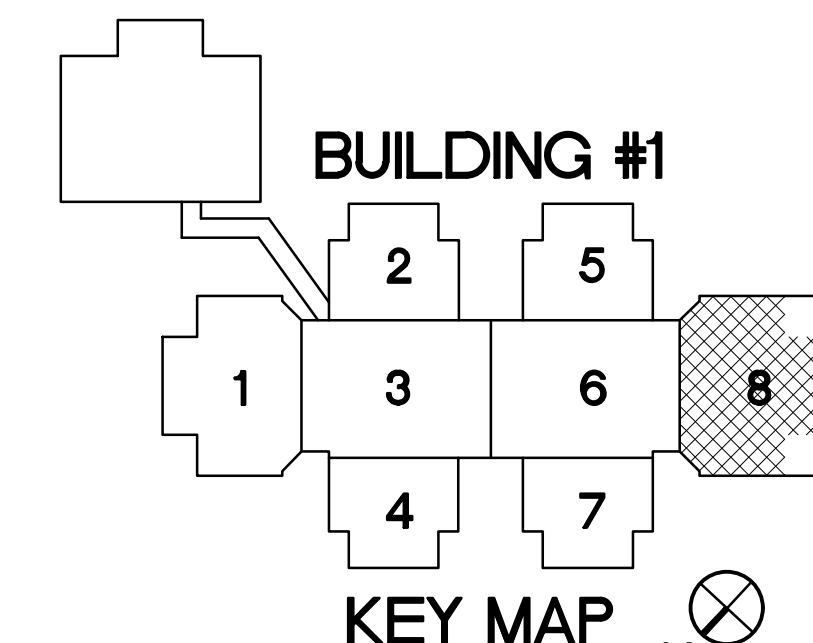


KEYED NOTES

0V-1	UNIT VENTILATOR/FAN COIL - SUPPLY AIR TEMPERATURE SENSOR - HOT WATER VALVE ACTUATOR - CHILLER WATER VALVE ACTUATOR - THERMOSTAT - INTEGRATE W/BAS REF TO POINTS LIST AND SEQUENCES
F-3	FAN - CT SWITCH - INTEGRATE W/BAS REF TO POINTS LIST AND SEQUENCES
0A0-2	OUTSIDE AIR DAMPER - AIR DAMPER ACTUATOR - INTEGRATE W/BAS REF TO POINTS LIST AND SEQUENCES
0A1-1	AIR HANDLING UNIT (REFER TO DWG 4-M105 FOR ADDITIONAL REQUIRED DEVICES) - OUTSIDE AIR TEMPERATURE SENSOR - MIXED AIR TEMPERATURE SENSOR - THERMOSTAT - HOT WATER VALVE ACTUATOR - CHILLER WATER VALVE ACTUATOR - OUTSIDE AIR DAMPER ACTUATOR - RETURN AIR DAMPER ACTUATOR - FREEZE STAT - FILTER DIFFERENTIAL PRESSURE SENSOR - INTEGRATE W/BAS REF TO POINTS LIST AND SEQUENCES
30-2	SMOKE DAMPER - AIR DAMPER ACTUATOR - INTEGRATE W/BAS REF TO POINTS LIST AND SEQUENCES
FF-7	FAN TIE RADIATION - THERMOSTAT - HOT WATER VALVE ACTUATOR - INTEGRATE W/BAS REF TO POINTS LIST AND SEQUENCES

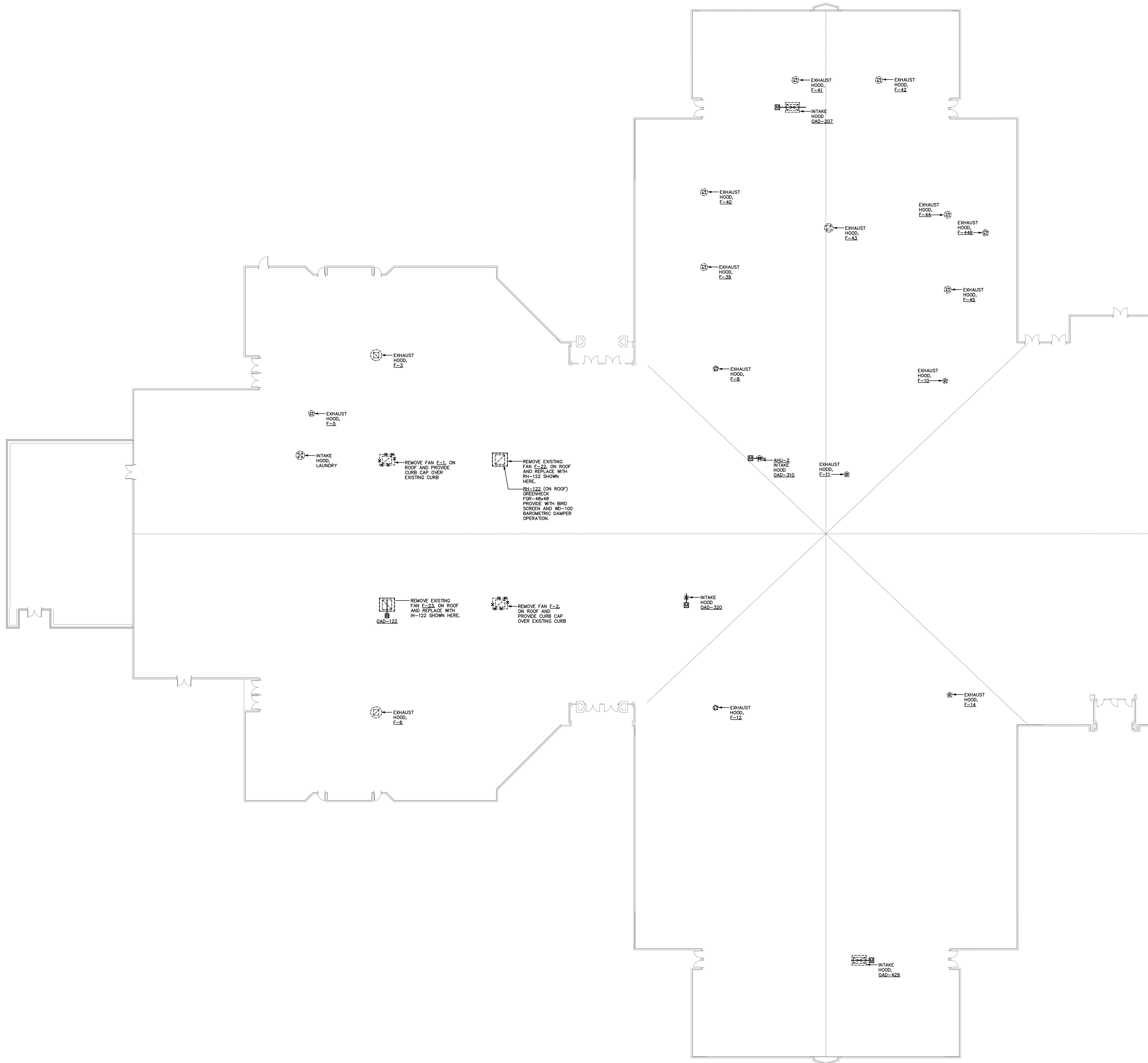
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BUILDING #2

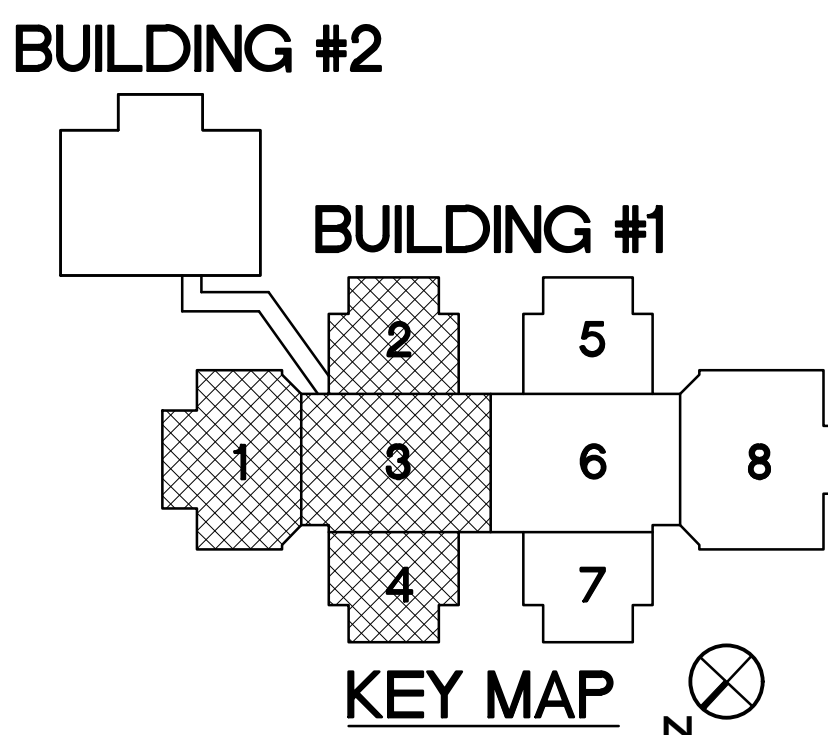


1 MECHANICAL FLOOR PLAN - AREA-8
1/8" = 1'-0"

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1 MECHANICAL PARTIAL ROOF PLAN
1/8" = 1'-0"



MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • LIGHTING DESIGN

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WWW.OPTIMAENGINEERING.COM
NORTH CAROLINA LICENSE NUMBER C00114

SEAL:

STEVEN E. DILL
9-29-22

BUTLER HIGH SCHOOL
HVAC CONTROLS UPGRADE

361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

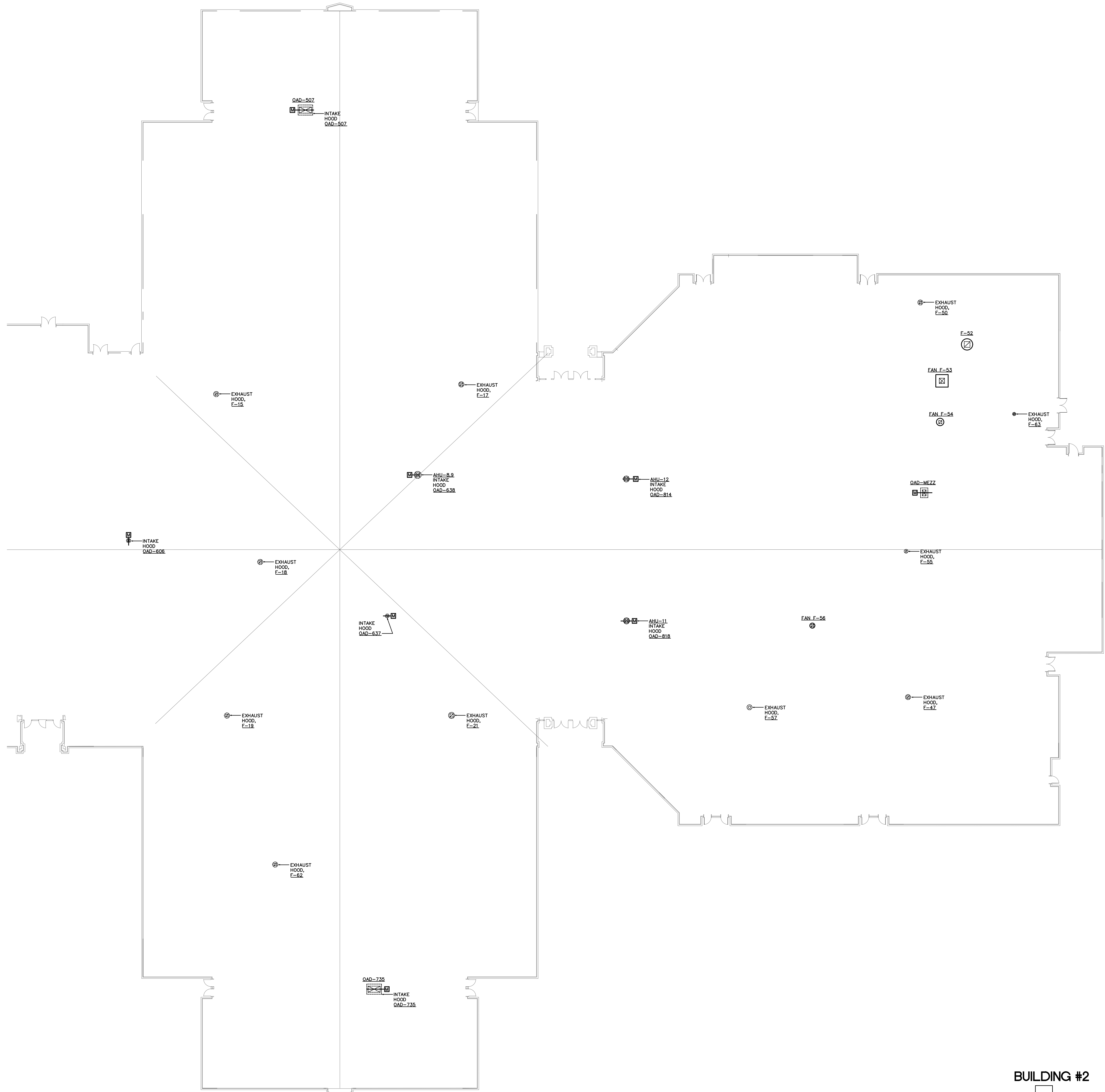
REV #	DATE	DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

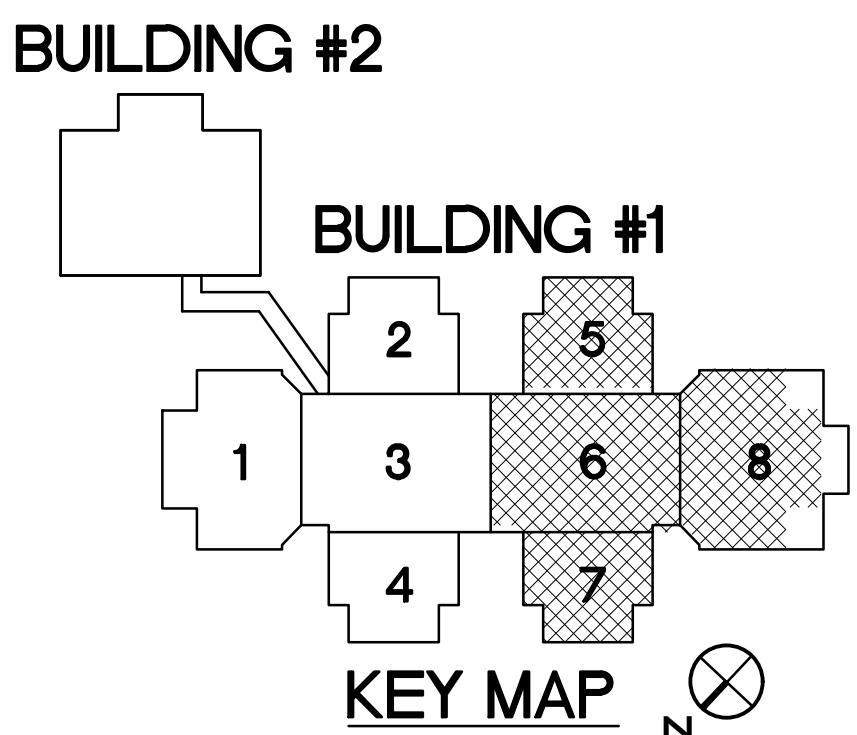
SHEET TITLE:
MECHANICAL -
PARTIAL ROOF
PLAN
BUILDING #1

OWB #:
M309
SHEET NO: 17 OF 23

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1 MECHANICAL PARTIAL ROOF PLAN
1/16" = 1'-0"



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SEAL:

STEVEN E. DILL
9-29-22

BUTLER HIGH SCHOOL
HVAC CONTROLS UPGRADE

361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

REV #	DATE	DESCRIPTION

DATE: 09-29-2022

PROJECT #: 22-0151

DRAWN BY: JMF

DESIGNED BY: JMF

CHECKED BY: SRD

SHEET TITLE:

MECHANICAL -
PARTIAL ROOF
PLAN
BUILDING #1

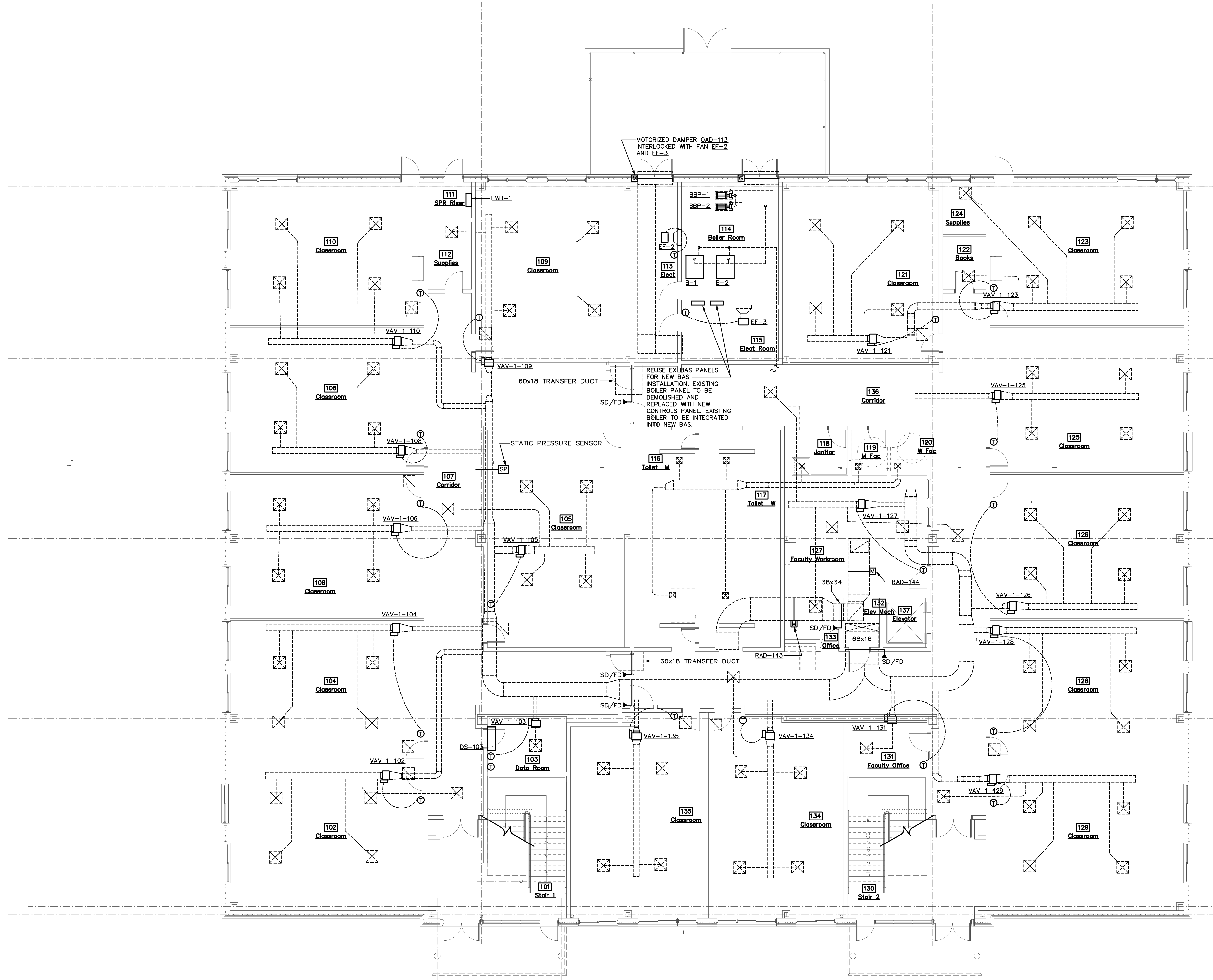
OWB #:

M310

SHEET NO: 18 OF 23

OPTIMA ENGINEERING
MECHANICAL • ELECTRICAL • PLUMBING • FIRE PROTECTION • LIGHTING DESIGN

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1/8" = 1'-0"

1 MECHANICAL FLOOR PLAN - LEVEL - 1
1/8" = 1'-0"

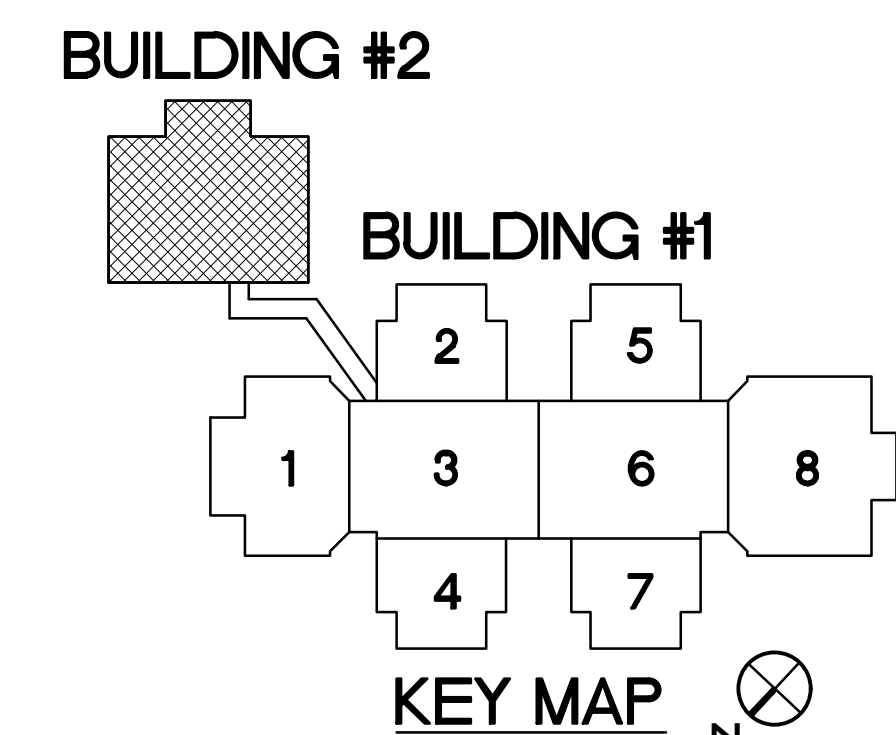
DEMOLITION NOTES

ALL EXISTING VARIABLE VOLUME BOXES (VAV), FANS (EF, EEF), PUMPS, BOILERS, DAMPERS, ELECTRIC HEATERS, ETC. SHALL HAVE THEIR EXISTING CONTROLS, THERMOSTATS, DEMOLISHED ALONG WITH ALL OTHER DDC EQUIPMENT (HW/CHW ACTUATORS, CONTROL BOARDS, ETC.). ALL VAV BOX AND ROOFTOP UNIT CONTROLS SHALL BE REPLACED WITH NEW CONTROLS SHOWN UNDER THESE DRAWINGS AS LISTED IN KEYED NOTES (THIS SHEET) ALONG WITH SCHEMATIC, SEQUENCE AND POINTS LIST DRAWINGS. ALL EXISTING MANUAL STOP SWITCHES FOR THE ROOFTOP UNITS SHALL BE DEMOLISHED AND NOT REPLACED.

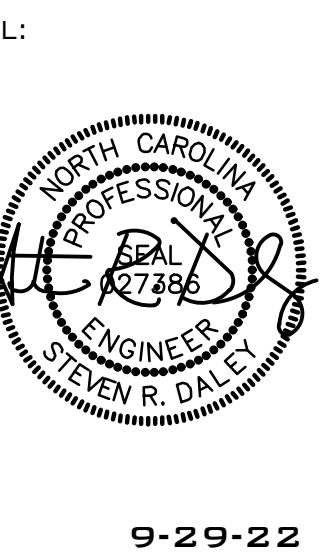
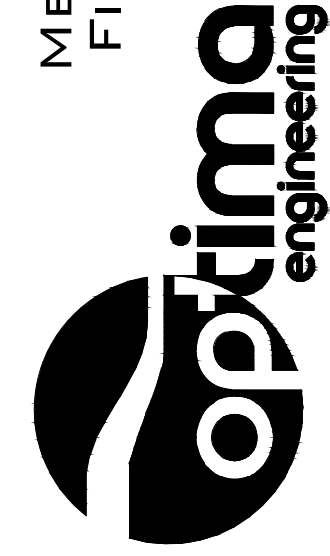
KEYED NOTES

- EF-X FAN
- CT SWITCH
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- EEF-X FAN
- CT SWITCH
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- RAO-X OUTSIDE AIR DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- QAD-X OUTSIDE AIR DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- EH-X ELECTRIC HEATER
- THERMOSTAT
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- P-X PUMPS
- CT SWITCH
- START/STOP RELAY
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- B-1 BOILERS
- START/STOP RELAY
- HOT WATER SUPPLY TEMPERATURE SENSOR
- HOT WATER RETURN TEMPERATURE SENSOR
- HOT WATER SYSTEM SUPPLY TEMPERATURE SENSOR
- HOT WATER BYPASS VALVE ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- SD-X SMOKE DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- DS-X DUCTLESS SPUT SYSTEM
- SPACE TEMPERATURE SENSOR
- VAV-X VARIABLE VOLUME BOX
- SUPPLY AIR TEMPERATURE SENSOR
- THERMOSTAT
- HOT WATER VALVE ACTUATOR
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)

COORDINATE ALL NEW TEMP/HUM/CO2 SENSOR PLACEMENT WITH EXISTING FURNITURE, EQUIPMENT, ETC.
ANY EXISTING TEMP/HUM/CO2 SENSOR LOCATION NOT UTILIZED FOR INDICATED SENSOR LOCATIONS SHALL BE PROVIDED WITH S.S. BLANK COVERPLATE.



MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • LIGHTING DESIGN



9-29-22

**BUTLER HIGH SCHOOL
HVAC CONTROLS UPGRADE**

361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

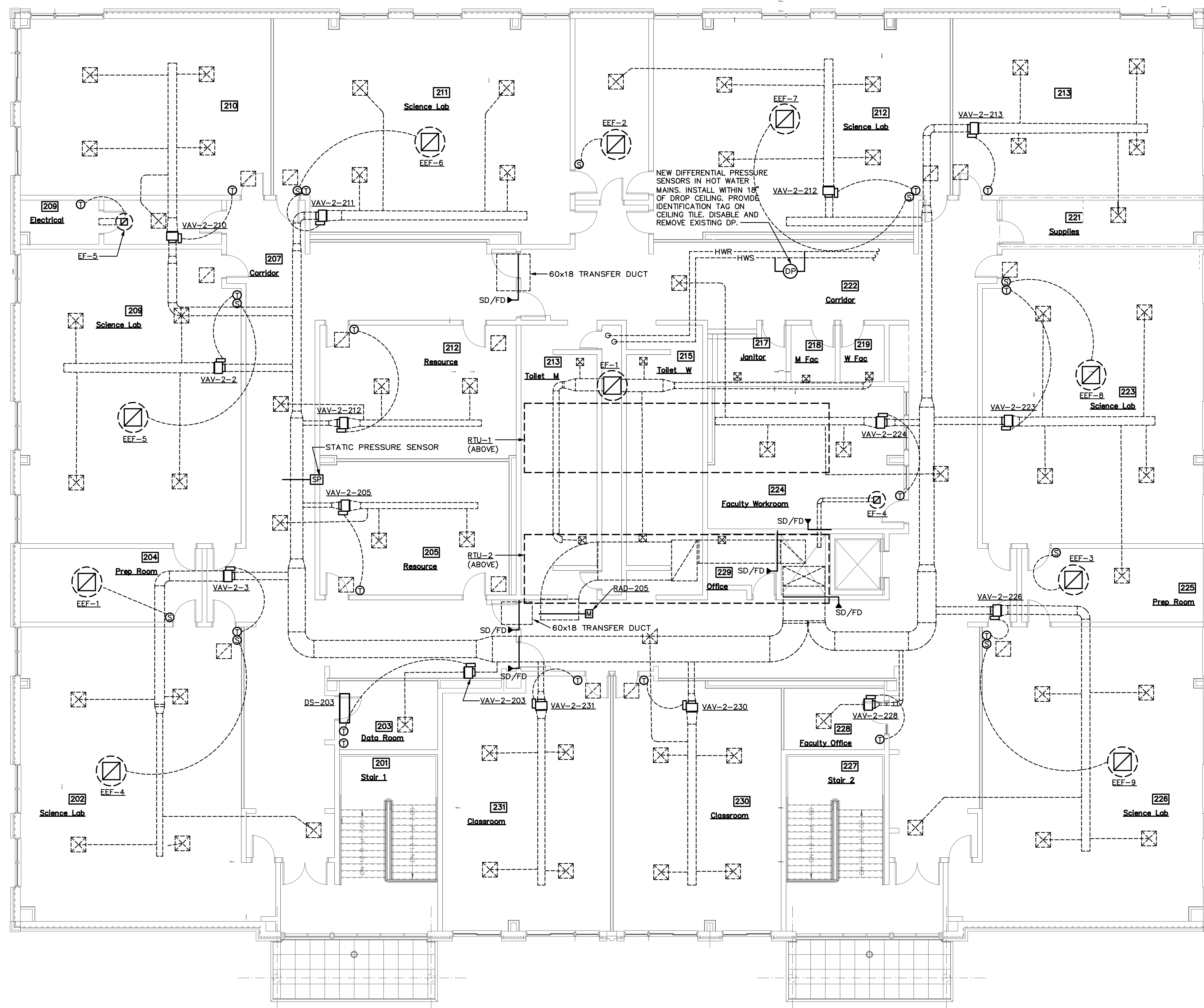
REV #	DATE	DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

SHEET TITLE:
MECHANICAL -
FLOOR PLAN
BUILDING #2
LEVEL 1

OWB #:
M311
SHEET NO: 19 OF 23

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1 MECHANICAL FLOOR PLAN - LEVEL - 2
1/8" = 1'-0"

DEMOLITION NOTES

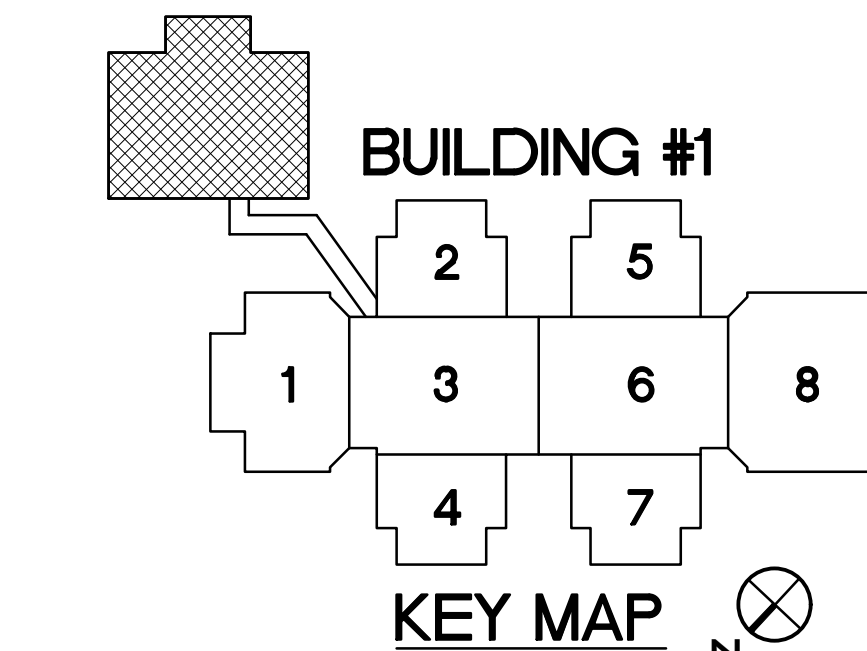
ALL EXISTING VARIABLE VOLUME BOXES (VAV), FANS (EF, EEF), DAMPERS, ETC. SHALL HAVE THEIR EXISTING CONTROLS, THERMOSTATS, DEMOLISHED ALONG WITH ALL OTHER DDC EQUIPMENT (HW/CHW ACTUATORS, CONTROL BOARDS, ETC.). ALL VAV BOX CONTROLS SHALL BE REPLACED WITH NEW CONTROLS SHOWN UNDER THESE DRAWINGS AS LISTED IN KEYED NOTES (THIS SHEET) ALONG WITH SCHEMATIC, SEQUENCE AND POINTS LIST DRAWINGS. ALL EXISTING MANUAL STOP SWITCHES FOR THE ROOFTOP UNITS SHALL BE DEMOLISHED AND NOT REPLACED.

KEYED NOTES

- VAV-3 VARIABLE VOLUME BOX
- SUPPLY AIR TEMPERATURE SENSOR
- THERMOSTAT
- HOT WATER VALVE ACTUATOR
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- DS-3 DUCTLESS SPLIT SYSTEM
- SPACE TEMPERATURE SENSOR
- SD-3 SMOKE DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- RAD-3 OUTSIDE AIR DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)

COORDINATE ALL NEW TEMP/HUM/CO2 SENSOR PLACEMENT WITH EXISTING FURNITURE, EQUIPMENT, ETC.
ANY EXISTING TEMP/HUM/CO2 SENSOR LOCATION NOT UTILIZED FOR INDICATED SENSOR LOCATIONS SHALL BE PROVIDED WITH S.S. BLANK COVERPLATE.

BUILDING #2



KEY MAP

BUTLER HIGH SCHOOL HVAC CONTROLS UPGRADE

361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

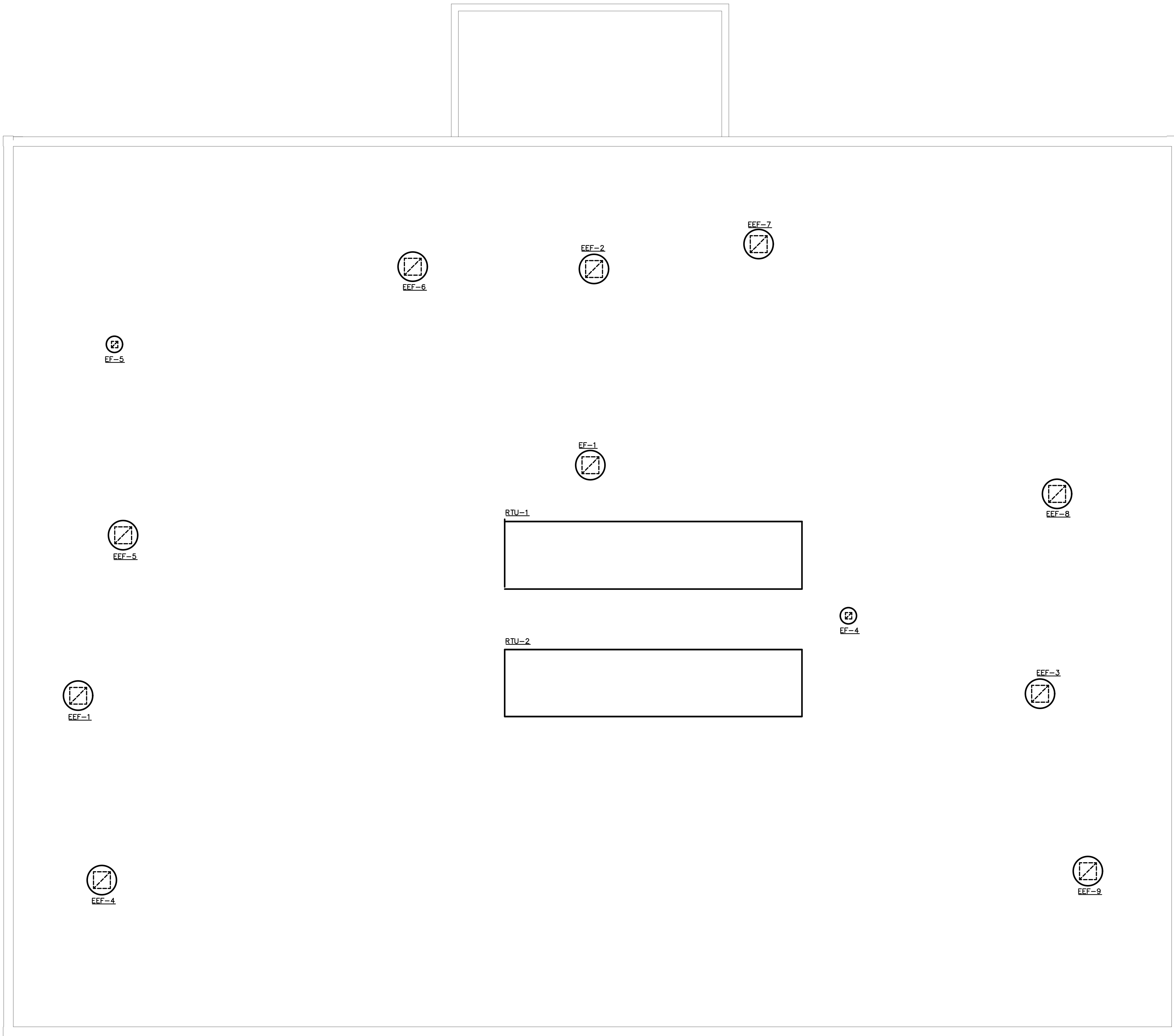
REV #	DATE	DESCRIPTION

DATE:	09-29-2022
PROJECT #:	22-0151
DRAWN BY:	JMF
DESIGNED BY:	JMF
CHECKED BY:	SRD

SHEET TITLE:	MECHANICAL - FLOOR PLAN BUILDING #2 LEVEL 2
--------------	--

OWB #:	M312
SHEET NO:	20 OF 23

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1 MECHANICAL ROOF PLAN
1/8" = 1'-0"

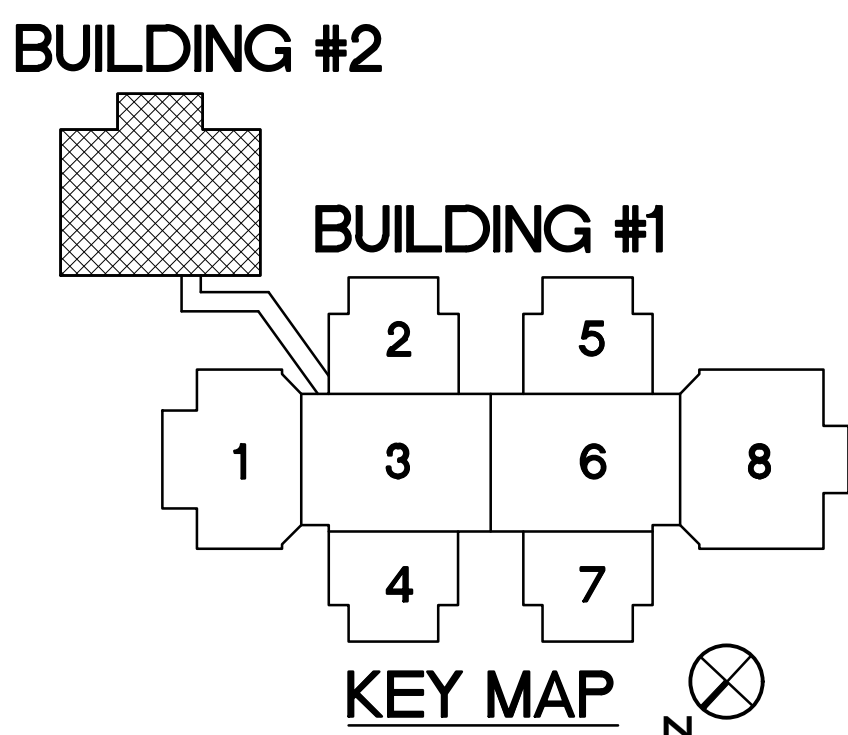
DEMOLITION NOTES

ALL EXISTING FANS (EF, EEF) AND ROOFTOP UNITS (RTU) SHALL HAVE THEIR EXISTING CONTROLS, THERMOSTATS, DEMOLISHED ALONG WITH ALL OTHER DDC EQUIPMENT (HW/CHW ACTUATORS, CONTROL BOARDS, ETC.). ALL VAV BOX AND ROOFTOP UNIT CONTROLS SHALL BE REPLACED WITH NEW CONTROLS SHOWN UNDER THESE DRAWINGS AS LISTED IN KEYED NOTES. (THIS SHEET) ALONG WITH SCHEMATIC, SEQUENCE AND POINTS LIST DRAWINGS. ALL EXISTING MANUAL STOP SWITCHES FOR THE ROOFTOP UNITS SHALL BE DEMOLISHED AND NOT REPLACED.

KEYED NOTES

- EQUIP. TYPE: 1
KX-20
- [EF-X] FAN
- CT SWITCH
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- [EEF-X] FAN
- CT SWITCH
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- [RTU-X] ROOFTOP UNIT
- REFER TO RTU FLOW DIAGRAM SCHEMATIC 3/M106 FOR REQUIRED BAS SENSORS, ACTUATORS, DAMPERS, ETC.
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)

COORDINATE ALL NEW TEMP/AHJW/CO2 SENSOR PLACEMENT WITH EXISTING FURNITURE, EQUIPMENT, ETC.
ANY EXISTING TEMP/HUM/CO2 SENSOR LOCATION NOT UTILIZED FOR INDICATED SENSOR LOCATIONS SHALL BE PROVIDED WITH S.S. BLANK COVERPLATE.



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FIRE PROTECTION • LIGHTING DESIGN



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WWW.OPTIMAENGINEERING.COM NORTH CAROLINA LICENSE NUMBER C-05114

BUTLER HIGH SCHOOL
HVAC CONTROLS UPGRADE

361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

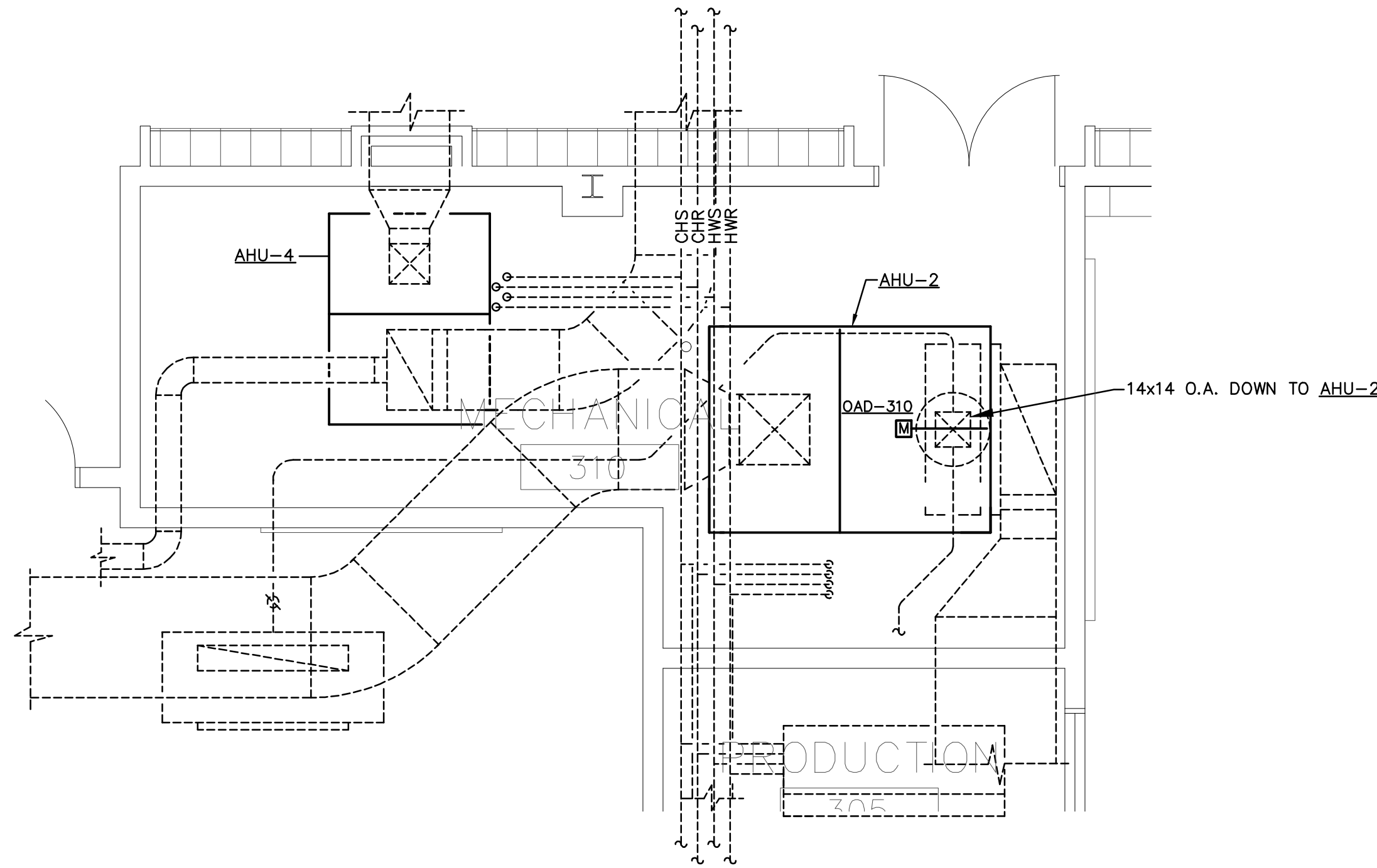
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DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

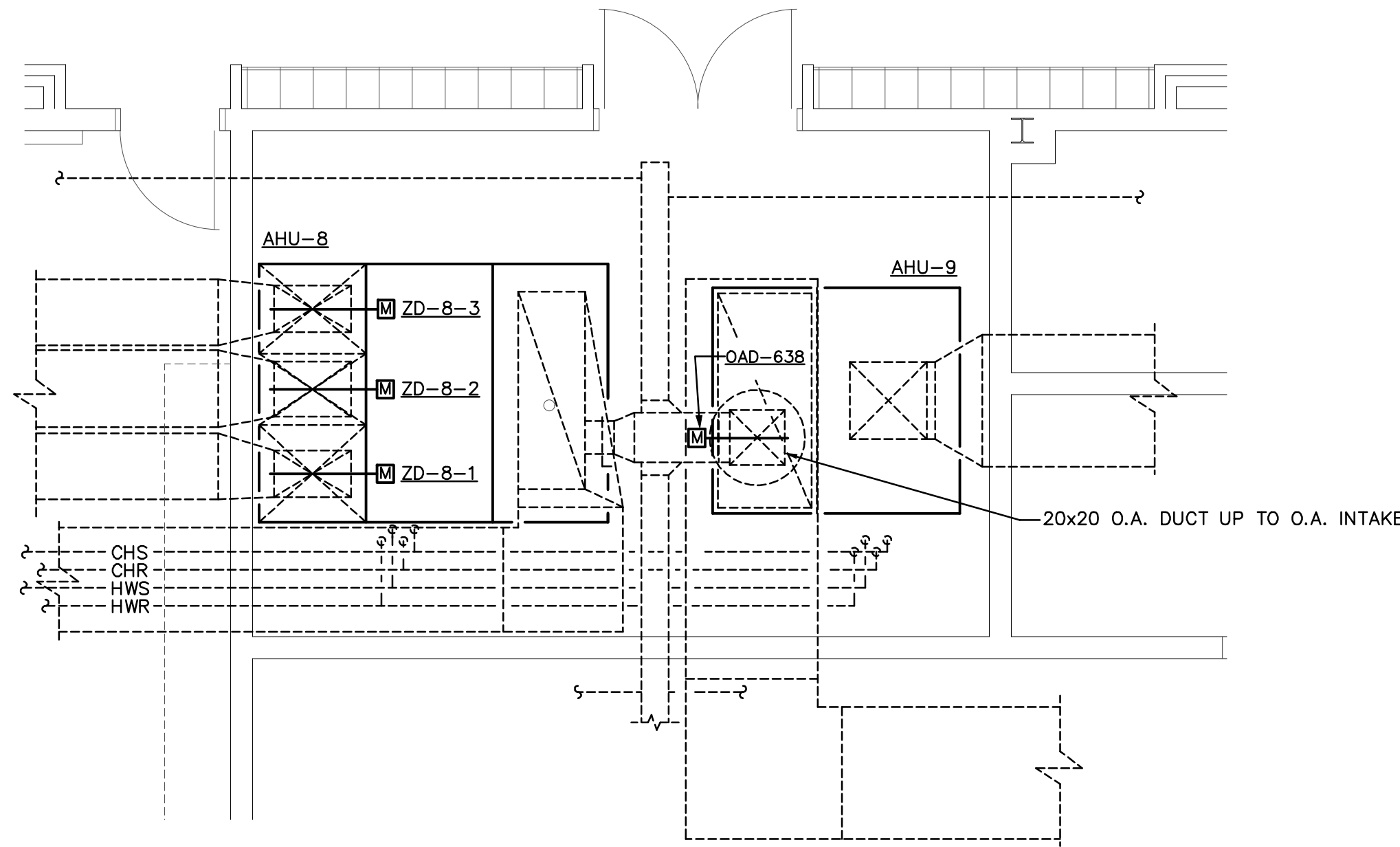
SHEET TITLE:
MECHANICAL -
ROOF PLAN
BUILDING #2

OWB #:
M313
SHEET NO: 21 OF 23

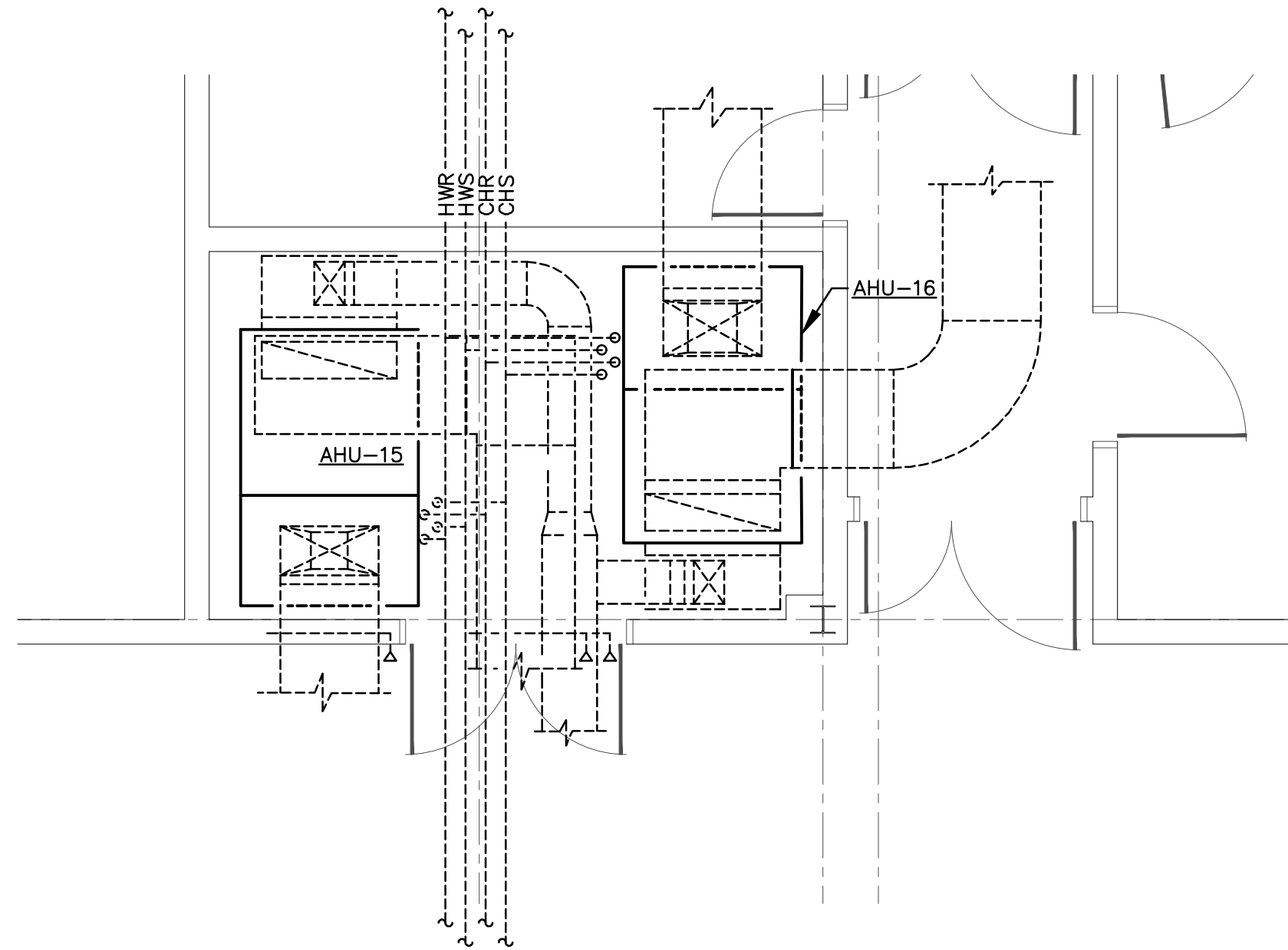
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① ENLARGED PLAN - MECHANICAL ROOM 310
1/4" = 1'-0"



② ENLARGED PLAN - MECHANICAL ROOM 638
1/4" = 1'-0"



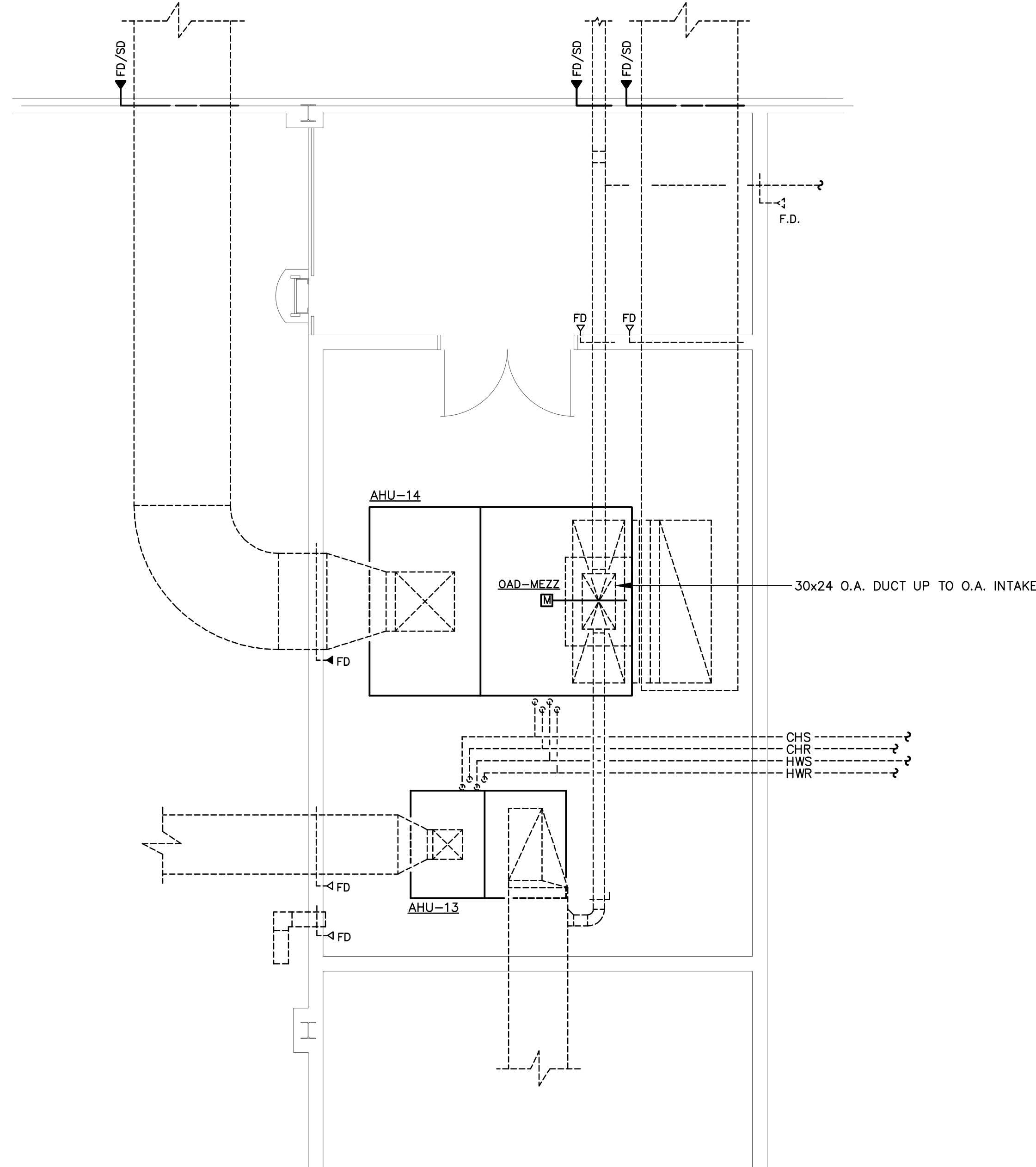
③ ENLARGED PLAN - MECHANICAL ROOM 834
1/4" = 1'-0"

- KEYED NOTES**
- UV-X** UNIT VENTILATOR / FAN COIL
- SUPPLY AIR TEMPERATURE SENSOR
- HOT WATER VALVE ACTUATOR
- CHILLER WATER VALVE ACTUATOR
- THERMOSTAT
- FAN SPEED SWITCH
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- F-X** FAN
- CT SWITCH
- THERMOSTAT
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- DAD-X** OUTSIDE AIR DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- AHU-X** AIR HANDLING UNIT (REFER TO DWG 4/M105 FOR ADDITIONAL REQUIRED DEVICES)
- SUPPLY AIR TEMPERATURE SENSOR
- MIXED AIR TEMPERATURE SENSOR
- THERMOSTAT
- HOT WATER VALVE ACTUATOR
- CHILLER WATER VALVE ACTUATOR
- OUTSIDE AIR DAMPER ACTUATOR
- RETURN AIR DAMPER ACTUATOR
- FREEZE STAT
- FILTER DIFFERENTIAL PRESSURE SENSOR
- MULTI-ZONE DUCT DAMPER ACTUATORS IF APPLICABLE
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- SD-X** SMOKE DAMPER
- AIR DAMPER ACTUATOR
- INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)

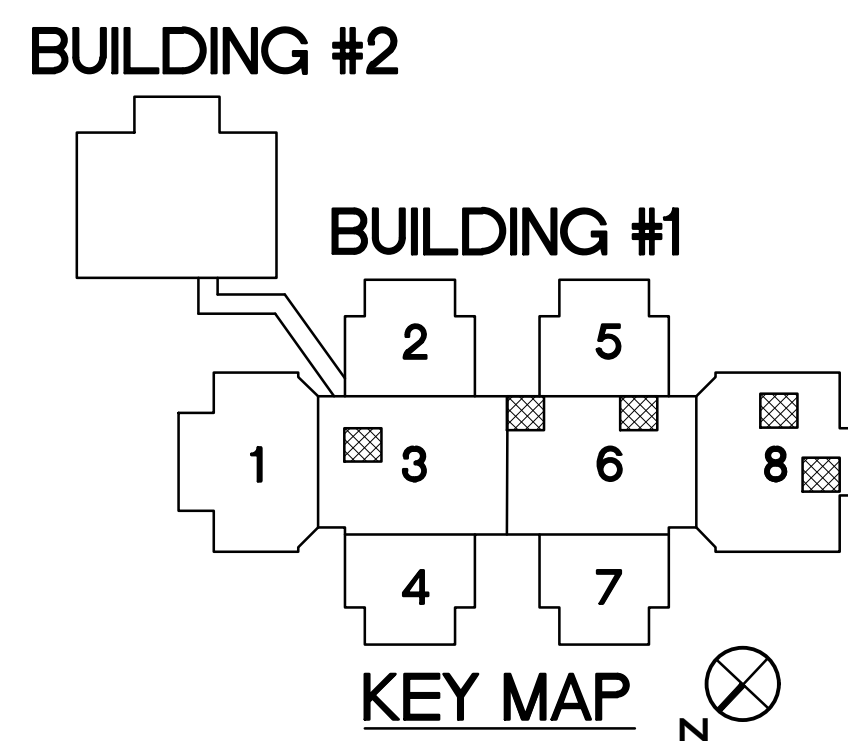
COORDINATE ALL NEW TEMP/HUM SENSOR PLACEMENT WITH EXISTING FURNITURE, EQUIPMENT, ETC.
ANY EXISTING TEMP/HUM/CO2 SENSOR LOCATION NOT UTILIZED FOR INDICATED SENSOR LOCATIONS SHALL BE PROVIDED WITH S.S. BLANK COVERPLATE.

DEMOLITION NOTES

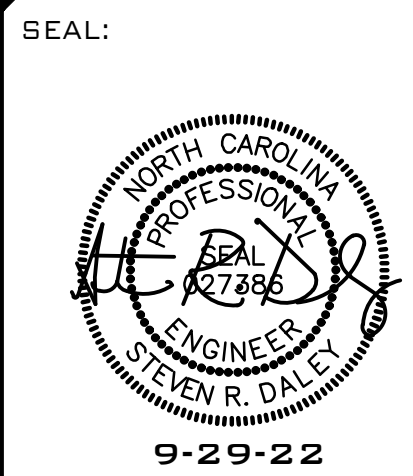
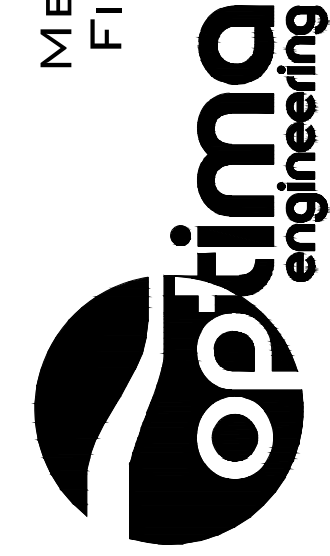
ALL EXISTING UNIT VENTILATORS (UV), FANS (F) AND AIR HANDLERS (AHU) SHALL HAVE THEIR EXISTING CONTROLS, THERMOSTATS AND MANUAL SPEED SELECTOR WALL SWITCH (IF APPLICABLE) DEMOLISHED ALONG WITH ALL OTHER DDC AND/OR PNEUMATIC CONTROLS EQUIPMENT (HW/CHW ACTUATORS, DAMPER ACTUATORS, CONTROL BOARDS, ETC.). ALL UNIT VENTILATOR, FAN AND AIR HANDLER CONTROLS SHALL BE REPLACED WITH NEW CONTROLS SHOWN UNDER THESE DRAWINGS AS LISTED IN KEYED NOTES (THIS SHEET) ALONG WITH SCHEMATIC SEQUENCE AND POINTS LIST DRAWINGS. UV WALL MOUNTED MANUAL SPEED SWITCHES SHALL NOT BE REPLACED. ALL EXISTING MANUAL STOP SWITCHES FOR THE AIR HANDLERS SHALL BE DEMOLISHED AND NOT REPLACED. UV SPEED SELECTOR CONTROL SHALL BE INTEGRATED WITH NEW BAS CONTROLS. IN ADDITION ALL AHU AND FCU/LV'S SHALL HAVE THEIR EXISTING PIPING KITS DEMOLISHED AND REPLACED INCLUDING MANUAL ISOLATION VALVES, GROUT SETTERS, GAUGE PORTS, REFER TO DETAIL 5/M107.



④ ENLARGED MEZZANINE PLAN - MECHANICAL
1/4" = 1'-0"



MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • LIGHTING DESIGN



BUTLER HIGH SCHOOL
HVAC CONTROLS UPGRADE

361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

REV #	DATE	DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

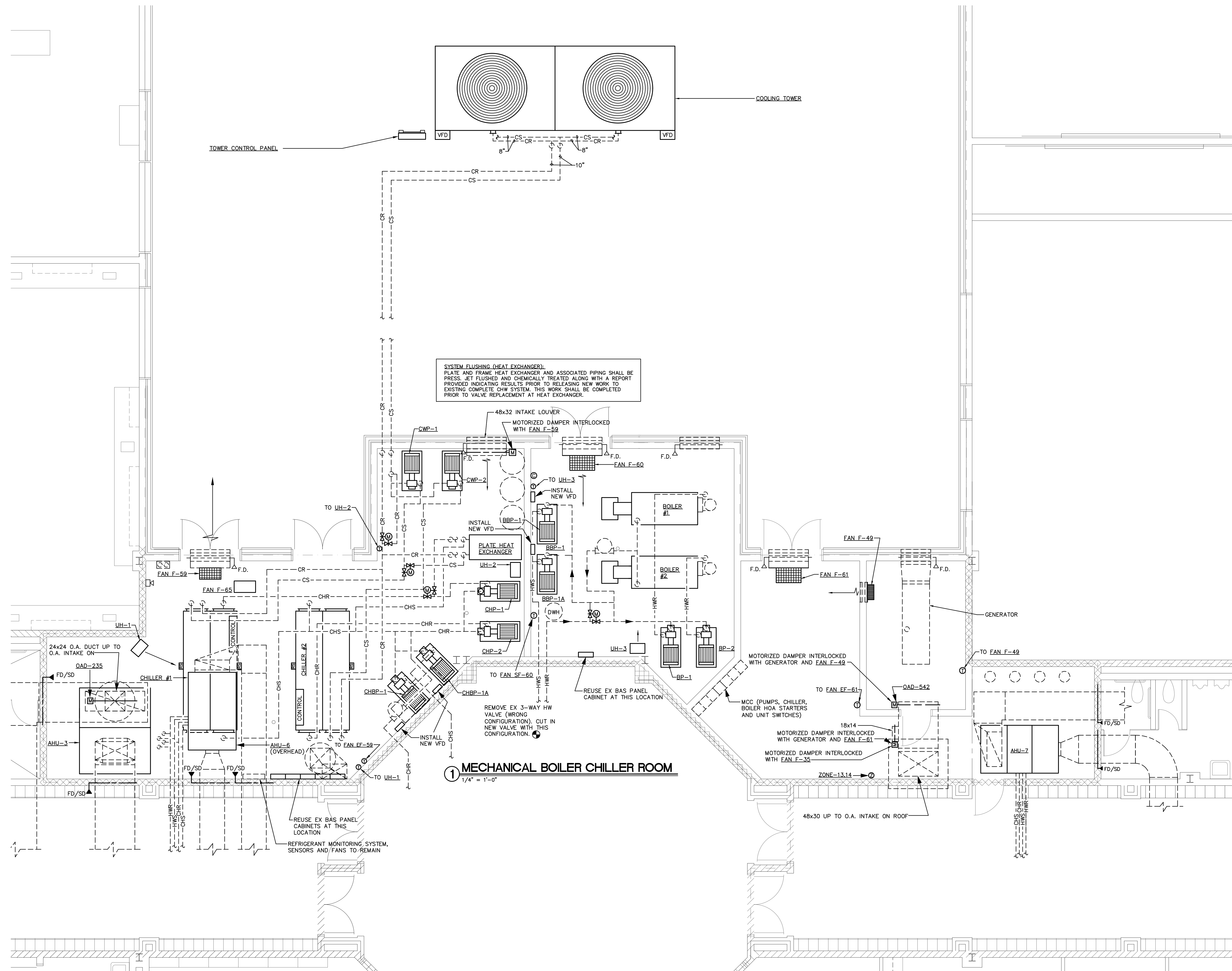
SHEET TITLE:
MECHANICAL
ROOM FLOOR
PLANS

OWB #:

M361

SHEET NO: 22 OF 23

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SYSTEM FLUSHING (HEAT EXCHANGERS):
PLATE AND FRAME HEAT EXCHANGER AND ASSOCIATED PIPING SHALL BE PRESS. JET FLUSHED AND CHEMICALLY TREATED ALONG WITH A REPORT PROVIDED INDICATING RESULTS PRIOR TO RELEASING NEW WORK TO EXISTING COMPLETE CHW SYSTEM. THIS WORK SHALL BE COMPLETED PRIOR TO VALVE REPLACEMENT AT HEAT EXCHANGER.

MECHANICAL BOILER CHILLER ROOM

1/4" = 1'-0"

DEMOLITION NOTES

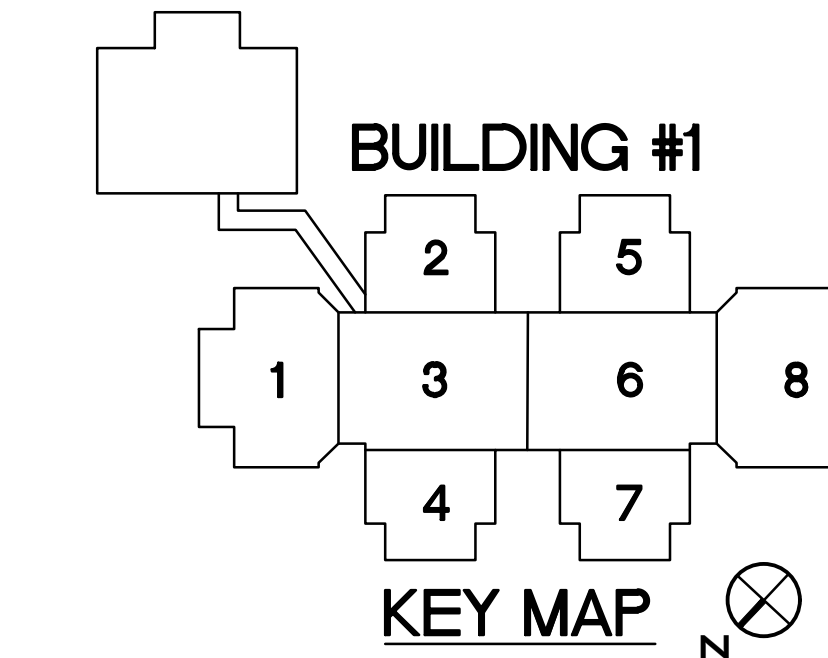
ALL EXISTING FANS, PUMPS, BOILERS, CHILLERS, COOLING TOWERS, DAMPERS, ELECTRIC HEATERS, AHU'S, ETC. SHALL HAVE THEIR EXISTING CONTROLS, THERMOSTATS, ETC. DEMOLISHED ALONG WITH ALL OTHER DDC/PNEUMATIC EQUIPMENT (HW/CHW ACTUATORS, CONTROL BOARDS, ETC.). ALL UNIT VENTILATOR, FAN AND AIR HANDLER CONTROLS SHALL BE REPLACED WITH NEW CONTROLS SHOWN UNDER THESE DRAWINGS AS LISTED IN KEYED NOTES.
(THIS SHEET) ALONG WITH SCHEMATIC, SEQUENCE AND POINTS LIST DRAWINGS, UV WALL MOUNTED MANUAL SPEED SWITCHES SHALL NOT BE REPLACED. ALL EXISTING MANUAL STOP SWITCHES FOR THE AIR HANDLERS SHALL BE DEMOLISHED AND NOT REPLACED. UV SPEED SELECTOR CONTROL SHALL BE INTEGRATED WITH NEW BAS CONTROLS. IN ADDITION ALL AHU AND FSL/AVS SHALL HAVE THEIR EXISTING PIPING KITS DEMOLISHED AND REPLACED INCLUDING, MANUAL ISOLATION VALVES, CIRCUIT SETTERS, GAUGE PORTS, REFER TO DETAIL S/M107.

KEYED NOTES

- P-X** PUMPS
 - CT SWITCH
 - START/STOP RELAY
 - INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- F-X** FAN
 - CT SWITCH
 - THERMOSTAT
 - INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- OAD-X** OUTSIDE AIR DAMPER
 - AIR DAMPER ACTUATOR
 - INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- AHU-X** AIR HANDLING UNIT
 - SUPPLY AIR TEMPERATURE SENSOR
 - MIXED AIR TEMPERATURE SENSOR
 - THERMOSTAT
 - HOT WATER VALVE ACTUATOR
 - CHILLER WATER VALVE ACTUATOR
 - OUTSIDE AIR DAMPER ACTUATOR
 - RETURN AIR DAMPER ACTUATOR
 - FREEZE STAT
 - FILTER DIFFERENTIAL PRESSURE SENSOR
 - INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- CH-X** CHILLER
 - START/STOP RELAY
 - CHILLED WATER SUPPLY TEMPERATURE SENSOR
 - CHILLED WATER RETURN TEMPERATURE SENSOR
 - CHILLED WATER SYSTEM SUPPLY TEMPERATURE SENSOR
 - CHILLED WATER BYPASS VALVE ACTUATOR
 - CONDENSER FLOW CONTROL VALVE ACTUATOR
 - REFRIGERANT MONITORING PANEL STATUS
 - INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- CT-X** COOLING TOWER
 - START/STOP RELAY
 - CONDENSER WATER SUPPLY TEMPERATURE SENSOR
 - CONDENSER WATER RETURN TEMPERATURE SENSOR
 - COOLING TOWER BYPASS VALVE ACTUATOR
 - INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)
- HEX-X** HEAT EXCHANGER
 - CT LEAVING WATER TEMPERATURE SENSOR
 - CHW LEAVING TEMPERATURE SENSOR
 - CT ENTERING WATER TEMPERATURE SENSOR
 - CHW ENTERING TEMPERATURE SENSOR
- UH-X** UNIT HEATER
 - THERMOSTAT
- B-1** BOILERS
 - START/STOP RELAY
 - HOT WATER SUPPLY TEMPERATURE SENSOR
 - HOT WATER RETURN TEMPERATURE SENSOR
 - HOT WATER SYSTEM SUPPLY TEMPERATURE SENSOR
 - HOT WATER BYPASS VALVE ACTUATOR
 - INTEGRATE W/BAS REFER TO POINTS LIST AND SEQUENCES (230993)

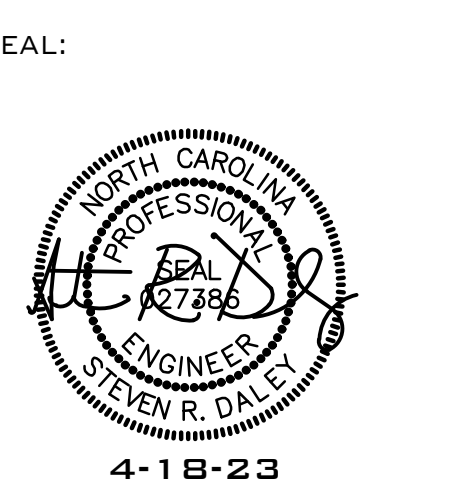
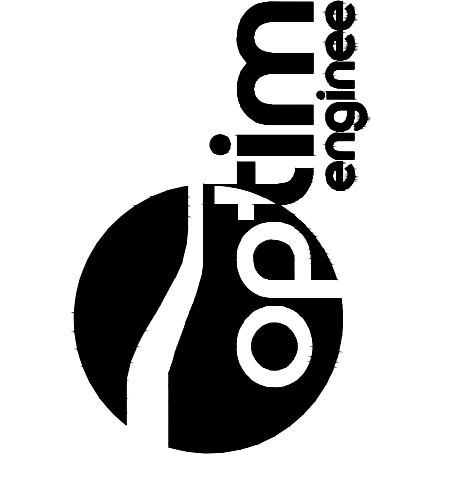
COORDINATE ALL NEW TEMP/AHU/CO2 SENSOR PLACEMENT WITH EXISTING FURNITURE, EQUIPMENT, ETC.
ANY EXISTING TEMP/AHU/CO2 SENSOR LOCATION NOT UTILIZED FOR INDICATED SENSOR LOCATIONS SHALL BE PROVIDED WITH S.S. BLANK COVERPLATE.

BUILDING #2



KEY MAP

MECHANICAL • ELECTRICAL • PLUMBING
FIRE PROTECTION • LIGHTING DESIGN



BUTLER HIGH SCHOOL HVAC CONTROLS UPGRADE

361 DAVID BUTLER HIGH SCHOOL
1810 MATTHEWS-MINT ROAD
MATTHEWS, NC 28105

REV #	DATE	DESCRIPTION
1	04/18/23	ADDENDUM 2

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: JMF
DESIGNED BY: JMF
CHECKED BY: SRD

SHEET TITLE:
MECHANICAL -
CHILLER AND
BOILER ROOMS

DWG #:
M362
SHEET NO: 23 OF 23

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2018 NORTH CAROLINA ENERGY CONSERVATION CODE COMMERCIAL ENERGY EFFICIENCY – ELECTRICAL SUMMARY	
C401.1 METHOD OF COMPLIANCE	☐ 2018 NCECC CHAPTER 4 ☐ NO SPECIFIC COMCHECK PROVIDED ☐ N/A BASED ON PROJECT SCOPE ☐ ASHRAE 90.1-2013
C406. ADDITIONAL EFFICIENCY PACKAGE OPTIONS	☐ C406.2 EFFICIENT MECH EQUIPMENT ☐ C406.5 ON-SITE RENEWABLE ENERGY ☐ C406.3 REDUCED LTG DENSITY ☐ C406.6 DEDICATED OA SYSTEM ☐ C406.4 ENHANCED DIGITAL LTG CNTLS ☐ C406.7 HI-EFF SERVICE WTR HTG ☒ NOT APPLICABLE BASED ON PROJECT SCOPE ☐ C406.7.1 WTR HTG LOAD FRACTION SCOPE
C408 – SYSTEM COMMISSIONING:	BUILDING IS LESS THAN 10,000 SQUARE FEET AND IS EXEMPT FROM THE SYSTEM COMMISSIONING REQUIREMENTS OF SECTION C408. BUILDING IS GREATER THAN 10,000 SQUARE FEET AND REQUIRES SYSTEM COMMISSIONING PER SECTION C408. ☒ NOT APPLICABLE
C405.2 – LIGHTING CONTROLS (MANDATORY REQUIREMENTS):	LIGHTING SYSTEMS ARE PROVIDED WITH CONTROLS AS REQUIRED PER SECTION C405.2, EXCEPT WHERE EXEMPT. ☒ NOT APPLICABLE
C405.3 – EXIT SIGNS (MANDATORY REQUIREMENTS):	INTERNALLY ILLUMINATED EXIT SIGNS DO NOT EXCEED 5 WATTS PER SIDE. ☒ NOT APPLICABLE
C405.4 – INTERIOR LIGHTING POWER REQUIREMENTS (PRESCRIPTIVE) (NON-EXEMPT):	☒ NOT APPLICABLE PER 2018 NCECC C503.1, EXCEPTION 2.G. C405.4.1 – TOTAL CONNECTED INTERIOR LIGHTING POWER: WATTS SPECIFIED % REDUCTION OF SPECIFIED VS. ALLOWED (APPLICABLE IF C406.1.2 IS SELECTED) C405.4.2 – TOTAL ALLOWABLE INTERIOR LIGHTING POWER: METHOD OF COMPLIANCE: ☐ BUILDING AREA METHOD ☐ SPACE-BY-SPACE METHOD
C405.5.1 – EXTERIOR BUILDING LIGHTING POWER (NON-EXEMPT):	☒ NOT APPLICABLE TOTAL CONNECTED EXTERIOR LIGHTING POWER: WATTS SPECIFIED TOTAL ALLOWABLE EXTERIOR LIGHTING POWER: WATTS ALLOWED
C405.6 – ELECTRICAL ENERGY CONSUMPTION (DWELLING UNITS):	SEPARATE ELECTRICAL METERING HAS BEEN PROVIDED FOR EACH DWELLING UNIT IN GROUP P-2 BUILDINGS ☒ NOT APPLICABLE
C405.7 – ELECTRICAL TRANSFORMERS (MANDATORY REQUIREMENTS):	ELECTRICAL TRANSFORMERS HAVE BEEN SPECIFIED TO MEET MINIMUM EFFICIENCY REQUIREMENTS PER C405.7, EXCEPT WHERE EXEMPT. ☒ NOT APPLICABLE
C405.8 – ELECTRICAL MOTORS (MANDATORY REQUIREMENTS):	ELECTRICAL MOTORS HAVE BEEN SPECIFIED TO MEET MINIMUM EFFICIENCY REQUIREMENTS PER C405.8, EXCEPT WHERE EXEMPT. ☒ NOT APPLICABLE

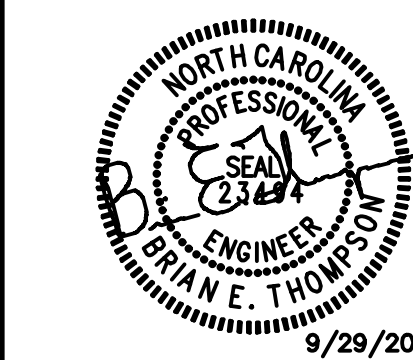
DEVICES AND PATHWAYS	
	BRANCH CIRCUIT HOMERUN TO PANEL
	JUNCTION BOX WITH CONNECTION TO EQUIPMENT SERVED. 4" SQUARE BOX WITH A SINGLE-GANG OPENING AND PLASTER RING.
PANELS, DISCONNECTS	
	FUSED HEAVY DUTY DISCONNECT SWITCH. NUMERALS INDICATE SWITCH RATING/FUSE SIZE. NEMA 1 ENCLOSURE, UNLESS OTHERWISE NOTED.
	PANELBOARD. SEE SCHEDULE FOR MOUNTING. TOP OF PANEL AT 6'-6" AFF.
ABBREVIATIONS	
	BUILDING AUTOMATION SYSTEM
	AIR OF THE OWNER'S BUILDING
	UNIT VENTILATOR
	FAN COIL UNIT
	VARIABLE AIR VOLUME

ELECTRICAL SHEET INDEX	
PLAN NUMBER	PLAN NAME
E001	ELECTRICAL NOTES, LEGENDS & SPECIFICATIONS
E200	MAIN BUILDING ELECTRICAL FLOOR PLAN
E201	AREA "1" ELECTRICAL FLOOR PLAN
E202	AREA "2" ELECTRICAL FLOOR PLAN
E203	AREA "3" ELECTRICAL FLOOR PLAN
E204	AREA "4" ELECTRICAL FLOOR PLAN
E205	AREA "5" ELECTRICAL FLOOR PLAN
E206	AREA "6" ELECTRICAL FLOOR PLAN
E207	AREA "7" ELECTRICAL FLOOR PLAN
E208	AREA "8" ELECTRICAL FLOOR PLAN
E209	BUILDING #2 FLOOR 1 ELECTRICAL FLOOR PLAN
E210	BUILDING #2 FLOOR 2 ELECTRICAL FLOOR PLAN
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E601	ELECTRICAL DETAILS
E701	POWER RISER DIAGRAM & SCHEDULES
E702	2ND BUILDING POWER RISER DIAGRAM & SCHEDULES

1. GENERAL:	A. THE WORK COVERED BY THESE SPECIFICATIONS CONSISTS OF FURNISHING ALL LABOR, EQUIPMENT, MATERIALS AND SUPPLIES AS NECESSARY FOR THE COMPLETE AND SATISFACTORY OPERATING ELECTRICAL SYSTEMS AS SHOWN ON THE PLANS. B. ALL WORK SHALL BE IN ACCORDANCE WITH LATEST EDITIONS OF THE NATIONAL ELECTRICAL CODE, NFPA, STATE BUILDING CODE, AND ANY OTHER LOCAL REQUIREMENTS THAT MAY APPLY. C. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL ELECTRICAL PERMITS AND INSPECTION FEES. D. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND SHALL BE LISTED BY THE UNDERWRITER'S LABORATORIES, INC. OR BY A STATE APPROVED THIRD PARTY TESTING AGENCY. E. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND CATALOG DATA IN ELECTRONIC FORMAT (PDF) FOR ALL ELECTRICAL ITEMS IN THE SCOPE OF WORK, INCLUDING, BUT NOT LIMITED TO, ELECTRICAL PANELS, DISCONNECTS, TERMINALS, LAMPS, BALLASTS, WIRING DEVICES, SAFETY SWITCHES, DISCONNECTS, TRANSFORMERS, PANELBOARDS, SWITCHBOARDS, FIRE ALARM, TELECOMMUNICATIONS, ETC. FOR APPROVAL AS APPLICABLE FOR THE PROJECT. ONE COMPLETE SET OF APPROVED SUBMITTALS SHALL BE MAINTAINED AT THE JOB SITE. F. ALL COST ASSOCIATED WITH SUBSTITUTED EQUIPMENT TO COMPLY WITH THE BASIS OF DESIGN, INCLUDING PROVIDING MATERIAL ACCESS, CLEARANCE, CONDUIT, WIRING, REPLACEMENT OF OTHER SYSTEM COMPONENTS, BUILDING ALTERATIONS, METHODS, ETC., SHALL BE INCLUDED IN THE ORIGINAL BASE BID. NO ADDITIONAL COSTS ASSOCIATED WITH SUBSTITUTED EQUIPMENT WILL BE APPROVED AFTER BIDS HAVE BEEN ACCEPTED AND ALL COSTS WILL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR. CREDITS SHALL BE GIVEN TO THE OWNER WHERE SUCH EQUIPMENT AND METHODS RESULT IN LESS EXPENSE TO THE CONTRACTOR. G. ONE COMPLETE SET OF THE LATEST CONSTRUCTION PLANS OF ALL TRADES SHALL BE MAINTAINED AT THE JOB SITE. IN ADDITION, ALL ADDENDUMS, CORRECTIONS, AND/OR SKETCHES SHALL BE INCORPORATED INTO THE ON-SITE CONSTRUCTION PLANS AS THE JOB PROGRESSES. H. COMPLETELY ASSEMBLED EQUIPMENT SHALL BE PROVIDED FOR ALL MATERIALS STORED ON JOB SITE. ONLY CONDUIT MAY BE STORED OUTSIDE, BUT NOT IN CONTACT WITH THE GROUND. I. THE CONDUIT AND NEUTRAL SYSTEM SHALL BE GROUNDED AT THE MAIN SERVICE EQUIPMENT. GROUNDING ELECTRODE SYSTEM SHALL BE INSTALLED PER NEC 250. J. PROVIDE AN INTERSYSTEM BONDING TERMINATION DEVICE AT THE MAIN ELECTRICAL SERVICE PER NEC 250.34. K. WIRING SHALL BE TESTED FOR CONTINUITY AND GROUNDS BEFORE BEING ENERGIZED. FAULTY WIRING SHALL BE REPLACED AT NO ADDITIONAL EXPENSE TO THE OWNER. L. PROVIDE ALL CUTTING AND PATCHING FOR INSTALLATION OF WORK AND REPAIR ANY DAMAGE DONE. M. THE ELECTRICAL CONTRACTOR SHALL CONNECT ALL EQUIPMENT REQUIRING ELECTRICAL CONNECTIONS (UNLESS OTHERWISE NOTED), EXCEPT FOR CONTROL WIRING FOR EQUIPMENT NOT PROVIDED BY THE ELECTRICAL CONTRACTOR. CONTROL WIRING FOR SUCH EQUIPMENT SHALL BE PROVIDED BY THE RESPECTIVE DISCIPLINE. N. ALL ELECTRICAL JUNCTION BOXES, SWITCHGEAR, CABLING, VOICE/DATA OUTLETS, LOW VOLTAGE CABINETS, EMERGENCY RECEPTACLES, ETC. SHALL BE LABELED ACCORDING TO PANEL/PACK AND CIRCUIT NUMBER. O. UPON COMPLETION OF WORK, CONTRACTOR SHALL PRESENT ENGINEER WITH CERTIFICATE OF APPROVAL FROM LOCAL INSPECTOR AND/OR AUTHORITY HAVING JURISDICTION BEFORE WORK WILL BE APPROVED FOR FINAL PAYMENT. P. CONTRACTOR SHALL GUARANTEE ALL WORK AND MATERIALS FOR A PERIOD OF ONE YEAR EFFECTIVE THE DATE THE PROJECT IS ACCEPTED BY THE OWNER. ANY IMPERFECT MATERIALS OR WORKMANSHIP SHALL BE REPLACED WITHOUT ADDED COST TO THE PROJECT. Q. IT SHALL NOT BE THE INTENT OF ISSUED PLANS AND/OR SPECIFICATIONS TO TURN EVERY MINOR DETAIL OF CONSTRUCTION. THE ELECTRICAL CONTRACTOR IS EXPECTED TO FURNISH AND INSTALL ALL NECESSARY ITEMS FOR COMPLETE AND OPERATING SYSTEM. R. THE WORD "PROVIDE" MEANS THAT THIS CONTRACTOR SHALL FURNISH, FABRICATE, ERECT, CONNECT, AND COMPLETELY INSTALL SYSTEMS IN PROPER OPERATING CONDITION. ALL LABOR, PRODUCT OPTIONS, ACCESSORIES AND INCIDENTAL MATERIALS REQUIRED SHALL BE INCLUDED AS PART OF THIS WORK TO COMPLETE THE INSTALLATION. S. ELECTRICAL CONTRACTOR SHALL NOT SCALE PLANS. CONTRACTOR SHALL REFER TO ARCHITECTURAL PLANS AND ELEVATIONS FOR EXACT LOCATIONS OF ALL EQUIPMENT, UNLESS OTHERWISE NOTED. T. IF DURING THE COURSE OF WORK, THE CONTRACTOR DISCOVERS A PROBLEM WITH THE PERFORMANCE OF THE INSTALLATION RELATIVE TO THE PLANS AND SPECIFICATIONS, THE NEC OR REQUIREMENTS, THE CONTRACTOR SHALL IMMEDIATELY BRING THE PROBLEM TO THE ATTENTION OF THE ARCHITECT AND/OR ENGINEER FOR RESOLUTION PRIOR TO THE EXECUTION OF THE WORK. U. WHERE THERE ARE CONFLICTS BETWEEN THE PLANS AND SPECIFICATIONS, THE CONTRACTOR SHALL BRING THE ISSUE TO THE ATTENTION OF THE ENGINEER FOR RESOLUTION PRIOR TO THE EXECUTION OF THE WORK OR ORDERING ANY MATERIALS. NO ADDITIONAL COSTS SHALL BE WARRANTED WITHOUT A CHANGE TO THE PROJECT SCOPE.
2. RACEWAYS:	A. CONDUIT SHALL BE MANUFACTURED BY ALLED, WHEATLAND, REPUBLIC CONDUIT, WESTERN TUBE, OR APPROVED EQUIVALENT. B. FOR INTERIOR WORK CONDUIT SHALL BE ZINC COATED EMT EXCEPT WHERE NOT PERMITTED BY CODE. USE SCHEDULE 40 PVC BELOW CONCRETE SLAB, IN DUCTBANKS, AND FOR EXTERIOR WORK WHERE NOT SUBJECT TO DAMAGE. USE IMC WHERE SUBJECT TO PHYSICAL DAMAGE. C. EMT FITTINGS SHALL BE COMPRESSION GLAND TYPE, OF MALLEABLE STEEL. CONNECTORS SHALL HAVE INSULATED THROATS. CAST, SET SCREW, OR INDENTER TYPE FITTINGS ARE NOT ACCEPTABLE. ALL FITTINGS FOR EMT SHALL BE MADE OF STEEL. D. ALL RACEWAY SHALL BE RUN CONCEALED, UNLESS OTHERWISE NOTED. FISH ALL NEW OUTLETS IN EXISTING WALLS, WHERE POSSIBLE. ALL RUNS SHALL BE NEAT AND SQUARE. E. LOW VOLTAGE CABLING NOT SPECIFIED TO BE INSTALLED IN CONDUIT, SHALL BE INSTALLED IN A CABLE TRAY SYSTEM OR J-HOOK SYSTEM CONSISTING OF MINIMUM 2" DIAMETER HOOKS LOCATED ON 3'-0" CENTERS IN ALL ACCESSIBLE CEILINGS. WHERE THERE ARE INACCESSIBLE CEILINGS, PROVIDE CONDUIT FOR ENTIRE LENGTH OF INACCESSIBILITY. F. RACEWAYS USED FOR LOW VOLTAGE SYSTEMS SUCH AS TELECOMMUNICATIONS, FIRE ALARM, SECURITY, CCTV, CONTROLS, AND SIMILAR CONDUITS ABOVE THE CEILING AND BACKBOARD(S) SHALL BE PROVIDED WITH INSULATED THROAT BUSHINGS AT EACH CONDUIT TERMINATION. THESE BUSHINGS SHALL BE INSTALLED PRIOR TO PULLING LOW-VOLTAGE CABLES. G. RACEWAY PENETRATIONS THROUGH FLOOR SLABS AND FIRE-RATED WALLS SHALL BE FILLED WITH IMPERIOUS, NON-SHRINK GROUT SUFFICIENTLY TIGHT TO PREVENT THE TRANSFER OF SMOKE, WATER, AND DUST. ROOF PENETRATIONS SHALL BE WITHIN THE EQUIPMENT ROOF CURB. H. SUPPORT ALL CONDUIT WITH STRAPS AND CLAMPS. I. ALL CONDUIT SHALL BE RUN PARALLEL OR PERPENDICULAR TO BUILDING LINES, WHETHER EXPOSED OR NOT AND SUPPORTED FROM STRUCTURE AND PROPERLY SECURED. J. WHERE CONDUITS PASS THROUGH A BUILDING EXPANSION JOINT, PROVIDE GALVANIZED EXPANSION FITTINGS WITH BONDING JUMPERS. K. MINIMUM CONDUIT SIZE SHALL BE 3/4" FOR INTERIOR WORK. L. PROVIDE MINIMUM 210M TEST NYLON PULL CORD AND NYLON BUSHINGS IN ALL EMPTY RACEWAYS. M. PROVIDE PULL BOXES, SUCH THAT NO SINGLE CONDUIT RUN HAS BENDS IN EXCESS OF 360°. PULL BOXES SHALL BE SUITABLE AND APPROVED FOR THE INTENDED USE. WHERE CONDUITS PASS UNDER PAVED AREAS, THEY SHALL BE RIS. N. ALL CONDUIT BENDS/ELBOWS EMERGING FROM UNDERGROUND SHALL BE IMC AND SHALL EXTEND A MINIMUM OF 18" BELOW GRADE. O. ALL UNDERGROUND RACEWAYS SHALL BE THOROUGHLY COATED WITH TWO COATS OF ASPHALTUM BITUMASTIC. P. ALL CONDUITS INSTALLED UNDERGROUND OR IN CONCRETE SHALL HAVE JOINTS MADE WATER TIGHT BY USE OF POLYETRA-FLUORETHYLENE TAPE. Q. THE USE OF AC OR IMC CABLE IS NOT PERMITTED. R. T, MC CABLE MAY BE USED IN LENGTHS OF 50' MAX PER CIRCUIT.
3. OUTLET BOXES:	A. JUNCTION AND PULL BOXES SHALL BE CODE GAUGE GALVANIZED STEEL. ACCEPTED MANUFACTURERS SHALL BE STEEL CITY (THOMAS & BETTS), RACO, CROUSE-HINDS, APPLETON (EMERSON), OR APPROVED EQUIVALENT. B. OUTLET BOXES SHALL NOT BE MOUNTED BACK TO BACK IN COMMON WALLS. C. ATTACH EMT WITH CONNECTORS HAVING INSULATED THROAT. D. ATTACH BOXES TO STUD WORK USING CADDY BAR STRAPS THAT CONNECT TO TWO ADJACENT METAL STUDS TO PREVENT TWISTING OF BOX IN WALL. E. ALL OUTLET BOXES (INCLUDING TELEPHONE, CABLE TV, AND COMPUTER) SHALL HAVE COVER PLATES, BLANK IF NOT USED.
4. CONDUCTORS:	A. CONDUCTORS SHALL BE MANUFACTURED BY SOUTHWIRE (SMPULL), ENCORE (SUPERSLOW), UNITED COPPER (CU), CERRO (CLP), OR APPROVED EQUAL. "PRE-LUBRICATED" BY THE MANUFACTURER. B. ALL CONDUCTORS SHALL BE COPPER, RATED 75° C WET/DRY EXCEPT WHERE OTHERWISE NOTED OR REQUIRED BY UL OR OTHER CODES. C. ALL CONDUCTORS SHALL BE SINGLE INSULATED CONDUCTOR, THHN/THWN-2, SIZES #10 AWG AND SMALLER SHALL BE SOID, SIZES #8 AWG AND LARGER SHALL BE STRANDED. D. BRANCH CIRCUITS SHALL NOT BE SMALLER THAN #12 AWG. E. CONDUCTORS SHALL BE COLOR CODED BLACK/RED/BLUE FOR 120/208 VOLT SYSTEMS AND BROWN/ORANGE/YELLOW FOR 277/480 VOLT SYSTEMS FOR A, B, AND C PHASES, RESPECTIVELY. NEUTRAL SHALL BE WHITE FOR 120/208 VOLT SYSTEMS AND NATURAL GRAY FOR 277/480 VOLT SYSTEMS. GROUND CONDUCTOR SHALL BE GREEN ON ALL SYSTEMS. ALL CONDUCTOR SIZES SHALL HAVE COLOR-CODED INSULATION. THE USE OF COLORED TAPE ON LARGER WIRE SIZES SHALL NOT BE ALLOWED. F. INSULATION SHALL BE DUAL RATED TYPE THHN/THWN-2 FOR FEEDERS AND BRANCH CIRCUITS. FIXTURE TAPS SHALL BE #12 THHN/THWN-2 IN FLEX WITH GREEN #12 AWG GROUNDING CONDUCTOR. G. ALL CONDUCTORS SHALL BE IN CONDUIT. H. MULTI-WIRE BRANCH CIRCUITS SHALL NOT BE ALLOWED. I. JOINTS IN #10 AWG AND SMALLER SHALL BE MADE UP WITH CRIMPED CONNECTORS WITH INSULATING CAPS (NO TAPE) OR WIRENUTS (MAXIMUM OF 3 CONDUCTORS UNDER ANY CONNECTOR OR WIRENUT). LARGER WIRE SHALL USE SPLIT BOLTS OR BOLTED CLAMPS. K. ALL WIRING LUGS THROUGHOUT THE PROJECT, INCLUDING, BUT NOT LIMITED TO, BREAKERS, PANELBOARD/SWITCHBOARD LUGS, SAFETY SWITCH LUGS, MOTOR STARTER LUGS, TRANSFORMERS LUGS, WIRING DEVICE TERMINALS, AND ALL EQUIPMENT LUGS/TERMINALS SHALL BE RATED FOR USE WITH 75 DEGREE INSULATED CONDUCTORS AT THEIR 75 DEGREE RATING AND SHALL BE SIZED AND SELECTED TO MATCH THE CONDUCTOR SIZE AND MATERIAL. L. CIRCUIT JOINTS SHALL NOT BE MADE ON DEVICE TERMINALS. M. WIRE WITHIN PANELBOARDS SHALL BE NEATLY TRIMMED, SQUARED, BUNDLED, AND TAGGED. N. GROUND ALL EQUIPMENT PER NEC ARTICLE 250. BOND WHERE CONDUITS ENTER ENCLOSURES THROUGH CONCENTRIC KNOCKOUTS. ALL FLEX, INCLUDING FIXTURE TAPS, SHALL INCLUDE GREEN GROUNDING CONDUCTOR, #12 AWG MINIMUM. PROVIDE GREEN INSULATED EQUIPMENT GROUNDING CONDUCTOR IN EACH CONDUIT AND FOR EACH CIRCUIT, SIZED PER NEC 250-122. O. ALL CONDUCTORS INSTALLED IN VERTICAL RACEWAYS SHALL BE SUPPORTED AT INTERVALS AS REQUIRED PER NEC 300-19. P. THE ELECTRICAL CONTRACTOR SHALL FOLLOW AND APPLY THE TABLE BELOW, REGARDLESS WHAT THE PANEL SCHEDULE INDICATES, FOR SIZING ALL 120V & 277V, 20 AMP BRANCH CIRCUITS (COPPER CONDUCTORS) TO ALLOW A MAXIMUM OF 3% VOLTAGE DROP FROM THE CIRCUIT BREAKER TO THE FIRST DEVICE ON THE BRANCH CIRCUIT AND ACHIEVE A MAXIMUM OF 5% VOLTAGE DROP ACROSS

THE ENTIRE BRANCH CIRCUIT:		
VOLTAGE	CONDUCTOR LENGTH *	BRANCH CIRCUIT
120	0' – 50'	#12
120	51' – 80'	#10
120	91' – 140'	#8
120	141' – 225'	#6
* – THE LENGTH IS MEASURED FROM THE CIRCUIT BREAKER TO THE FIRST DEVICE WHICH THE BRANCH CIRCUIT SERVES. WHERE THE DISTANCE EXCEEDS ABOVE, CONSULT WITH THE ENGINEER.		
5. SUPPORTS:	A. ALL EQUIPMENT SHALL BE ADEQUATELY SUPPORTED FROM STRUCTURE, B. INSERTS IN MASONRY SHALL BE LEAD OR FIBER IN DRILLED HOLES, OR CAST IN FINISH, OR AS DIRECTED BY THE ARCHITECT. C. NAILS OR POWER ACTUATED FASTENERS SHALL NOT BE USED. D. DMT/IMG/NGS SUPPORTS SHALL BE A MAXIMUM OF 8'-0" APART AND A MAXIMUM OF 3'-0" FROM BOXES.	
6. PAINTING:	A. SUITABLE FINISH COAT SHALL BE PROVIDED FOR ALL EQUIPMENT, PANEL TUBS, COVERS, ETC. SHALL BE PRIMED AND ENAMELED TO BLEND WITH ADJACENT SURFACES, OR SHALL BE MANUFACTURER'S STANDARD COLOR BAKED ENAMEL FINISH, OR AS DIRECTED BY THE ARCHITECT. B. CONTRACTOR TO PAINT WHERE EXISTING EXPOSED PANELBOARDS, SURFACE RACEWAY, SURFACE BOXES, ETC. HAVE BEEN REMOVED DURING THE DEMOLITION PHASE, EITHER FOR TEMPORARY WORK OR PERMANENTLY.	
7. FIRE STOPPING:	A. ALL PENETRATIONS OF RATED ASSEMBLIES SHALL BE SEALED WITH RATED MATERIALS MEETING ASTM E-814. B. PROVIDE FIRESTOPPING DEVICES(S) OR SYSTEM(S) WHICH HAVE BEEN TESTED AND LISTED AS COMPLYING WITH ASTM E-814. INSTALL THE DEVICE(S) OR SYSTEM(S) IN ACCORDANCE WITH THE CONDITIONS OF THEIR LISTING. PROVIDE THE APPROPRIATE DEVICE(S) OR SYSTEM(S) WITH AN "F" RATING EQUAL TO THE RATING OF THE ASSEMBLY BEING PENETRATED. C. DEVICE(S) AND/OR SYSTEM(S) SHALL BE BY ULTI, 3M OR EQUIVALENT.	
8. SEISMIC:	A. THE ELECTRICAL CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR PROVIDING SEISMIC SUPPORT AND BRACING OF ELECTRICAL COMPONENTS TO RESIST THE EFFECTS OF EARTHQUAKES TO THE ELECTRICAL SYSTEMS AS WELL AS ANY REQUIRED SPECIAL INSPECTIONS BASED ON THE SPECIFIC GEOGRAPHIC LOCATION AS REQUIRED. THE SEISMIC RESTRAINTS AND SPECIAL INSPECTIONS SHALL MEET ALL APPLICABLE STATE AND LOCAL BUILDING CODE REQUIREMENTS AS WELL AS ASCE-7 REQUIREMENTS.	
10. DEMOLITION NOTES:	A. PARTIAL AND TOTAL DEMOLITION OF PORTIONS SHALL BE PERFORMED ALONG WITH ALL NECESSARY MODIFICATIONS TO THAT PORTION OF THE EXISTING BUILDING WHICH SHALL REMAIN SO THAT IT CONTINUES TO FUNCTION UNIMPAIRED BY THE DEMOLITION AND ASSOCIATED NEW CONSTRUCTION. B. WHERE INCLUDED AS PART OF THE CONTRACT DOCUMENTS, THE DRAWINGS INDICATE THE GENERAL AREAS OF WORK INVOLVED. HOWEVER, THE ELECTRICAL CONTRACTOR SHALL PERFORM WORK OUTSIDE THOSE AREAS SHOWN AS IS NECESSARY TO COMPLY WITH THE INTENT OF THIS SECTION. C. THE ELECTRICAL CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THE EXISTING BUILDING AND WITH THE WORK OF ALL OTHER TRADES AND INCLUDE ALL WORK NECESSARY TO COMPLY WITH THE INTENT OF THE DEMOLITION. D. IT SHALL BE UNDERSTOOD THAT FIELD CONDITIONS MAY BE ENCOUNTERED DURING THE EXECUTION OF THIS CONTRACT WHICH WILL REQUIRE EXTENSION OR RELOCATION OF EXISTING SYSTEMS OR EQUIPMENT WHICH ARE NOT SPECIFICALLY SHOWN ON THE DRAWINGS, BUT WHICH ARE REQUIRED TO MEET THE STATED INTENT THAT THE BUILDING CONTINUE TO FUNCTION UNIMPAIRED BY THE DEMOLITION AND ASSOCIATED NEW CONSTRUCTION. THE ELECTRICAL CONTRACTOR SHALL INCLUDE SUCH WORK AS WOULD NORMALLY BE EXPECTED IN AN EXISTING BUILDING OF THIS AGE AND TYPE. E. THE ELECTRICAL CONTRACTOR SHALL PROVIDE ALL TOOLS, EQUIPMENT, LABOR, ETC. IN ORDER TO ACCOMPLISH THE DEMOLITION PORTION OF THE PROJECT. F. THE DEMOLITION OF CERTAIN AREAS OF THE EXISTING BUILDING SHALL BE PERFORMED BY THE GENERAL CONTRACTOR. IT SHALL BE THE ELECTRICAL CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE GENERAL CONTRACTOR TO DIFFERENTIATE THE SCOPE OF WORK BETWEEN SEPARATE TRADES. G. THE ELECTRICAL CONTRACTOR SHALL INCLUDE COORDINATION WITH THE GENERAL CONTRACTOR AND SUCH DEMOLITION OF THE EXISTING ELECTRICAL SYSTEMS AS IS NECESSARY SO THAT THE DEMOLITION WORK OF THE GENERAL CONTRACTOR SHALL NOT DAMAGE THOSE PORTIONS OF THE ELECTRICAL SYSTEMS WHICH ARE TO REMAIN IN SERVICE, ARE TO BE REUSED, OR ARE TO BECOME THE PROPERTY OF THE OWNER. H. TURN OVER TO OWNER, UPON REQUEST OR AS NOTED, ITEMS SHOWN AS BEING REMOVED AND NOT REINSTALLED. ITEMS NOT DIRECTED OR REQUESTED TO BE TURNED OVER TO THE OWNER SHALL BE DISPOSED OF BY THE ELECTRICAL CONTRACTOR. I. EQUIPMENT OR MATERIALS WHICH ARE TO BE REUSED OR TURNED OVER TO THE OWNER SHALL BE CAREFULLY REMOVED, CLEANED, AND STORED IN A CLEAN AND DRY AREA. SHOULD THE ELECTRICAL CONTRACTOR ENCOUNTER SUCH EQUIPMENT WHICH IS NOT IN SATISFACTORY CONDITION FOR REUSE AND NOT IN WORKING ORDER, THE ELECTRICAL CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER IMMEDIATELY. J. DISCONNECT ELECTRICAL SERVICES TO ALL EQUIPMENT REQUIRING REMOVAL. CONDUIT SHALL BE REMOVED BACK TO THE POINT WHERE IT WILL BE CONCEALED AT THE COMPLETION OF THIS CONTRACT. WIRE AND CABLE SHALL BE REMOVED BACK TO THE FIRST OUTLET BOX, CABINET, OR TERMINATION POINT WHICH IS TO REMAIN. CIRCUITS WHICH ARE NOT REUSED SHALL BE REMOVED BACK TO THE SOURCE IN THEIR ENTIRETY. K. REMOVE AND REPAIR ALL CELINGS IN THE EXISTING BUILDING AS REQUIRED FOR THE WORK. COORDINATE WITH THE GENERAL CONTRACTOR. IN SUCH AREAS, REMOVE AND REINSTALL ALL ELECTRICAL DEVICES WHICH ARE TO REMAIN IN OR ON THE CEILING. L. WHERE NEW CELINGS CONFLICT WITH EXISTING ELECTRICAL WORK WHICH IS TO REMAIN, RELOCATE THE ELECTRICAL WORK INVOLVED TO CLEAR THE NEW CONSTRUCTION. M. WHERE NEW WALL OR FLOOR FINISHES CONFLICT WITH EXISTING ELECTRICAL WORK WHICH IS TO REMAIN, RELOCATE THE ELECTRICAL WORK INVOLVED OR PROVIDE BOX EXTENSIONS OR SIMILAR DEVICES AND REINSTALL ON THE NEW FINISH. N. WHERE EXISTING BRANCH CIRCUITS AND SYSTEMS ARE INTERRUPTED BY NEW WORK OR SYSTEMS (ELECTRICAL, MECHANICAL, PLUMBING, FIRE PROTECTION, ETC.), EXTEND AND RECONNECT THOSE CIRCUITS AND SYSTEMS. WHERE THOSE CIRCUITS OR SYSTEMS MUST REMAIN IN SERVICE DURING THE EXECUTION OF THIS CONTRACT, PROVIDE TEMPORARY CONNECTIONS UNTIL FINAL CONNECTIONS ARE COMPLETE.	

SEAL:



butler high school
HVAC CONTROLS UPGRADE

361 david butler high school
1810 matthews-mint road
matthews, nc 28105

REV #	DATE	DESCRIPTION
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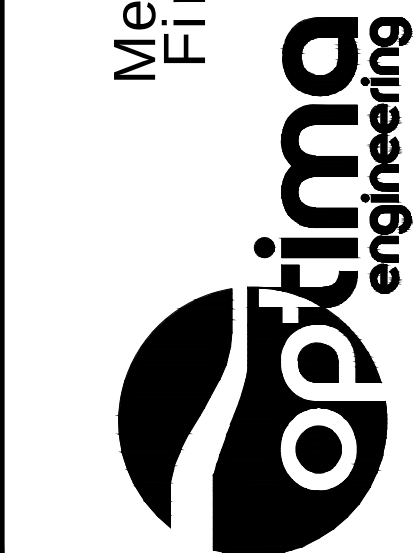
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DRAWN BY:	SMT
DESIGNED BY:	SMT
CHECKED BY:	MAM

SHEET TITLE:
ELECTRICAL
NOTES, LEGENDS
& SPECIFICATIONS

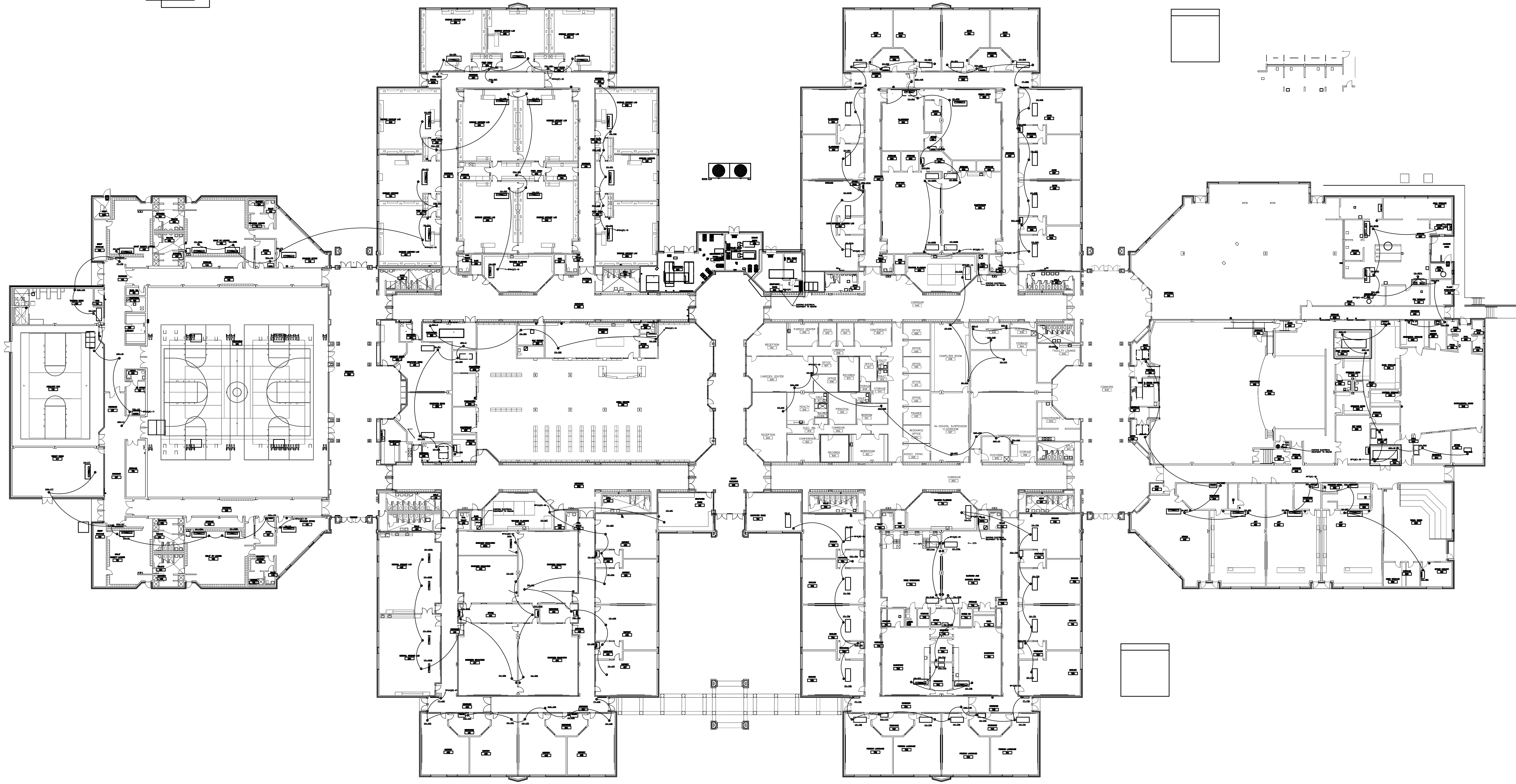
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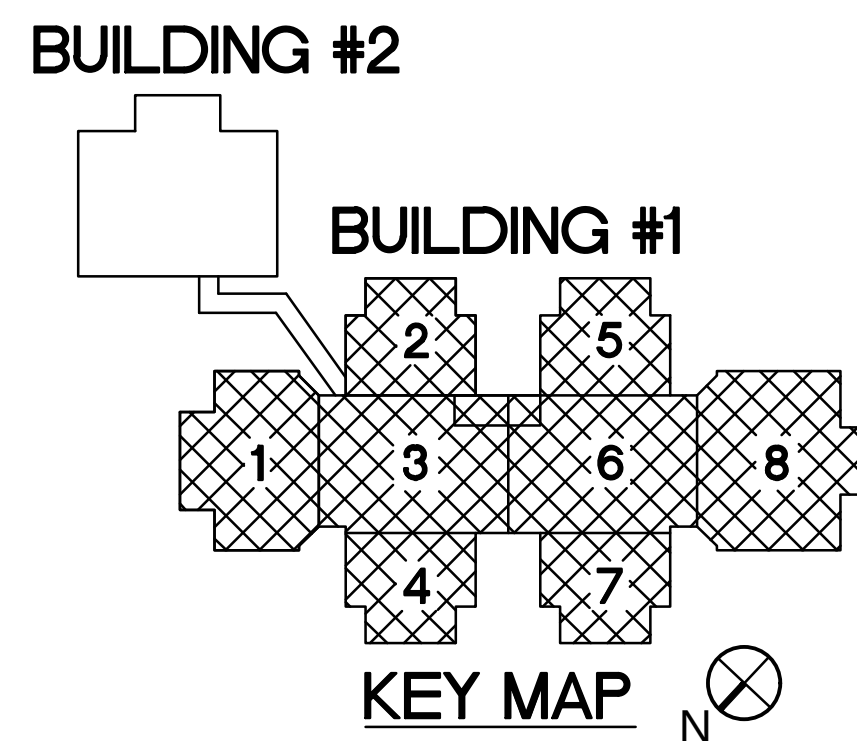
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1 ELECTRICAL FLOOR PLAN - MAIN BUILDING OVERALL ELECTRICAL PLAN
3/64" = 1'-0"



REV #	DATE	DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: SMT
DESIGNED BY: SMT
CHECKED BY: MAM

SHEET TITLE:
MAIN BUILDING
ELECTRICAL
FLOOR PLAN

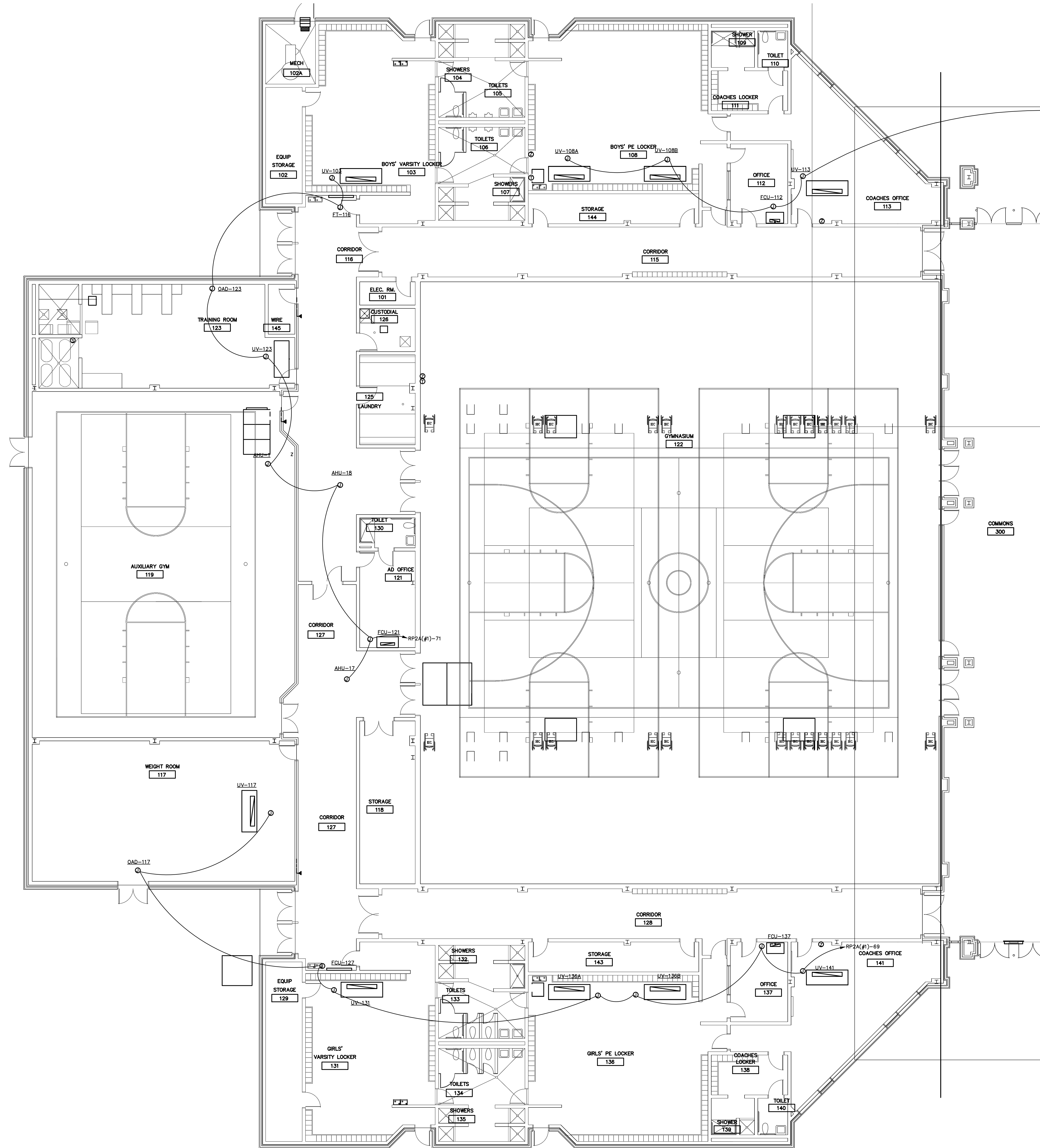
DWG #:
E200
SHEET NO: 2 of 16

Seal of the State of North Carolina, Professional Engineer, David C. Thomas, No. 28103, dated 9/29/2022.

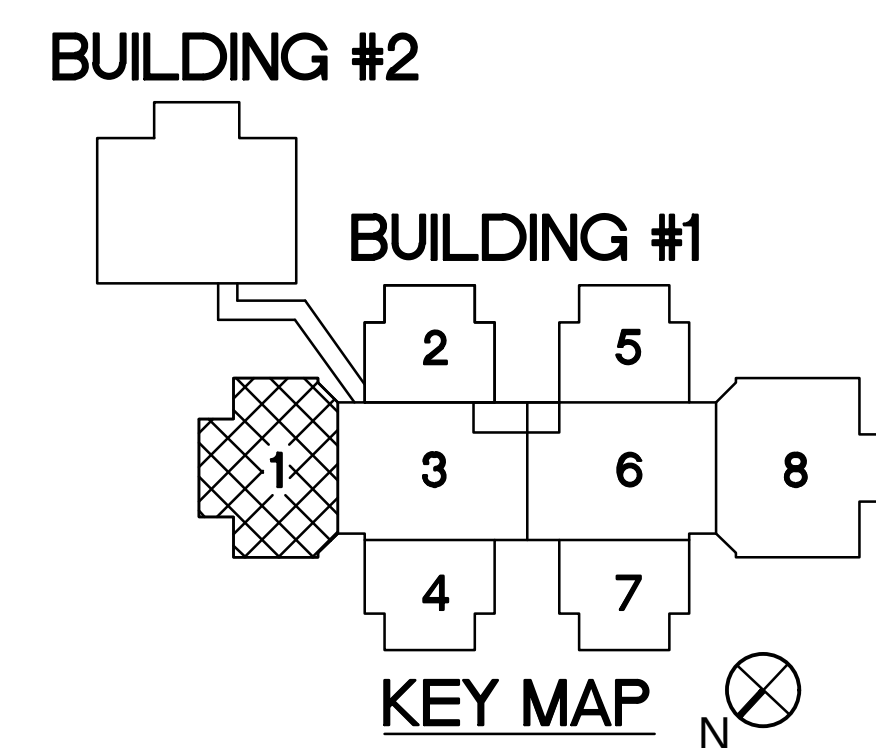
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333 Fayetteville Rd., Suite 311, Raleigh, NC 27601
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1 ELECTRICAL FLOOR PLAN - AREA 1 RENOVATION
1/8" = 1'-0"



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Email: info@optimaeng.com

SEAL:

NORTH CAROLINA
PROFESSIONAL
ENGINEER
JAMES E. TIVON
9/29/2022

butler high school
HVAC CONTROLS UPGRADE

361 david butler high school
1810 matthews-mint road
matthews, nc 28105

REV #	DATE	DESCRIPTION

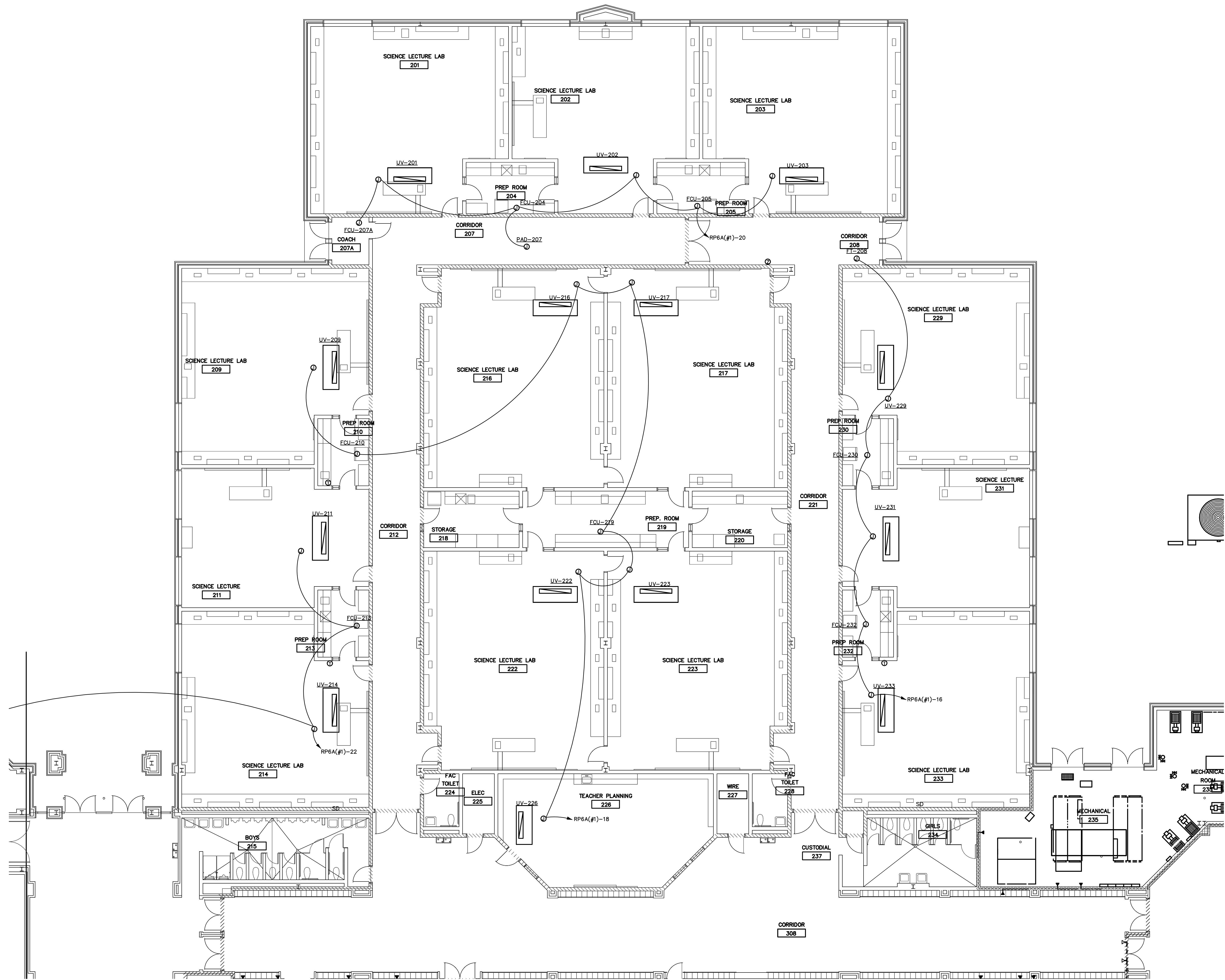
DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: SMT
DESIGNED BY: SMT
CHECKED BY: MAM

SHEET TITLE:
AREA "1"
ELECTRICAL
FLOOR PLAN

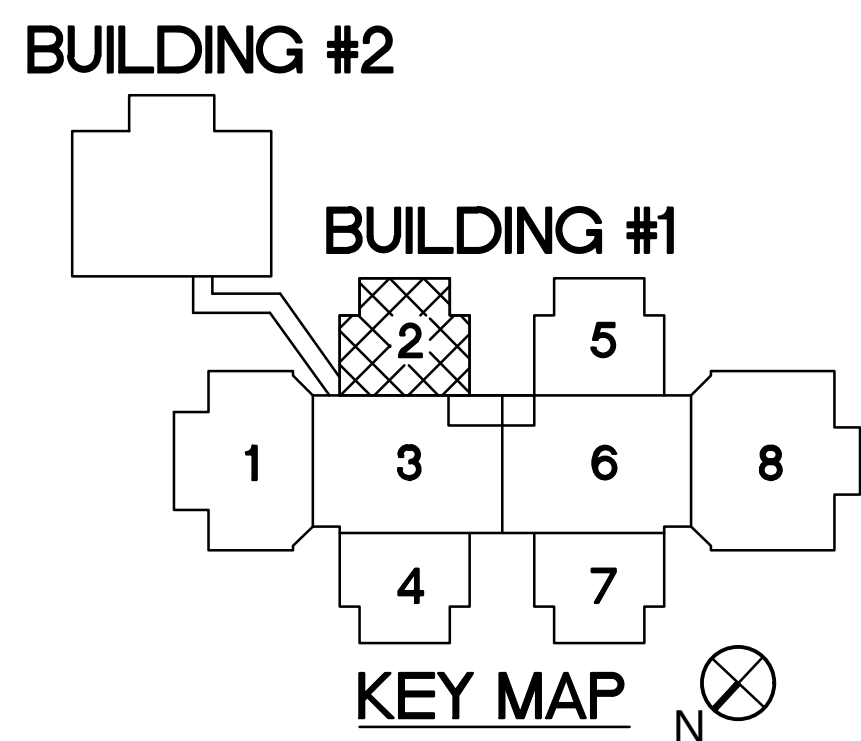
DWG #:
E201

SHEET NO: 3 of 16

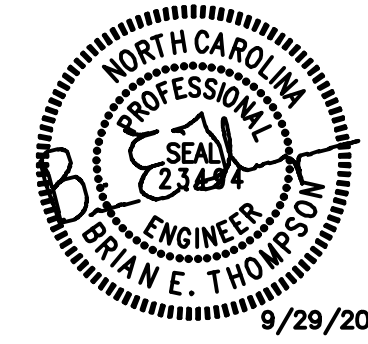
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1 ELECTRICAL FLOOR PLAN - AREA 2 RENOVATION
1/8" = 1'-0"



SEAL:



butler high school
HVAC CONTROLS UPGRADE

361 david butler high school
1810 matthews-mint road
matthews, nc 28105

REV #	DATE	DESCRIPTION

DATE:	09-29-2022
PROJECT #:	22-0151
DRAWN BY:	SMT
DESIGNED BY:	SMT
CHECKED BY:	MAM

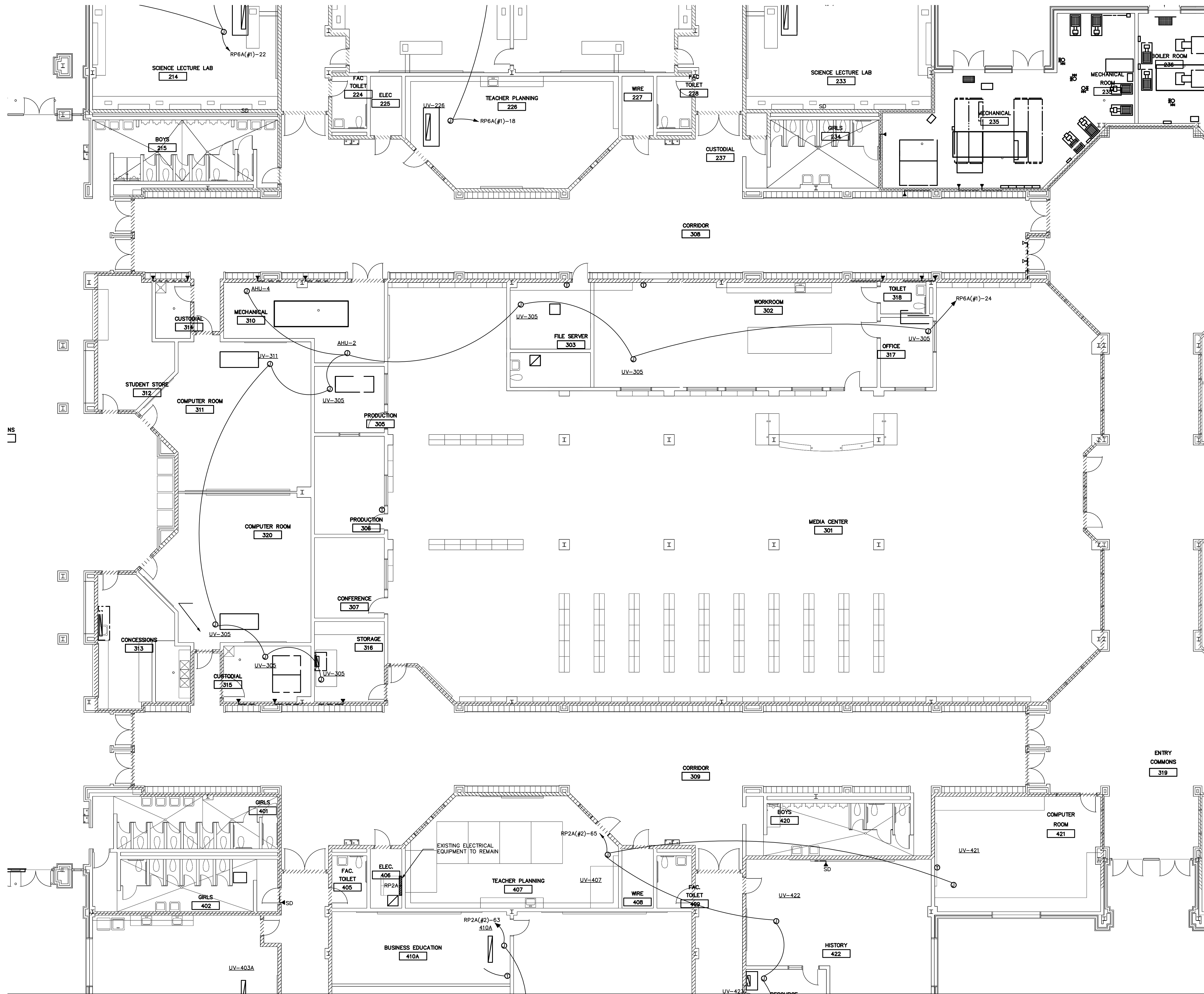
SHEET TITLE:
AREA 2
ELECTRICAL
FLOOR PLAN

DWG #:

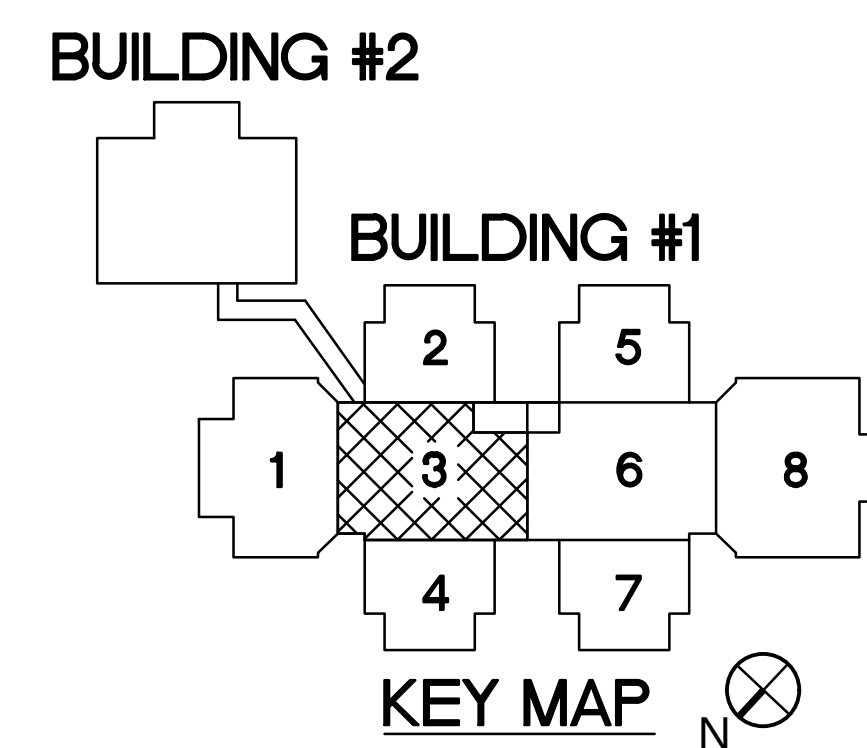
E202

SHEET NO: 4 of 16

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1 ELECTRICAL FLOOR PLAN - AREA 3 RENOVATION
1/8" = 1'-0"



REV #	DATE	DESCRIPTION

DATE:	09-29-2022
PROJECT #:	22-0151
DRAWN BY:	SMT
DESIGNED BY:	SMT
CHECKED BY:	MAM

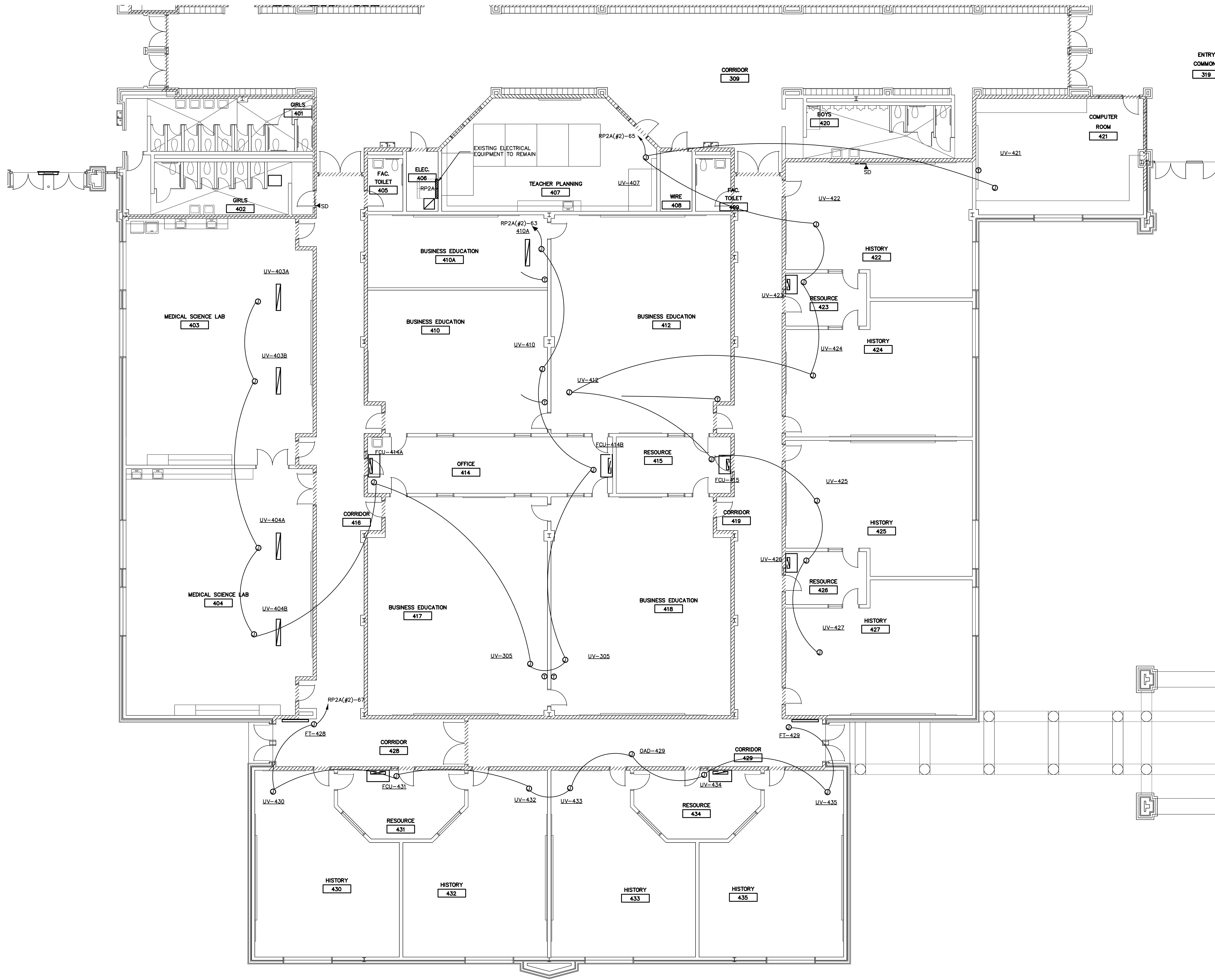
SHEET TITLE:
AREA 3
ELECTRICAL
FLOOR PLAN

DWG #:

E203

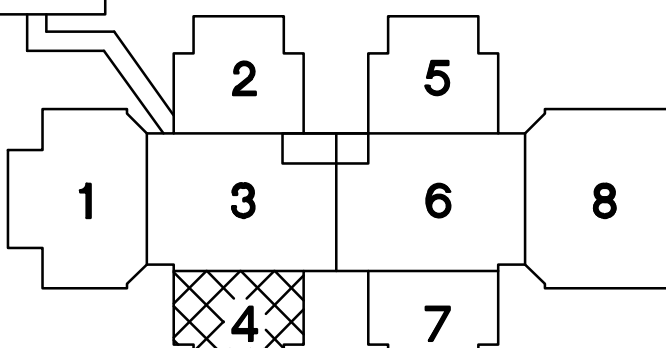
SHEET NO: 5 of 16

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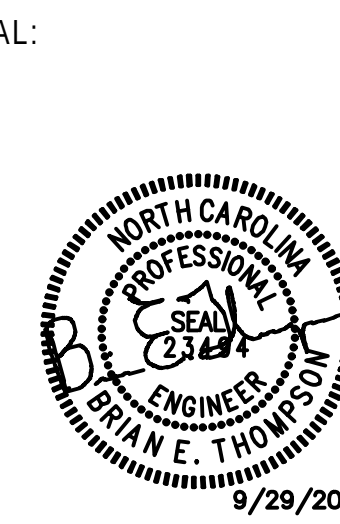
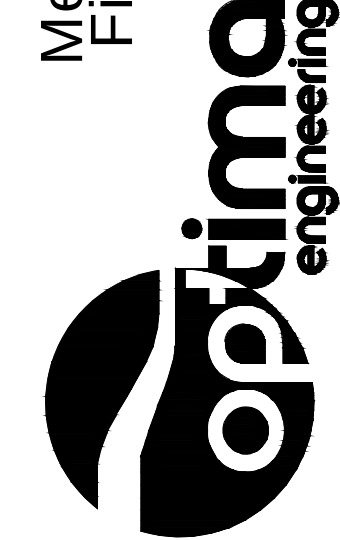
BUILDING #2

BUILDING #1



KEY MAP

Mechanical • Electrical • Plumbing
Fire Protection • Lighting Design



butler high school
HVAC CONTROLS UPGRADE

361 david butler high school
1810 matthews-mint road
matthews, nc 28105

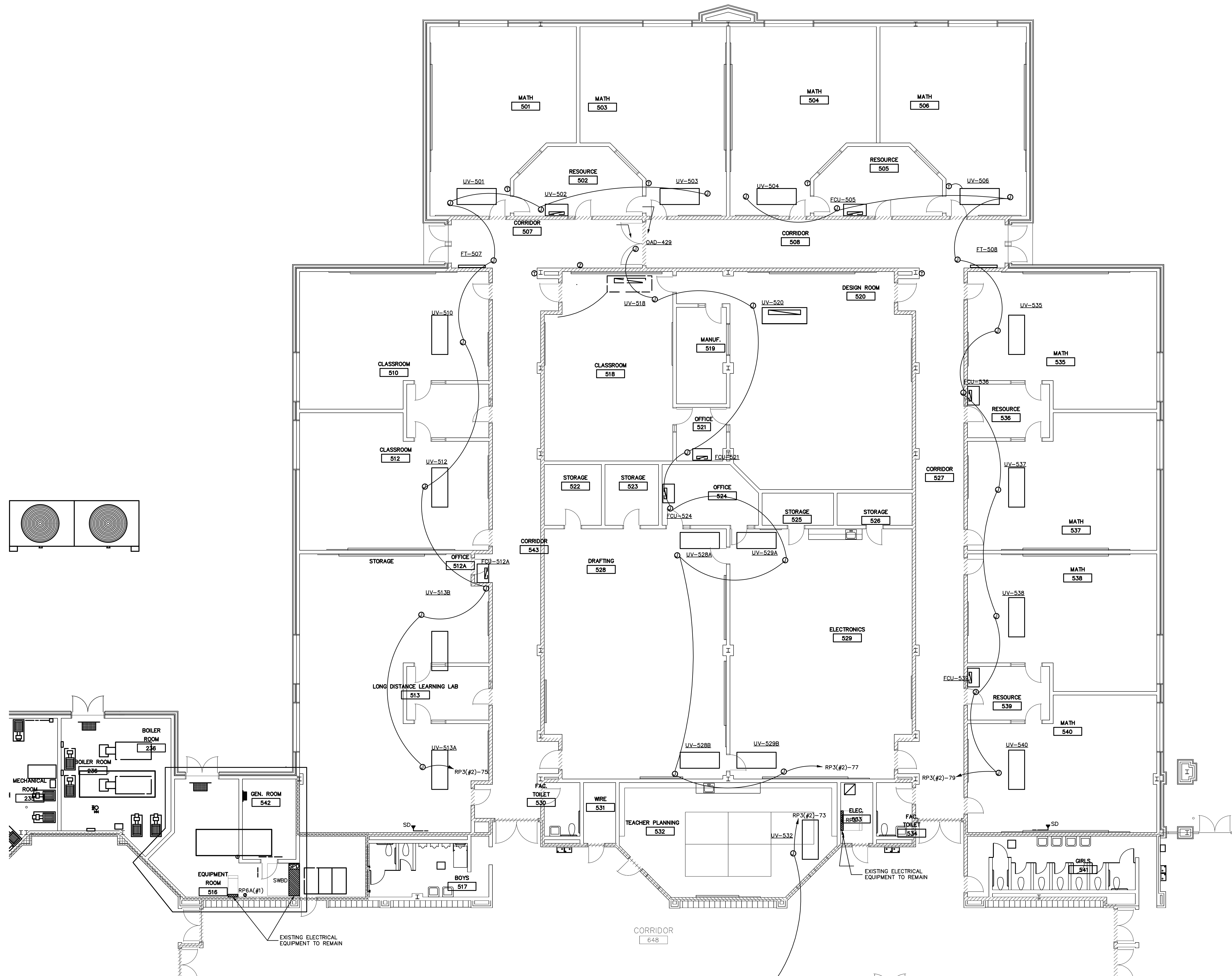
REV #	DATE	DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: SMT
DESIGNED BY: SMT
CHECKED BY: MAM

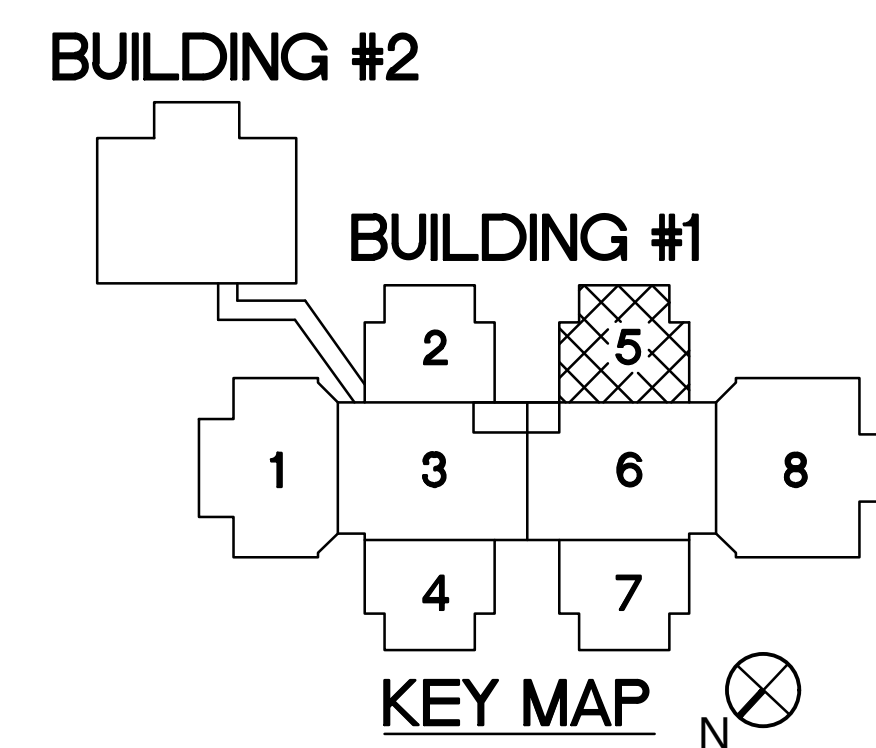
SHEET TITLE:
AREA "4"
ELECTRICAL
FLOOR PLAN

DWG #:
E204
SHEET NO: 6 of 16

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1 ELECTRICAL FLOOR PLAN - AREA 5 RENOVATION
1/8" = 1'-0"



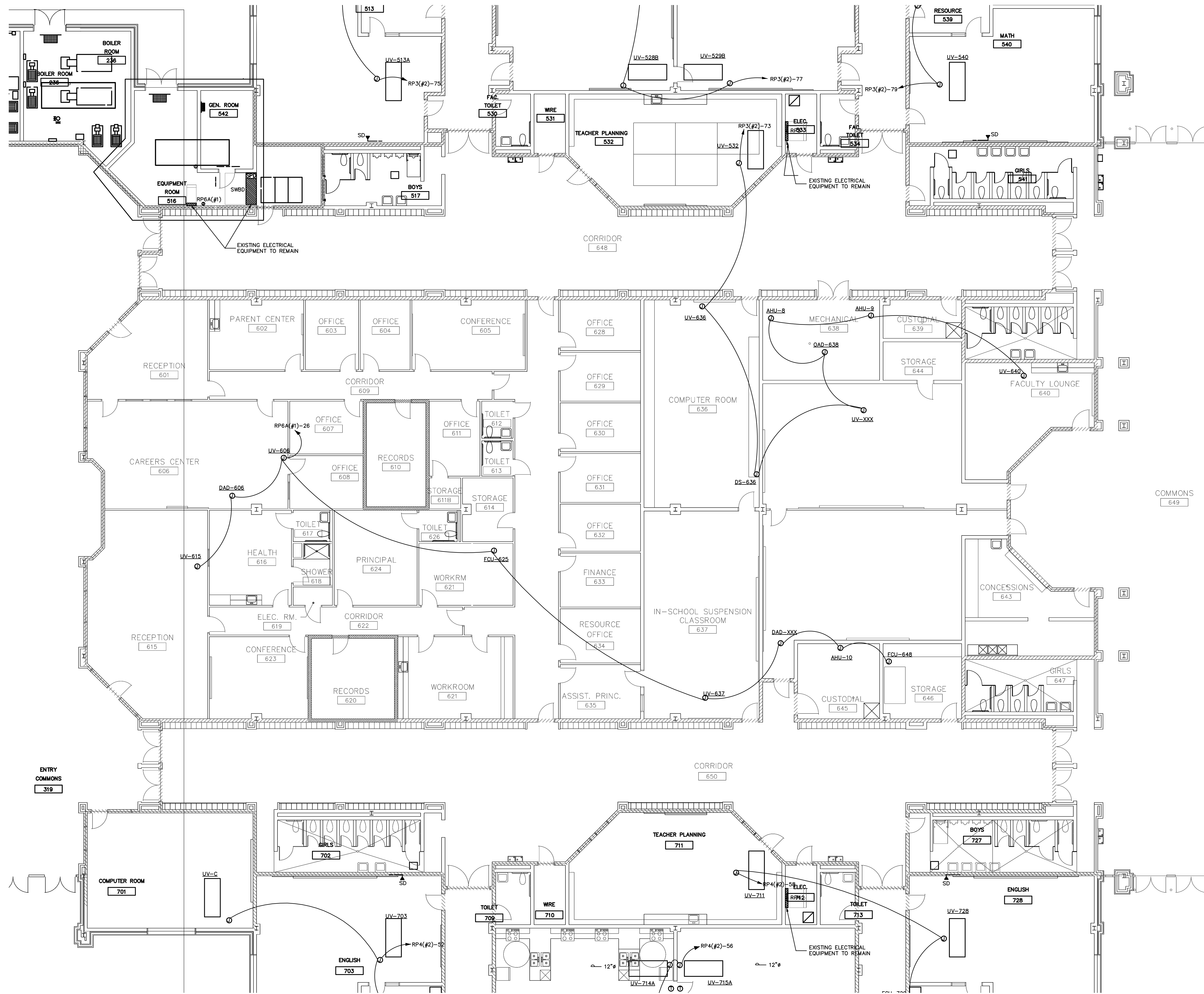
REV #	DATE	DESCRIPTION

DATE:	09-29-2022
PROJECT #:	22-0151
DRAWN BY:	SMT
DESIGNED BY:	SMT
CHECKED BY:	MAM

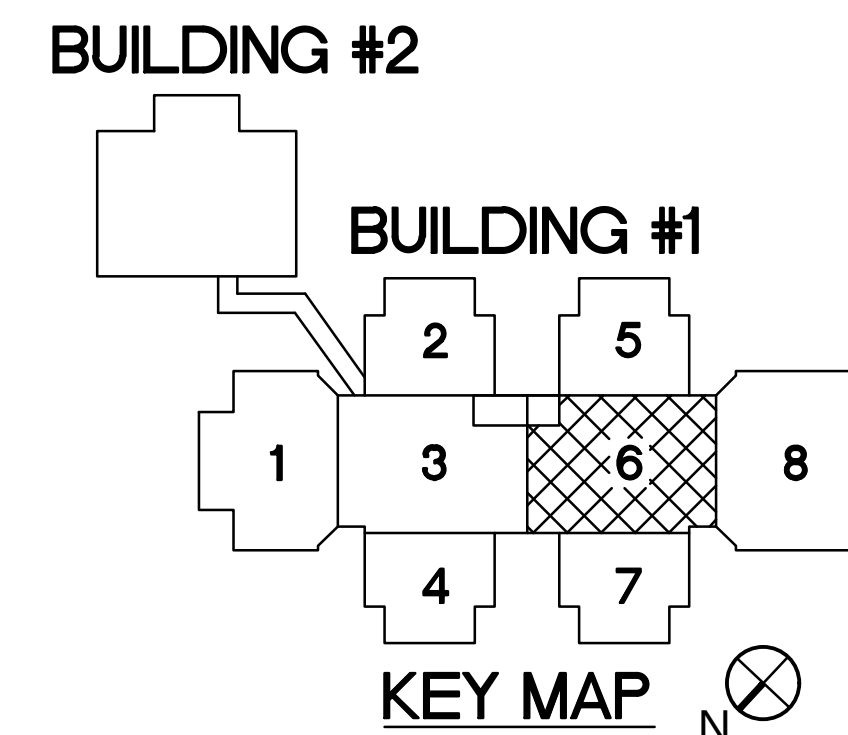
SHEET TITLE:
AREA "5"
ELECTRICAL
FLOOR PLAN

DWG #:
E205
SHEET NO: 7 of 16

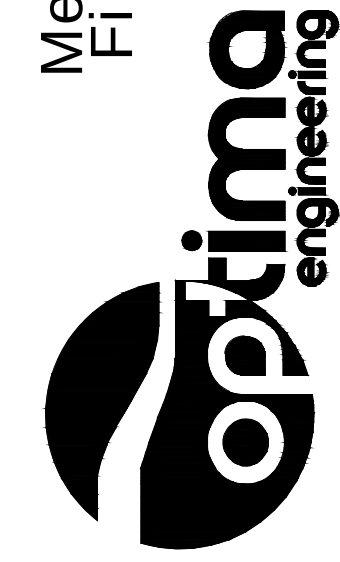
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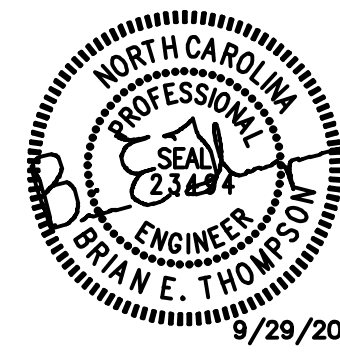
1 ELECTRICAL FLOOR PLAN - AREA 6 RENOVATION
1/8" = 1'-0"



Mechanical • Electrical • Plumbing
Fire Protection • Lighting Design



SEAL:



butler high school
HVAC CONTROLS UPGRADE

361 david butler high school
1810 matthews-mint road
matthews, nc 28105

REV # DATE DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: SMT
DESIGNED BY: SMT
CHECKED BY: MAM

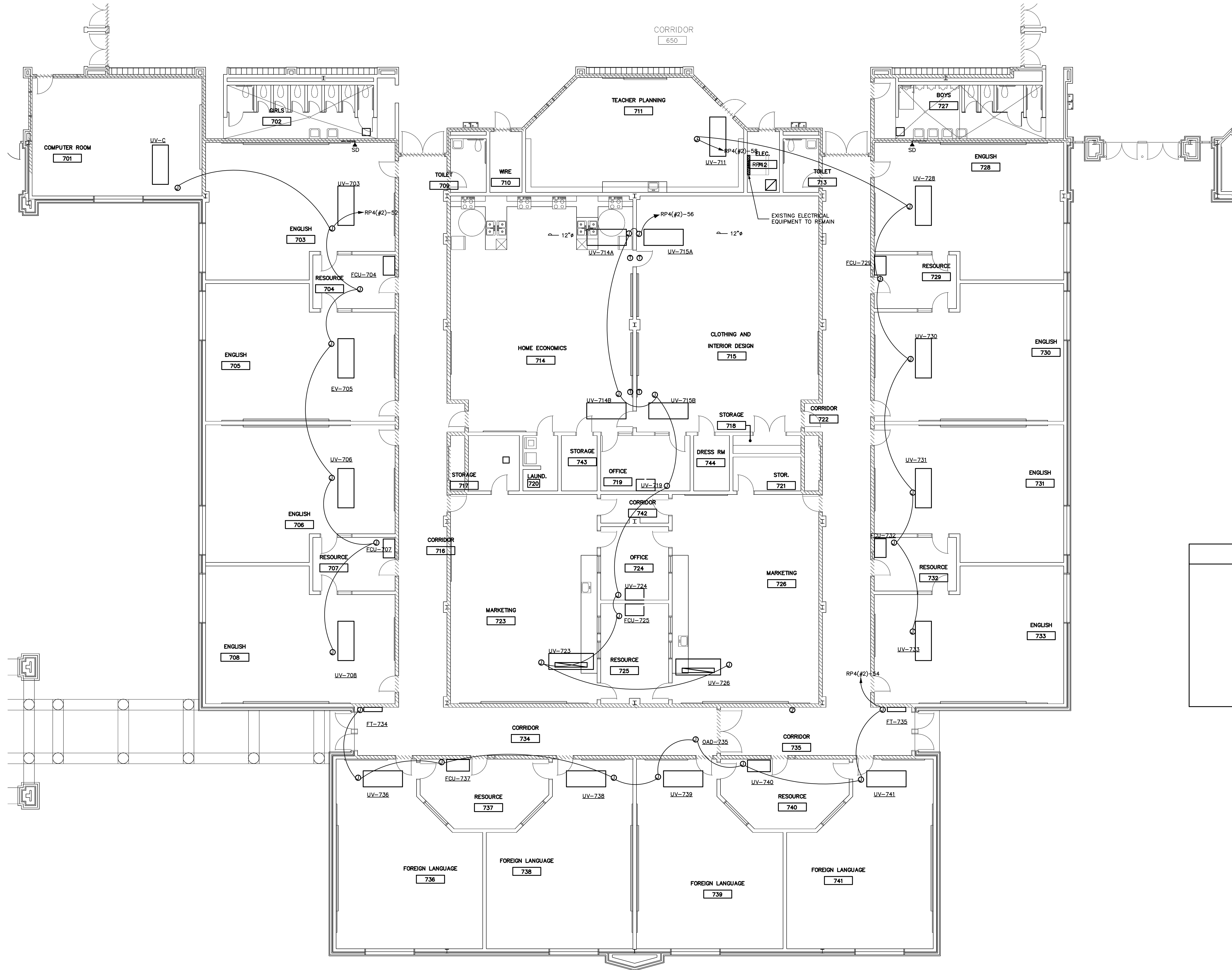
SHEET TITLE:
AREA "6"
ELECTRICAL
FLOOR PLAN

DWG #:

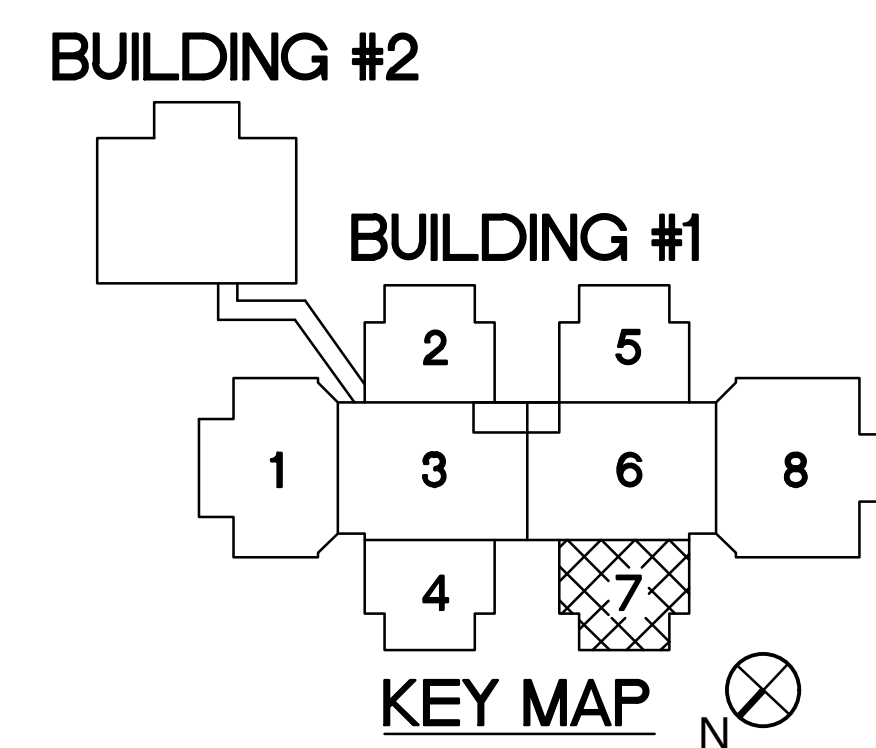
E206

SHEET NO: 8 of 16

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1 ELECTRICAL FLOOR PLAN - AREA 7 RENOVATION
1/8" = 1'-0"



REV #	DATE	DESCRIPTION

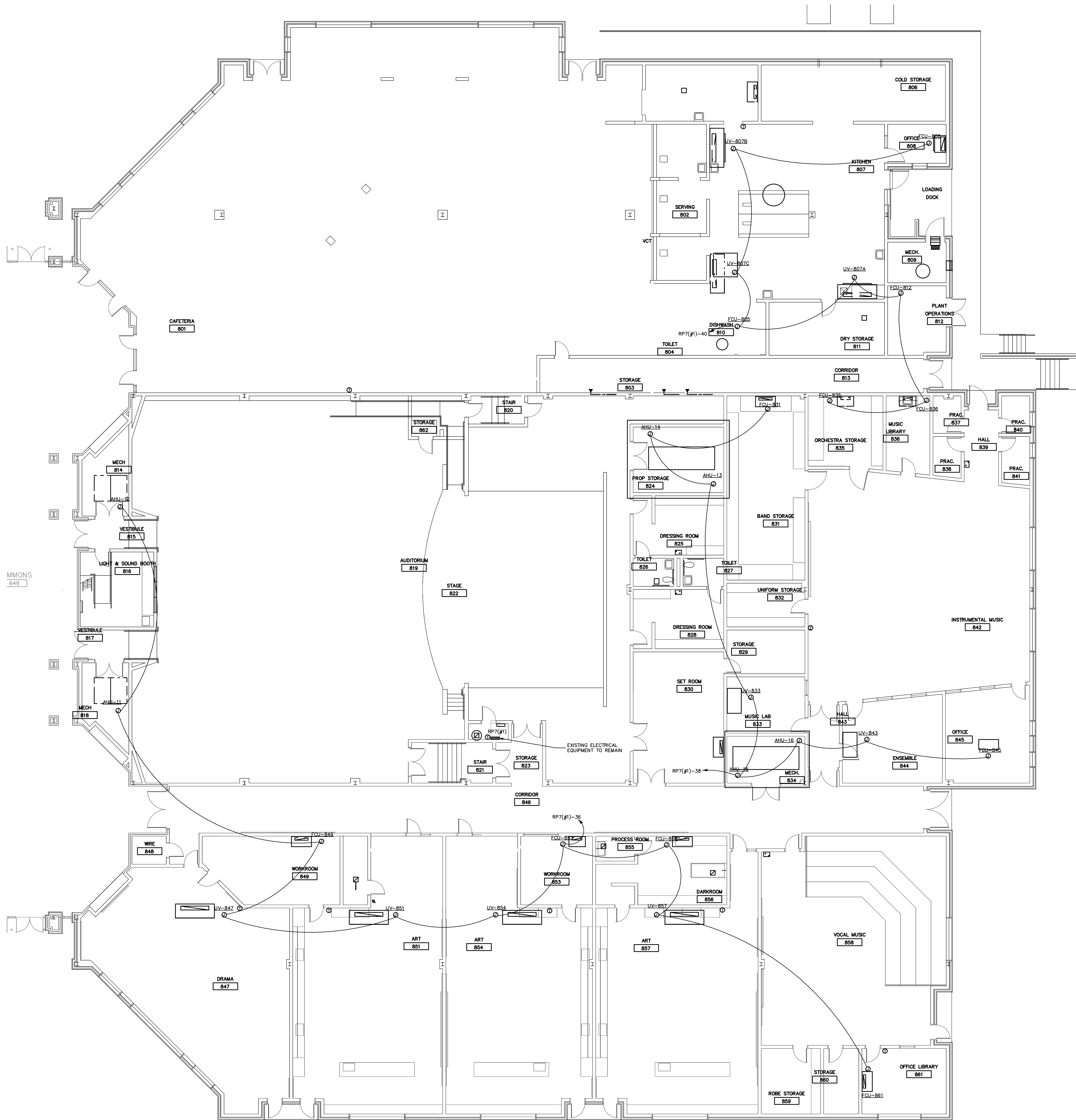
DATE:	09-29-2022
PROJECT #:	22-0151
DRAWN BY:	SMT
DESIGNED BY:	SMT
CHECKED BY:	MAM

SHEET TITLE:
AREA "7"
ELECTRICAL
FLOOR PLAN

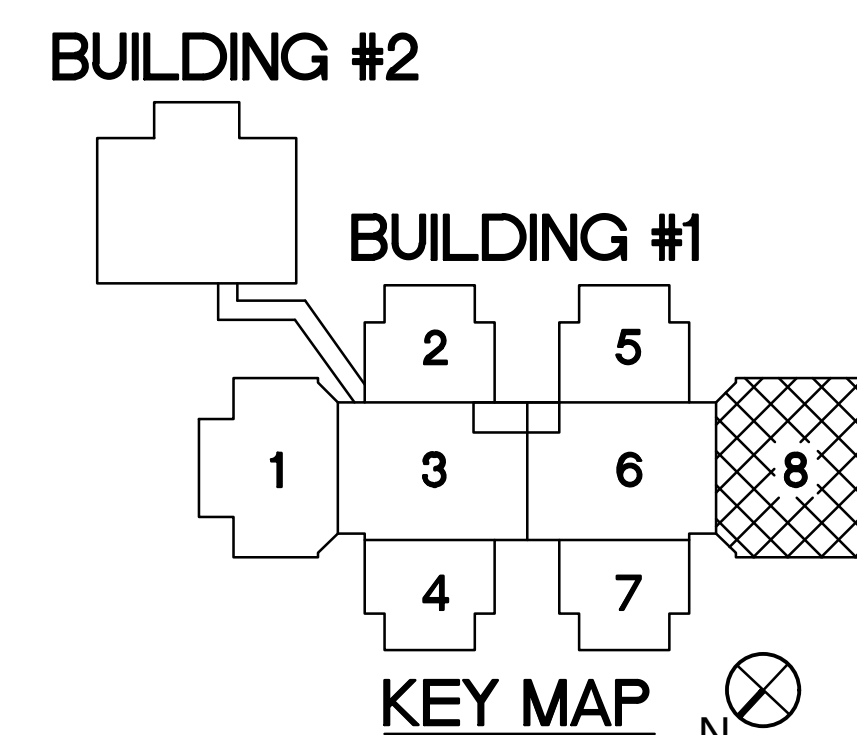
DWG #:
E207

SHEET NO: 9 of 16

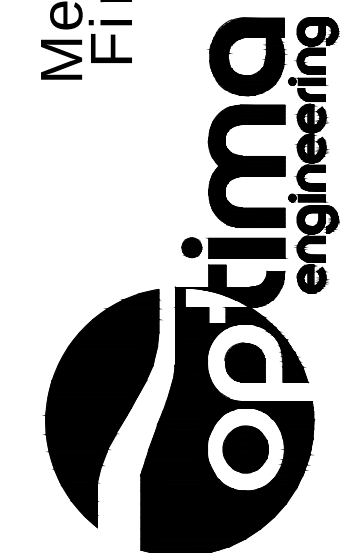
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1 ELECTRICAL FLOOR PLAN - AREA 8 RENOVATION
1/8" = 1'-0"



Mechanical • Electrical • Plumbing
Fire Protection • Lighting Design



butler high school
HVAC CONTROLS UPGRADE

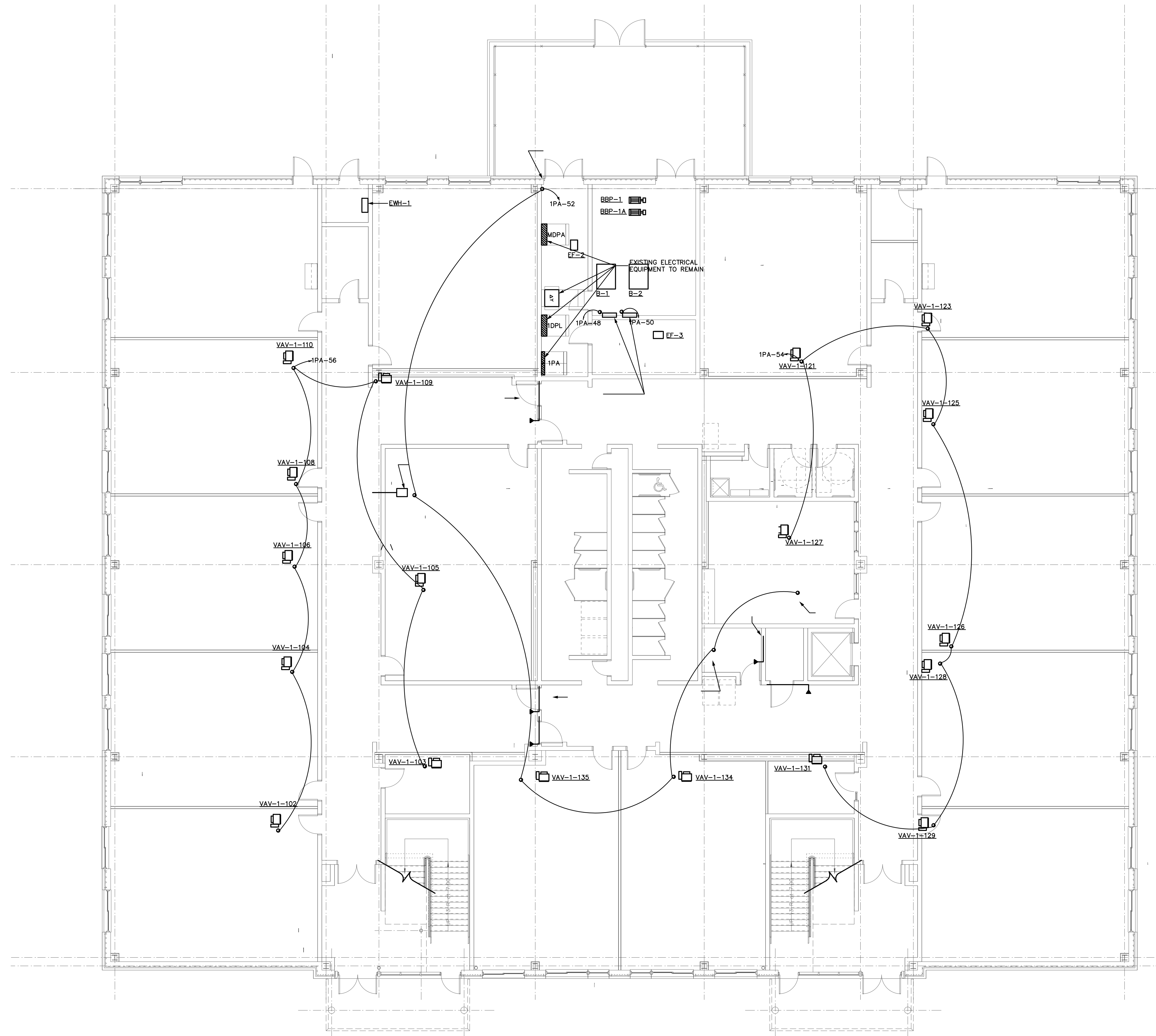
REV #	DATE	DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: SMT
DESIGNED BY: SMT
CHECKED BY: MAM

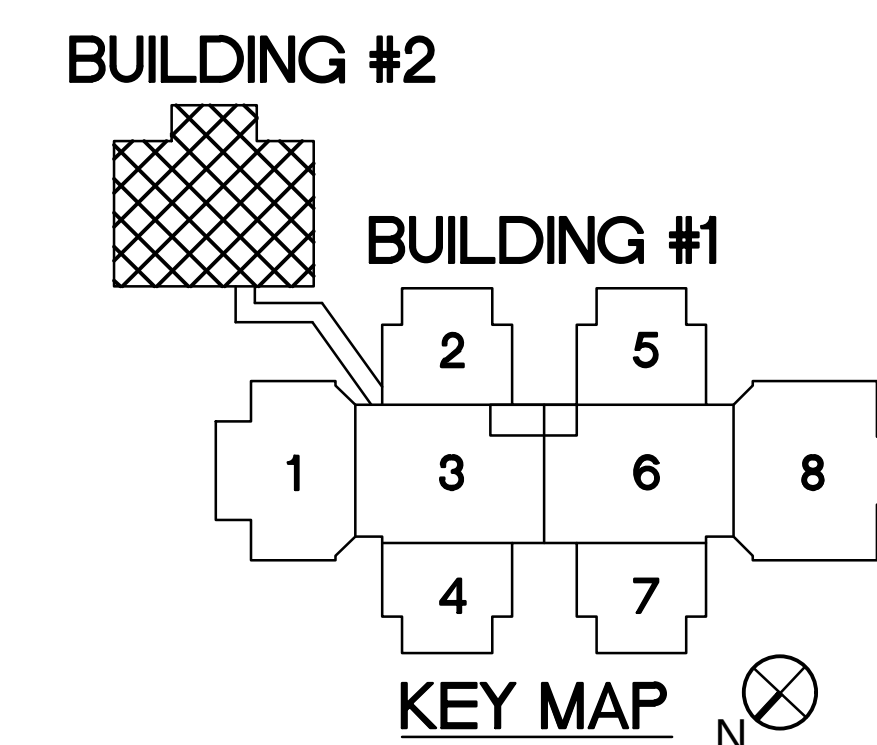
SHEET TITLE:
AREA "8"
ELECTRICAL
FLOOR PLAN

DWG #:
E208
SHEET NO: 10 of 16

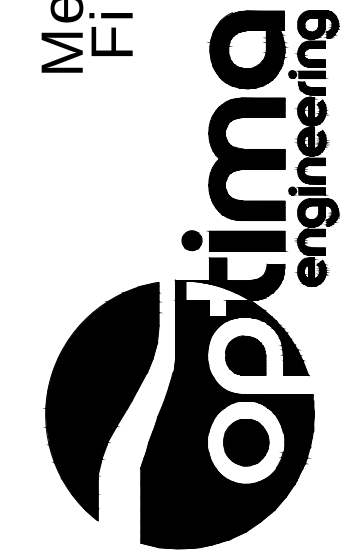
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1 ELECTRICAL FLOOR PLAN - BUILDING #2 FIRST FLOOR ELECTRICAL PLAN
1/8" = 1'-0"

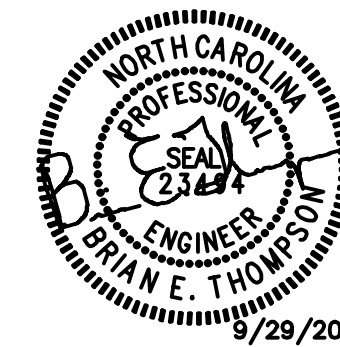


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Fire Protection • Lighting Design



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North Carolina License Number: C006114

SEAL:



butler high school
HVAC CONTROLS UPGRADE

361 david butler high school
1810 matthews-mint road
matthews, nc 28105

REV #	DATE	DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: SMT
DESIGNED BY: SMT
CHECKED BY: MAM

SHEET TITLE:
BUILDING #2
FLOOR 1
ELECTRICAL
FLOOR PLAN

DWG #:

E209

SHEET NO: 11 of 16

This mechanical floor plan for the second floor details the placement and connections of various HVAC and electrical systems. Key components include:

- VAV Units:** Numerous Variable Air Volume (VAV) units are distributed throughout the floor, including VAV-2-210, VAV-2-212, VAV-2-205, VAV-2-203, VAV-2-231, VAV-2-230, VAV-2-228, VAV-2-226, VAV-2-224, VAV-2-223, VAV-2-213, and VAV-2-204.
- STU Units:** Two Supply Terminal Units (STU) are located above the main circulation areas, labeled STU-1 (ABOVE) and STU-2 (ABOVE).
- Ductwork and Connections:** Solid lines represent ductwork, with arrows indicating the direction of airflow. A dashed line outlines a central area, possibly a core or a specific zone.
- Electrical and Fire Alarm Symbols:** Various symbols are used to denote electrical equipment (e.g., EEF-1 through EEF-8) and fire alarm devices (e.g., FPF-1, FPF-2, FPF-3, FPF-4, FPF-5).
- Room Layouts:** The plan shows the outlines of rooms, corridors, and stairwells, providing context for the equipment placement.

BUILDING #2

BUILDING #1

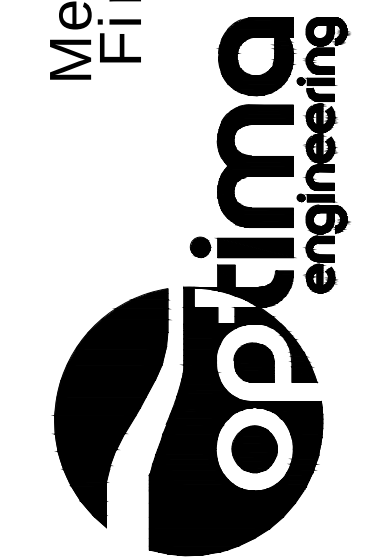
KEY MAP

1 2 3 4 5 6 7 8

N

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Mechanical • Electrical • Plumbing
Fire Protection • Lighting Design

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matthews, nc 28105

W #	DATE	DESCRIPTION

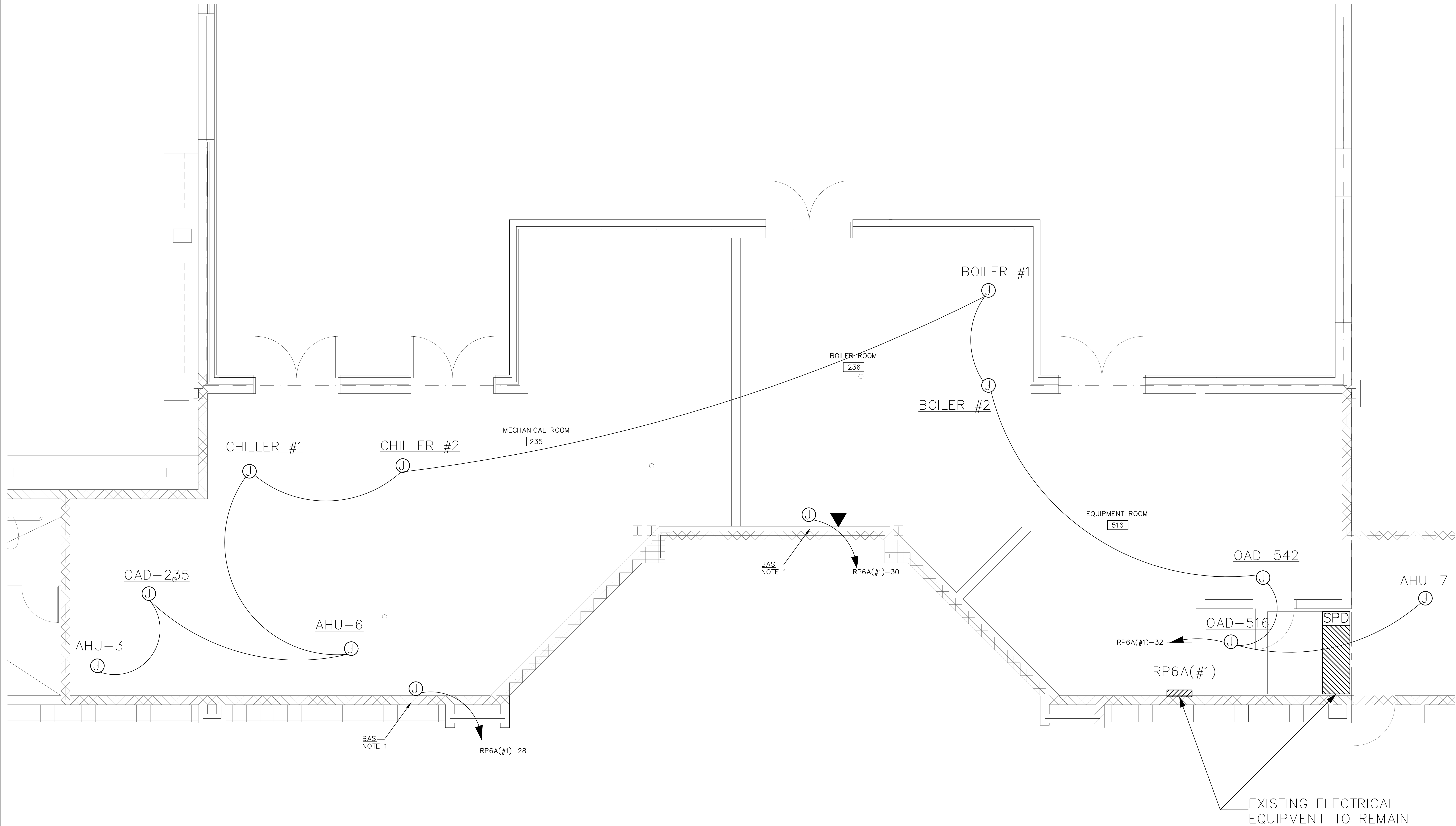
TE: 09-29-2022
OBJECT #: 22-0151
AWN BY: SMT
SIGNED BY: SMT
CHECKED BY: MAM

HEET TITLE:
BUILDING #2
FLOOR 2
ELECTRICAL
FLOOR PLAN

EG #: **E210**

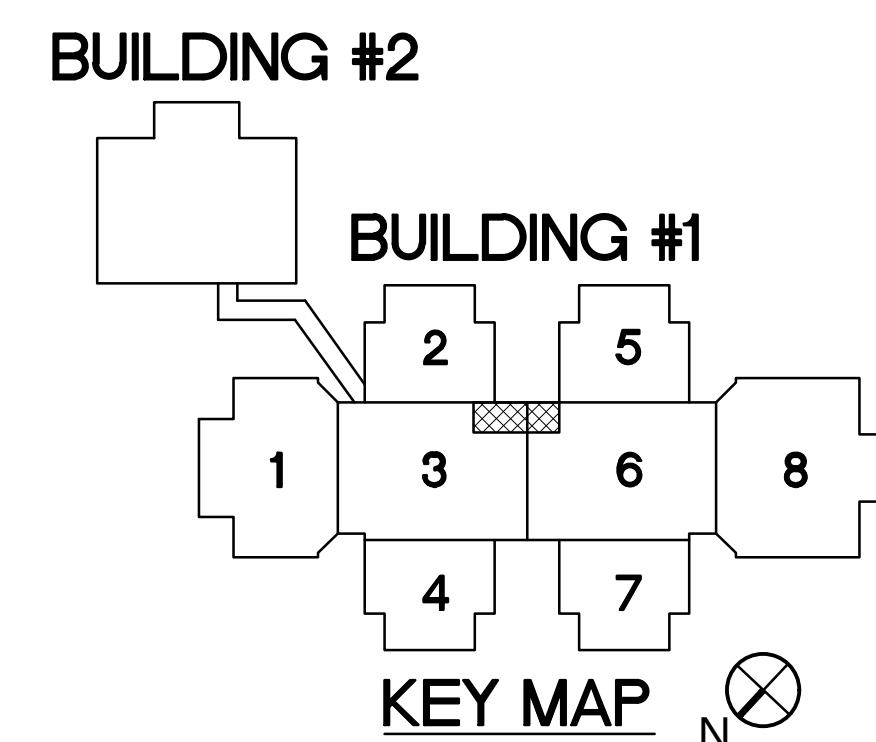
EET NO: 13 of 16

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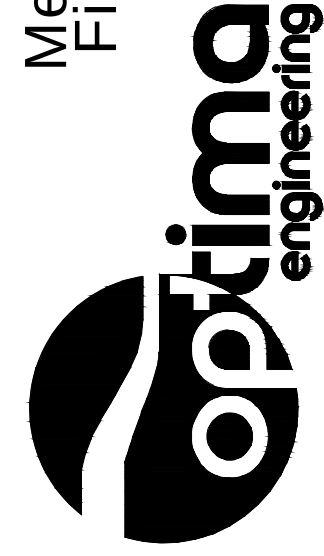


NOTES:
EXISTING PANEL WILL BE REMOVED, BAS PANEL WILL BE INSTALLED. EXISTING PANEL POWER AND DATA WILL BE USED FOR THE BAS PANEL.

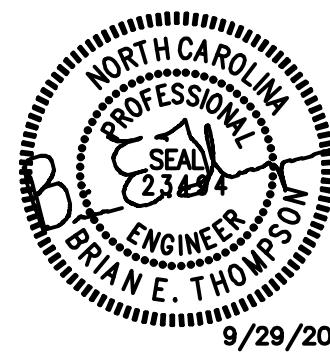
1 ELECTRICAL FLOOR PLAN - BOILER/CHILLER ROOM
1/4" = 1'-0"



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matthews, nc 28105

REV #	DATE	DESCRIPTION

DATE: 09-29-2022
PROJECT #: 22-0151
DRAWN BY: SMT
DESIGNED BY: SMT
CHECKED BY: MAM

SHEET TITLE:
ELECTRICAL
ENLARGED
BOILER/MECH
ROOM PLANS

DWG #:
E262
SHEET NO: 13 of 16

