A127 COORDINATE WITH PHASED CONSTRUCTION AND DEMOLISH COMPLETE EXISTING CONTROL PANELS. DURING ENABLING PHASE, REMOVE EXISTING EF-USDA STATUS POINT FROM CONTROLLER AT ADDRESS #74. REWIRE TO NEW DEVICE IN CONTROL PANEL CP-M. ALSO, REFER TO ENABLING PHASE WORK TO RELOCATE CHW PUMP DIFFERENTIAL PRESSURE SENSOR AND REROUTE CONTROL WIRING. REFER TO M2.0C DRAWING FOR ADDITIONAL DETAILS.

A151 MS/TP TRUNK LINE UP TO EF-1 VFD'S ON ROOF.

A152 MS/TP TRUNK LINE FROM EF-1 VFD'S ON ROOF.

A153 PROVIDE NEW EQUIPMENT CONTROL PANEL WITH ASC DEVICE(s) AND MOUNT ON AHU-3.

A154 PROVIDE VFD'S FOR AHU-3 SA AND RA FANS AND MOUNT ON AHU-3.

A155 PROVIDE NEW EQUIPMENT CONTROL PANEL WITH ASC DEVICE(s) AND MOUNT ON COLUMN AS SHOWN.

A156 PROVIDE VFD FOR AHU-4 SA FANS AND MOUNT ON COLUMN AS SHOWN.

A157 MS/TP TRUNK LINE UP TO EF-2 VFD'S ON ROOF.

A158 MS/TP TRUNK LINE FROM EF-3 VFD ON ROOF.

A159 PROVIDE VFD FOR AHU-2 SA FANS AND MOUNT ON COLUMN AS SHOWN.

A160 PROVIDE NEW ANCHILLARY EQUIPMENT CONTROL PANEL AND MOUNT ON WALL AS SHOWN.

A161 PROVIDE VFD'S FOR EF-4 AND RF-2 AND MOUNT ON WALL. COORDINATE MOUNTING VFD'S WITH STEAM PIPE DEMOLITION AND NEW CHILLED WATER PIPE INSTALLATION. PIPING SHALL NOT RUN ABOVE VFD'S.

A162 PROVIDE VFD'S FOR P-3 AND P-4. MOUNT ON FABRICATED UNISTRUT STAND NEAR PUMPS.

A163 PROVIDE NEW EQUIPMENT CONTROL PANEL WITH ASC DEVICE(s) AND MOUNT ON AHU-1.

A164 PROVIDE VFD FOR AHU-1 SA FANS AND MOUNT ON AHU-1.

A165 COORDINATE PHASED CONSTRUCTION AND MAINTAIN ALL ACTIVE EP AND PE DEVICES CONTAINED IN CONTROL PANELS. REFER TO IC1.7 FOR ADDITIONAL INFORMATION.
LAB EXHAUST FANS EF-1 - EF-2 POINTS LIST

1. LABORATORY EXHAUST FANS (EF 1-2)

1.1. Schedule

CTRL

1.2. Control Points

1.2.1. The fans are equipped with (5) duct static pressure sensors as located on the drawings and shall supply to maintain a 2.5" duct static pressure sensor at all of the locations. Each fan shall be provided with an isolation damper to prevent air from short cycling as fans cycle through their control requirements. When the isolation damper is fully open an end switch will engage an EP which will then allow the fan to start. A current sensor shall be provided at each fan to prove fan status.

1.2.2. The fans shall operate in a lead/lag scenario with each fan operating as lead. Each fan shall be provided with a VFD. The fans shall include a packaged control sequence that operates the bypass damper when the fan is at the minimum speed and the static pressure exceeds the setpoint. If the end switch fails to engage the EP the fan will not be allowed to start. A current sensor shall be provided at each fan to prove fan status.

1.2.3. All seven fans shall cycle in a PSK loop.

1.3. Test Procedures/Sequence

1.3.1. Each fan shall be provided with a feed recovery coil connected into the lab air handling units and shall be exposed only when its corresponding fan is in operation. The energy recovery coil shall be provided with a 2 way 2 position control valve. The system shall be enabled from the DDC controller and shall have an indicator to indicate if the EP is engaged and if the fan is cycling. Additionally, the lab control valve shall be open.

LAB EXHAUST VALVE CONTROLS SEQUENCE

2. FEATURES

2.1. Outside Air Bypass Damper

2.2. Low Limit Alarm

2.3. Energy Recovery Return Water Temp

2.4. Energy Recovery Supply Water Temp

2.5. Exhaust Air Temp After Recovery

2.6. Exhaust Air Temp Before Recovery

2.7. Exhaust Fan VFD Alarm

2.8. Exhaust Fan Bypass

2.9. Exhaust Fan Status

2.10. Filter Status

2.11. Exhaust Damper Diff. Pressure

2.12. Exhaust Air Damper

2.13. Exhaust Fan System Status

2.14. Exhaust Fan System Command

2.15. Exhaust Static Actual

2.16. Exhaust Static Setpoint

LAB EXHAUST FAN CONTROLS

3. FEATURES

3.1. Outside Air Bypass Damper

3.2. Low Limit Alarm

3.3. Energy Recovery Return Water Temp

3.4. Energy Recovery Supply Water Temp

3.5. Exhaust Air Temp After Recovery

3.6. Exhaust Air Temp Before Recovery

3.7. Exhaust Fan VFD Alarm

3.8. Exhaust Fan Bypass

3.9. Exhaust Fan Status

3.10. Filter Status

3.11. Exhaust Damper Diff. Pressure

3.12. Exhaust Air Damper

3.13. Exhaust Fan System Status


3.15. Exhaust Static Actual

3.16. Exhaust Static Setpoint

LAB EXHAUST VALVE CONTROLS SEQUENCE

4. FEATURES

4.1. Outside Air Bypass Damper

4.2. Low Limit Alarm

4.3. Energy Recovery Return Water Temp

4.4. Energy Recovery Supply Water Temp

4.5. Exhaust Air Temp After Recovery

4.6. Exhaust Air Temp Before Recovery

4.7. Exhaust Fan VFD Alarm

4.8. Exhaust Fan Bypass

4.9. Exhaust Fan Status

4.10. Filter Status

4.11. Exhaust Damper Diff. Pressure

4.12. Exhaust Air Damper

4.13. Exhaust Fan System Status


4.15. Exhaust Static Actual

4.16. Exhaust Static Setpoint

LAB EXHAUST VALVE CONTROLS SEQUENCE

5. FEATURES

5.1. Outside Air Bypass Damper

5.2. Low Limit Alarm

5.3. Energy Recovery Return Water Temp

5.4. Energy Recovery Supply Water Temp

5.5. Exhaust Air Temp After Recovery

5.6. Exhaust Air Temp Before Recovery

5.7. Exhaust Fan VFD Alarm

5.8. Exhaust Fan Bypass

5.9. Exhaust Fan Status

5.10. Filter Status

5.11. Exhaust Damper Diff. Pressure

5.12. Exhaust Air Damper

5.13. Exhaust Fan System Status

5.14. Exhaust Fan System Command

5.15. Exhaust Static Actual

5.16. Exhaust Static Setpoint
1. Laboratory Air Handling Units (AHU1 and AHU4). 

1.1. Over Pressurization Control

1.1.7.2. Freezing Protection

1.2. Outside Air Damper Control

1.3. Supply fan Control

1.3.1. Supply fan shall be controlled during building operation. When the status of the building air-handling unit is in operation, the supply fans shall be controlled to maintain the desired discharge air temperature. The supply air temperature shall be maintained at the desired setpoint with a tolerance of ±5°F. The supply air temperature shall be measured at the air outlet of the AHU.

1.4. Steam Temperature Control - Steam Damper

1.4.1. The steam control valve shall be 0% (adj.) when the outdoor air temperature is 48°F (adj.) and shall be 100% (adj.) minimally when the outdoor air temperature is 37°F (adj.).

1.5. Supply Fan Operation

1.5.1. The supply fan status indicates the fan has started, the control sequence will be enabled. The supply fan shall be started and stopped from the local DDC Panel per the FMS schedule. When the start command is issued, the output to the supply fan shall be energized.

1.6. Dehumidification Mode: The unit shall have the capability of going into dehumidification mode as directed from the operator. When engaged, the dehumidification mode shall be enabled. Under the dehumidification mode, the discharge air temperature shall be 55°F (adj.) and the supply air temperature shall be 65°F (adj.).

1.7.1. When this is ENABLED, the sequence of operations for dehumidification shall be followed as listed on the M700 series drawings. This sequence may be locked out by the use of the DISABLE command.

1.7.2. When engaged in dehumidification mode the unit shall run for a minimum of 30 mins (adj.).

1.10. System Control

1.10.1. During building operation the building laboratory exhaust fans (EF 1 through EF 4) shall be enabled. The exhaust fans shall not be allowed to operate unless AHU 1 or AHU 4 are in operation and supply fans are operating.

1.13.1. When engaged in dehumidification mode the unit shall run for a minimum of 30 mins (adj.).
A constant hot water discharge temperature of 180 degrees Fahrenheit (degF) is to be maintained by the steam control valve to ensure proper water heating. The system shall communicate directly to the Delta Room NAE, allowing the maintenance of constant outlet water temperature.

The EIP while issued from a global command at the Delta Room shall initiate a building-wide EIP command. This allows an override of the steam control valve, providing an emergency shutdown capability. The Delta Room NAE shall provide global control commands and monitoring of the steam system.

The system shall enable from DDC system when the outside air temperature is below 75 degrees Fahrenheit (degF). The hot water system shall be enabled from DDC system, allowing for constant temperature control. The system shall monitor the high level alarm of the condensate pump and provide an alarm to the DDC, ensuring proper condensate flow monitoring.

In case of a low pressure alarm, the condensate flow meter shall be monitored, ensuring proper system operation. If the pump controller senses that all differential pressure sensors are above the pressure setpoint, the speed of the controlled pump shall be adjusted to maintain the required flow rate.

The system shall be capable of resetting and reactivating the pumps, ensuring proper system functionality. The pumps shall be capable of operating under control of the steam system, allowing for efficient water heating.

The system shall be capable of operating in various modes, including local and remote control. The system shall be capable of operating in variable flow mode, ensuring efficient water heating.

The system shall be capable of operating in variable flow pumping system, allowing for efficient water heating. The system shall be capable of operating in variable flow mode, ensuring efficient water heating.

The system shall be capable of operating in variable flow mode, allowing for efficient water heating. The system shall be capable of operating in variable flow mode, ensuring efficient water heating.

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1. **CLOSED LOOP HEAT RECOVERY POINTS LIST**

<table>
<thead>
<tr>
<th>Point Description</th>
<th>Object Name</th>
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</thead>
<tbody>
<tr>
<td>Make Up Water Tank Status MWP-S</td>
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</tr>
<tr>
<td>Make Up Water Tank Lower Level Alarm MWP-LL</td>
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</tr>
<tr>
<td>Energy Water Pump Command ERP-C</td>
<td>X</td>
</tr>
<tr>
<td>Energy Water Pump Alarm ERP-AL</td>
<td>X</td>
</tr>
<tr>
<td>Energy Water Pump ERP-1B VFD</td>
<td></td>
</tr>
<tr>
<td>Energy Water Pump ERP-1B Speed ERP-2B-SPD</td>
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<tr>
<td>Energy Water Pump ERP-1B Status ERP-2B-S</td>
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<tr>
<td>Energy Water Pump ERP-1A VFD</td>
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<td>Energy Water Pump ERP-1A Speed ERP-2A-SPD</td>
<td>X X</td>
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<td>Energy Water Pump ERP-1A Command ERP-2A-C</td>
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<td>Energy Water Pump ERP-1A Status ERP-2A-S</td>
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</tr>
<tr>
<td>Energy Recovery DP Actual ER-P</td>
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<tr>
<td>Energy Recovery DP Setpoint ER-P-SP</td>
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<tr>
<td>Energy Recovery Supply Temp #2 ERS-T-2</td>
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<tr>
<td>Energy Recovery Supply Temp #1 ERS-T-1</td>
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<tr>
<td>Energy Recovery Return Temp #1 ERR-T-1</td>
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2. **EXISTING BUILDING POINTS LIST**

<table>
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<tr>
<th>Point Description</th>
<th>Object Name</th>
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<tbody>
<tr>
<td>Vacuum Pump 1 Status VACP1-S</td>
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</tr>
<tr>
<td>High Pressure Steam AGN_MISC HPSTEAM-P</td>
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<tr>
<td>Control Air Pressure AGN_MISC AIRC-P</td>
<td></td>
</tr>
<tr>
<td>AgriScience Center North HVAC Renovation Lexington, KY 40508 300 South Limestone Lexington, KY 40508</td>
<td></td>
</tr>
</tbody>
</table>

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1. The system shall be provided with a glycol recirculation system including water pumps to prevent false alarms. After the cause of the alarm has been eliminated, the system shall be capable of resetting.

2. If water flow is not sensed by a current sensor at P1, the system shall be enabled from the DDC system when the outside air temperature is below 40°F (adj.) and above 85°F (adj.).

3. If water flow is not sensed by a current sensor at P2 or P3, the system shall be enabled from the DDC system when the outside air temperature is below 40°F (adj.) and above 85°F (adj.).
3. THE ENABLING PHASE WORK SHALL BE COMPLETED IN

1. THE GOAL FOR THE ENABLING PHASE IS TO PERFORM

5" LPS

EXHAUST FANS.

PHASE III.

E (22"ø)

E (14"ø)

E (36"x20")

DPS

P8

E (14"ø)

UP

UP

PE

E (82"x61")

S320A

COM

C301

A90

E (36"x56")

EL-A EL-B

H31

A112

E (24"ø)

A101

A108

1/2" DWHR

A138

E (22"ø)

E (14"ø)

E (60"x52")

EX AHU

8 5/8"

6 3/4"
PHASING NOTES:

- **MATERIAL PASSAGE INTO AND OUT OF PENTHOUSE POSSIBLE. IT CONSISTS OF THE FOLLOWING:**
  - D. DEMOLISH EXISTING ZONE SUPPLY FANS AND
  - E. DEMOLITION OF ZONE SUPPLY AIR FANS WITH
  - B. PARTIAL INSTALLATION OF NEW CHWS/R PIPES
    - AHU, CHWS/R, LPS AND LPC PIPES
    - TANKS AND ALL RELATED EQUIPMENT.
    - EXCHANGERS AND PUMPS.
    - WATER GENERATION PLANT CONTROLS AIR COMPRESSOR AND DRYER.
  - WALL. REMAINDER OF DEMOLITION TO BE DONE
    - EXHAUST DUCT SYSTEM THROUGH PENTHOUSE INTO AND OUT OF LAB.
  - EXISTING AHU 1 SUPPLY DUCTS.

**NEW MAIN WITH FUTURE LAB EXHAUST MANIFOLD AND OTHER DUCTS AND PIPES INSTALLED IN FUTURE PHASES. ROUTE PIPE INTO STRUCTURAL CAVITIES ABOVE AHU-1 STEAM AND CHILLED WATER PIPING. INSTALL IN A MANNER THAT DOES NOT INTERFERE WITH ALL EXISTING FUNCTIONING PNEUMATIC CONTROLS SHALL REMAIN OPERATIONAL AT THE CONCLUSION OF THIS ENABLING PHASE.

- I. COORDINATE ROUTING WITH EXISTING INFRASTRUCTURE STILL IN PLACE DURING ENABLING PHASE. INSULATION MAY BE TEMPORARILY OMITTED IN ROUTING.
  - FOR TEMPORARY AHU SERVICE AND THE SECOND 8" CHWS/R FOR PERMANENT CHWS/R PIPES TO FUTURE AHUS. SEE THIS PLAN FOR PERMANENT PIPE REINSTALLATION LOCATION.
  - FOR CONDENSATE TRAP AND COIL CONNECTIONS ABOVE ROOF LEVEL. LOCATE TEMPORARY UNIT AS TO NOT CONFLICT WITH ANY SCOPE OF WORK IN OTHER NEW WORK PLANNED. CONTRACTOR SHALL INCLUDE COST TO REWORK PIPING ONE TIME FOR COORDINATION WITH FUTURE WORK. THIS

- P17 INCLUDE COST TO REVISE THIS 1/2" DHWR BRANCH ONE TIME FOR COORDINATION WITH FUTURE WORK.
- P9 PROVIDE NEW 4" VTR. COORDINATE ROUTING WITH NEW RETURN DUCT TO BE INSTALLED IN LATER PHASE. PENETRATION SHALL BE IN STRUCTURAL PAN AND OTHER NEW WORK PLANNED. CONTRACTOR SHALL INCLUDE COST TO REWORK PIPING ONE TIME FOR COORDINATION WITH FUTURE WORK. THIS
  - A119 PROVIDE TEMPORARY CONNECTION FROM EXISTING SUPPLY DUCT TO AHU-1 SUPPLY DUCT. ROUTE DUCT BENEATH EXISTING LAB EXHAUST MANIFOLD AND
  - A113 INSTALL SALVAGED AIR COMPRESSOR. PROVIDE NEW HOUSEKEEPING PAD. PROVIDE 3/8" CONTROLS TUBING AND CONNECT TO RELOCATED AIR FILTER.
  - H51 PROVIDE HWS/R PIPES FOR FUTURE HEATING WATER SYSTEM. COORDINATE WITH EXISTING EQUIPMENT AND INSTALL IN MANNER TO NOT INTERFERE WITH
  - H50 PROVIDE HPS-MPS PRV STATION. PIPING TO MPS LOCATION TO BE INSTALLED IN LATER PHASE. SAFETY VALVE DISCHARGE PIPE WILL BE INSTALLED TO
  - H49 PROVIDE HPS-LPS PRV STATION. PIPING TO LPS LOCATIONS TO BE INSTALLED IN LATER PHASE. SAFETY VALVE DISCHARGE PIPE WILL BE INSTALLED TO
  - H27 PROVIDE 6" CHWS PIPE STUB AND VALVE FOR FUTURE AHU-1 CONNECTION.
  - H26 PROVIDE 2" HPS PIPE AND ROUTE ACROSS ROOF AS SHOWN. SUPPORT PIPE FROM ROOF BY WOOD BLOCKS. ROUTE PIPE TO PENTHOUSE ROOF AND AVOID
  - H25 PROVIDE 6" TCHWS/R PIPES AND ROUTE ACROSS ROOF AS SHOWN. SUPPORT PIPES FROM ROOF BY WOOD BLOCKS. ROUTE PIPES TO PENTHOUSE ROOF
  - H22 PROVIDE TCHWS/R PIPES AND CONNECT TO EXISTING 8" CHWS/R RISERS. PROVIDE TWO PAIRS OF VALVED CONNECTIONS ON EACH PIPE. ONE 6" CHWS/R

**OUTLINE OF COM S320A PLAN - PENTHOUSE ROOF**

**CMTA JOB #:**

**RSJ**