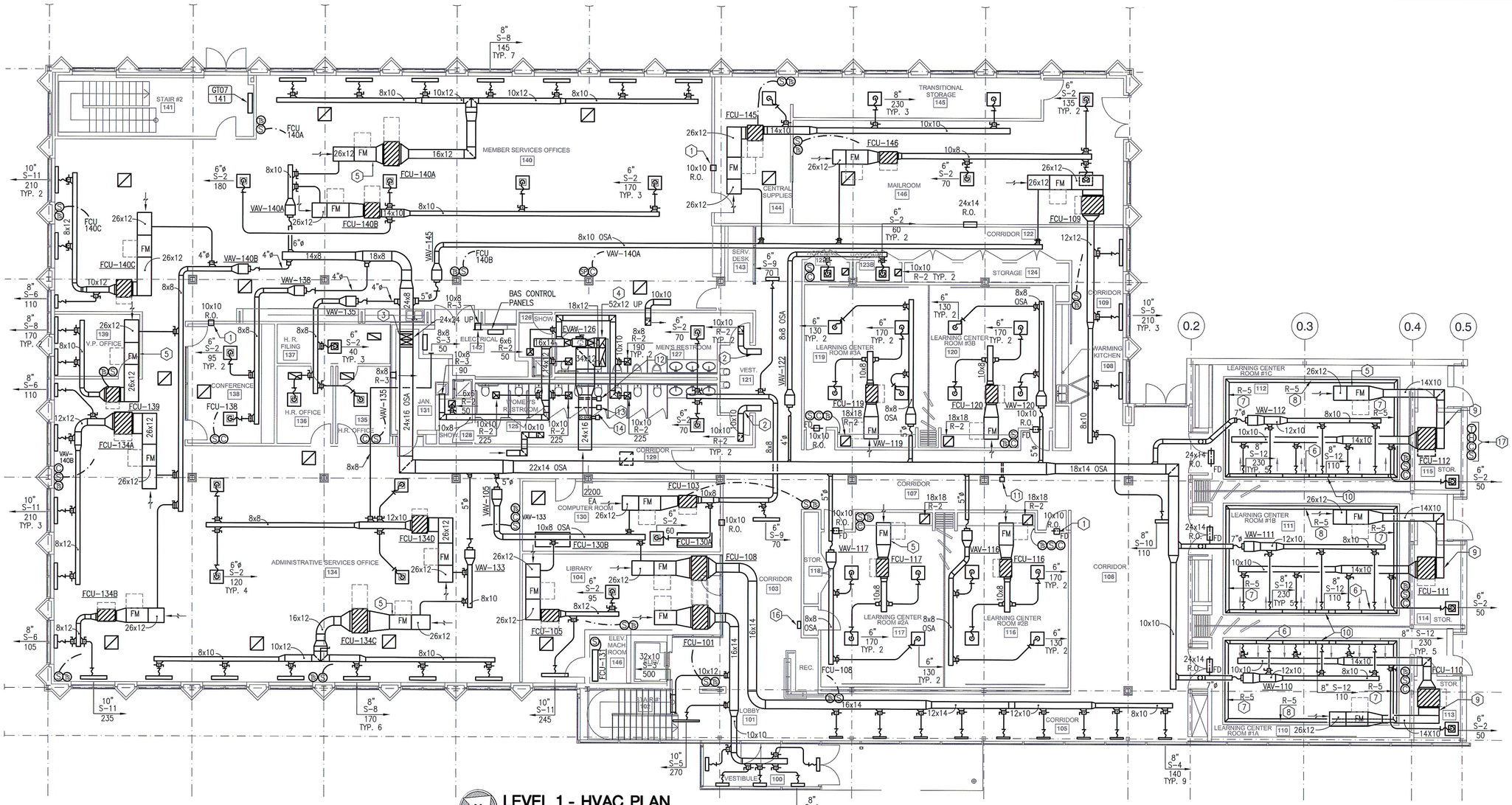


## LEVEL 1 - HVAC PLAN

SCALE: 1/8 " = 1'-0"

| FCU OSA SCHEDULE | | |
|---|---|---|
| WSHP # | OSA | |
| | CFM | DUCT SIZE |
| FCU-103 | 170 | 8"ø |
| FCU-105 | 85 | 6"ø |
| FCU-108 | 95 | 6"ø |
| FCU-109 | 180 | 8"ø |
| FCU-134A | 40 | 6"ø |
| FCU-134B | 40 | 6"ø |
| FCU-134C | 95 | 6"ø |

NOTE 1: SEE FCU SCHEDULE ON SHEET M4.1

| FCU OSA SCHEDULE | | |
|---|---|---|
| WSHP # | OSA | |
| | CFM | DUCT SIZE |
| FCU-134D | 180 | 8"ø |
| FCU-139 | 40 | 6"ø |
| FCU-140A | 190 | 8"ø |
| FCU-140B | 200 | 8"ø |
| FCU-140C | 55 | 6"ø |
| FCU-145 | 85 | 6"ø |
| FCU-146 | 80 | 6"ø |

## GENERAL NOTES

1. PROVIDE FIRE DAMPER IN DUCTWORK AT FLOOR SLAB PENETRATION AND 2 HOUR RATED WALLS.
2. ALL SUPPLY AIR REGISTERS TO BE TYPE S-1 AND ALL RETURN AIR GRILLES TO BE TYPE R-1, 24x24 OR 24x12, SIZE AS SHOWN, UNLESS OTHERWISE NOTED.
3. WALL-MOUNTED SENSORS AND THERMOSTATS SHALL BE MOUNTED AT 48" AFF.
4. MAXIMUM FLEXIBLE DUCT RUN TO DIFFUSERS SHALL NOT EXCEED 7 FEET. WHERE LENGTH EXCEEDS 7 FEET, PROVIDE INSULATED GALVANIZED STEEL RUNOUTS. FLEXIBLE DUCTWORK ONLY ALLOWED OVER ACCESSIBLE LAY IN CEILING.
5. RUNOUTS TO DIFFUSERS TO BE SAME SIZE AS DIFFUSER NECK SIZE. PROVIDE SCOOP, SPIN-IN, AND SINGLE BLADE DAMPER AT ALL DIFFUSER TAKE OFFS.
6. COORDINATE LOCATION OF ALL DIFFUSERS AND RETURN AIR GRILLES WITH ARCHITECTURAL REFLECTED CEILING PLAN.
7. INSTALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS SO THAT ACCESS IS PROVIDED AS REQUIRED BY INSTALLATION MANUAL.
8. SEE DRAWING SHEETS M4.1 AND M5.1 FOR HVAC SCHEDULES AND LEGEND.
9. ALL DUCTWORK AND PIPING TO BE INSTALLED ABOVE CEILING UNLESS OTHERWISE NOTED. COORDINATE DUCTWORK AND PIPING TO AVOID CONFLICTS WITH STRUCTURE, LIGHTING FIXTURES AND ELECTRICAL CONDUIT/CABLING.
10. PROTECT ALL MATERIALS AND EQUIPMENT FROM DAMAGE. SEAL ENDS OF OPEN DUCTWORK AND PIPIING DURING CONSTRUCTION TO PREVENT ENTRY OF DUST & DEBRIS.

## KEY NOTES

1. RETURN OPENING IN WALL ABOVE CEILING. SIZE AS SHOWN, TYPICAL.
2. TRANSFER DUCT ABOVE CEILING. SIZE AS SHOWN.
3. 24x24 OUTSIDE AIR FROM DOAS-1 TRANSITION UP TO 30x20. SEE M2.2 FOR CONTINUATION. PROVIDE FIRE DAMPER AT SECOND FLOOR SLAB PENETRATION
4. EXHAUST UP TO DOAS-1. SEE M2.2 FOR CONTINUATION. PROVIDE FIRE DAMPER AT SECOND FLOOR SLAB PENETRATION.
5. V-BANK FILTER MODULE WITH MERV 13 ELEMENTS. TYPICAL EACH FAN COIL UNIT.
6. CONTINUOUS LINEAR DIFFUSER WITH MITERED CORNERS. SEE ARCHITECTURAL DRAWINGS FOR EXACT LENGTH. BLANK OFF UNUSED PORTIONS.
7. CONTINUOUS LINEAR RETURN WITH MITERED CORNERS. SEE ARCHITECTURAL DRAWINGS FOR EXACT LENGTH.
8. CONTINUOUS LINEAR BLANKED OFF RETURN WITH MITERED CORNERS. SEE ARCHITECTURAL DRAWINGS FOR EXACT LENGTH.
9. RETURN PLENUM FULL HEIGHT AND WIDTH OF FAN COIL UNIT.
10. TWO FOOT PLENUM.
11. SUPPLY DUCT STATIC PRESSURE SENSOR.
12. EXHAUST DUCT STATIC PRESSURE SENSOR.
13. GENERAL EXHAUST DAMPER, GED-1.
14. FIRST FLOOR EXHAUST AIRFLOW METER.
15. 10x10 RETURN AIR OPENING ABOVE CEILING.
16. HVAC EMERGENCY SHUT-DOWN, SEE DETAIL 3/M5.3.
17. LOCATION OF EXTERIOR TEMP, HUMIDITY, CO2 AND PRESSURE SENSOR.

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RICHARD + WITTSCHIEBE

# ASHRAE HEADQUARTERS
ADDITION AND RENOVATION



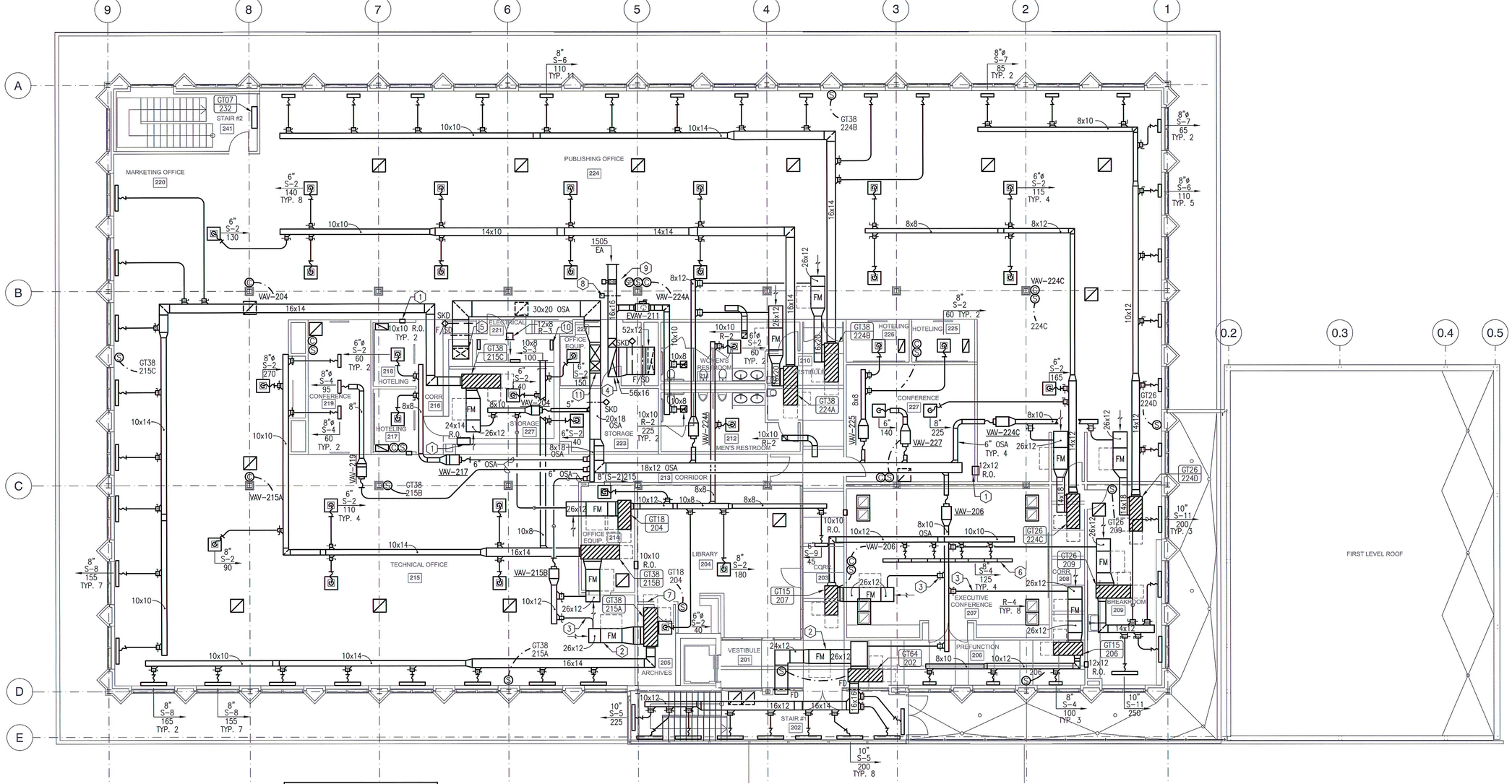
| | | |
|---|---|---|
| 7/12/07 | Final System Design | |

DRAWING TITLE:
**LEVEL 1 HVAC PLAN**

PROJECT NUMBER:
**200614**

DATE:
**6/15/07**

DRAWING NUMBER:
**M2.1**




## GLHP OSA SCHEDULE

| WSHP # | OSA | |
|---|---|---|
| | CFM | DUCT SIZE |
| GT38-215A | 115 | 6"ø |
| GT38-215B | 320 | 10"ø |
| GT38-215C | 115 | 6"ø |
| GT18-204 | 180 | 8"ø |
| GT38-224A | 300 | 10"ø |
| GT38-224B | 180 | 8"ø |
| GT26-224C | 225 | 8"ø |
| GT26-224D | 120 | 6"ø |
| GT26-209 | 190 | 8"ø |
| GT15-206 | 50 | 6"ø |
| GT64-202 | 30 | 6"ø |
| GT15-207 | 185 | 8"ø |
| TOTAL | 2010 | |

NOTE 1: SEE GLHP SCHEDULE ON SHEET M4.1

## LEVEL 2 - HVAC PLAN

SCALE: 1/8 " = 1'-0"

## GENERAL NOTES

1. PROVIDE FIRE DAMPER IN DUCTWORK AT FLOOR SLAB PENETRATION AND 2 HOUR RATED WALLS.
2. ALL SUPPLY AIR REGISTERS TO BE TYPE S-1 AND ALL RETURN AIR GRILLES TO BE TYPE R-1, 24x24 OR 24x12, SIZE AS SHOWN, UNLESS OTHERWISE NOTED.
3. WALL-MOUNTED SENSORS AND THERMOSTATS SHALL BE MOUNTED AT 48" AFF.
4. MAXIMUM FLEXIBLE DUCT RUN TO DIFFUSERS SHALL NOT EXCEED 7 FEET. WHERE LENGTH EXCEEDS 7 FEET, PROVIDE INSULATED GALVANIZED STEEL RUNOUTS. FLEXIBLE DUCTWORK ONLY ALLOWED OVER ACCESSIBLE LAY IN CEILING ONLY.
5. RUNOUTS TO DIFFUSERS TO BE SAME SIZE AS DIFFUSER NECK SIZE. PROVIDE SCOOP, SPIN-IN, AND SINGLE BLADE DAMPER AT ALL DIFFUSER TAKE OFFS.
6. COORDINATE LOCATION OF ALL DIFFUSERS AND RETURN AIR GRILLES WITH ARCHITECTURAL REFLECTED CEILING PLAN.
7. INSTALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS SO THAT ACCESS IS PROVIDED AS REQUIRED BY INSTALLATION MANUAL.
8. SEE DRAWING SHEETS M4.1 AND M5.1 FOR HVAC SCHEDULES AND LEGEND.
9. ALL DUCTWORK AND PIPING TO BE INSTALLED ABOVE CEILING UNLESS OTHERWISE NOTED. COORDINATE DUCTWORK AND PIPING TO AVOID CONFLICTS WITH STRUCTURE, LIGHTING FIXTURES AND ELECTRICAL CONDUIT/CABLING.
10. PROTECT ALL MATERIALS AND EQUIPMENT FROM DAMAGE. SEAL ENDS OF OPEN DUCTWORK AND PIPING DURING CONSTRUCTION TO PREVENT ENTRY OF DUST & DEBRIS.

## KEY NOTES

1. RETURN AIR OPENING IN WALL ABOVE CEILING. SIZE AS SHOWN TYPICAL.
2. V-BANK FILTER MODULE WITH MERV 13 ELEMENTS. TYPICAL EACH HEAT PUMP.
3. VENTILATION AIR FROM DOAS UNIT. EXTEND DUCT SIZE SHOWN TO HEAT PUMP RETURN IN CEILING PLENUM. SET AIRFLOW TO SCHEDULED CFM.
4. COMBINED 72x16 EXHAUST UP (56x16 AND 16x16) TRANSITION TO 15"x 83" UNIT CONNECTION IN RISE.
5. 30x20 TRANSITION DOWN TO 24x24. SEE M2-1 FOR CONTINUATION.
6. CONTINUOUS LINEAR DIFFUSER WITH END CAPS. SEE ARCHITECTURAL DRAWINGS FOR EXACT LENGTH. BLANK OFF UNUSED PORTIONS.
7. INSTALL FULL UNIT HEIGHT AND WIDTH ACCESS PANEL IN WALL ABOVE CEILING.
8. GENERAL EXHAUST DAMPER, GED-2.
9. SECOND FLOOR GENERAL EXHAUST AIR FLOW METER
10. BAS CONTROL PANEL, TYPICAL OF 3.
11. COMBINED 48x20 SUPPLY UP (30x20 AND 18x20) TRANSITION TO 15"x 73 UNIT CONNECTION IN RISE.

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# ASHRAE HEADQUARTERS
ADDITION AND RENOVATION



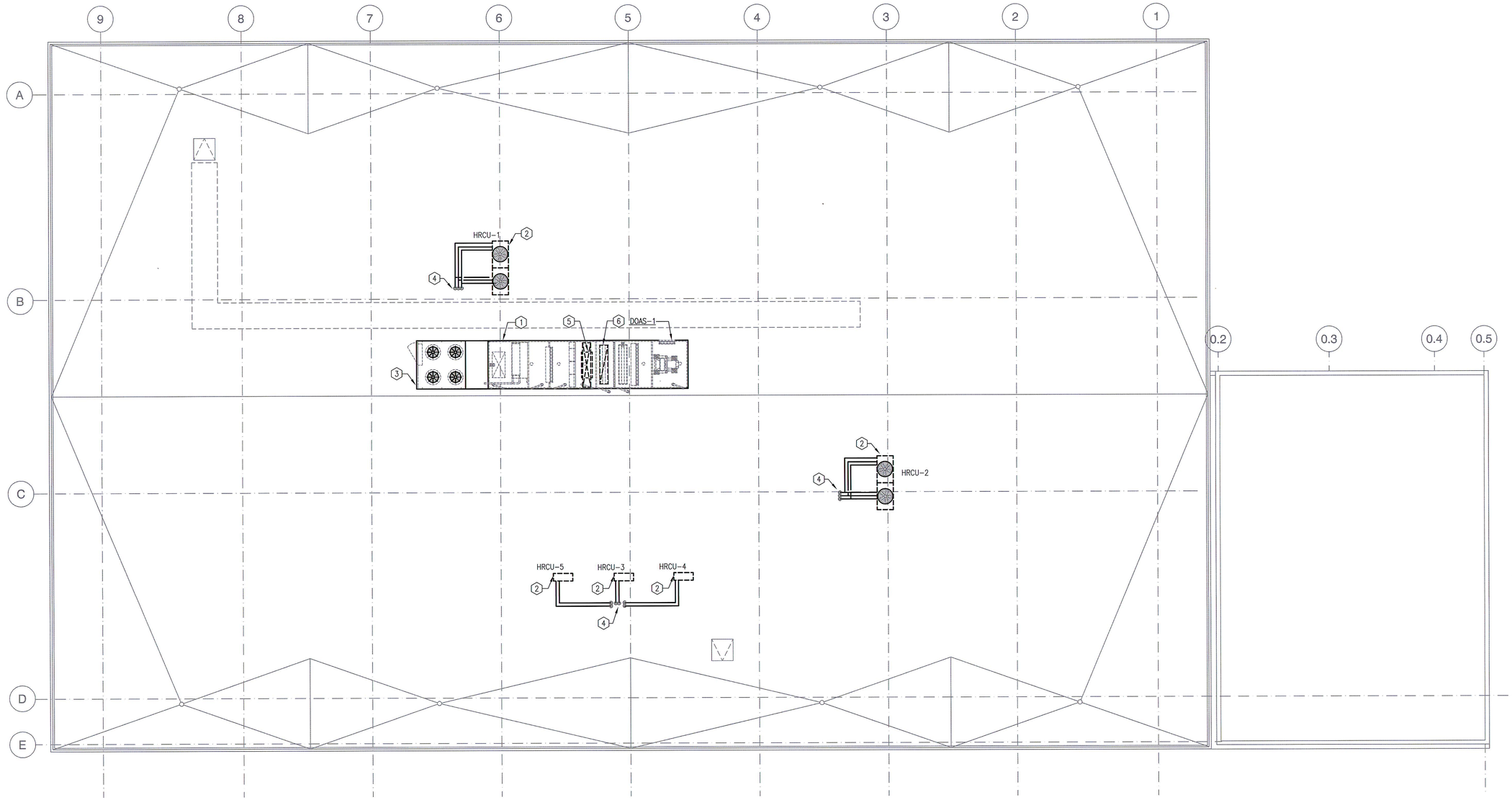
| | | |
|---|---|---|
| | 7/12/07 | Final System Design |

DRAWING TITLE:
**LEVEL 2 HVAC PLAN**

PROJECT NUMBER:
**200614**

DATE:
**6/15/07**

DRAWING NUMBER:
**M2.2**




## ROOF - HVAC PLAN

SCALE: 1/8 " = 1'-0"

## GENERAL NOTES

1. INSTALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
2. PROTECT ALL MATERIALS AND EQUIPMENT FROM DAMAGE.
3. SEE SHEET M4.1 FOR SCHEDULE AND CAPACITIES.
4. EXTEND REFRIGERANT PIPING FROM CONDENSING UNITS TO ROOF CAP. SUPPORT ALL REFRIGERANT ON EQUIPMENT SUPPORT CURBS. REFRIGERANT PIPING SHALL BE A MINIMUM OF 18" ABOVE ROOF.
5. SIZE REFRIGERANT PIPING IN ACCORDANCE WITH EQUIPMENT MANUFACTURER'S REQUIREMENTS SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
6. ALL ROOF MOUNTED EQUIPMENT SHALL BE SECURED TO SUPPORTS. SUPPORTS SHALL BE FASTENED TO ROOF.
7. ALL ROOF MOUNTED EQUIPMENT SHALL BE INSTALLED TO ALLOW REROOFING WITHOUT REMOVAL OF EQUIPMENT.

## KEY NOTES

1. DEDICATED OUTSIDE AIR SYSTEM (DOAS) UNIT ON ROOF CURB.
2. OUTDOOR VRF HEAT RECOVERY UNIT ON ROOF EQUIPMENT RAILS.
3. REMOTE CONDENSING UNIT ASSOCIATED WITH DOAS-1 ON ROOF EQUIPMENT RAILS.
4. REFRIGERANT PIPING THROUGH PENETRATION IN ROOF SLAB. SEE DRAWING M2.5 FOR CONTINUATION.
5. 15"x 83" RETURN/EXHAUST DUCT (UNIT OPENING) THROUGH OPENING IN ROOF SLAB. SEE DRAWING M2.2 FOR CONTINUATION.
6. 15"x 73" SUPPLY DUCT (UNIT OPENING) THROUGH OPENING IN ROOF SLAB. SEE DRAWING M2.2 FOR CONTINUATION.

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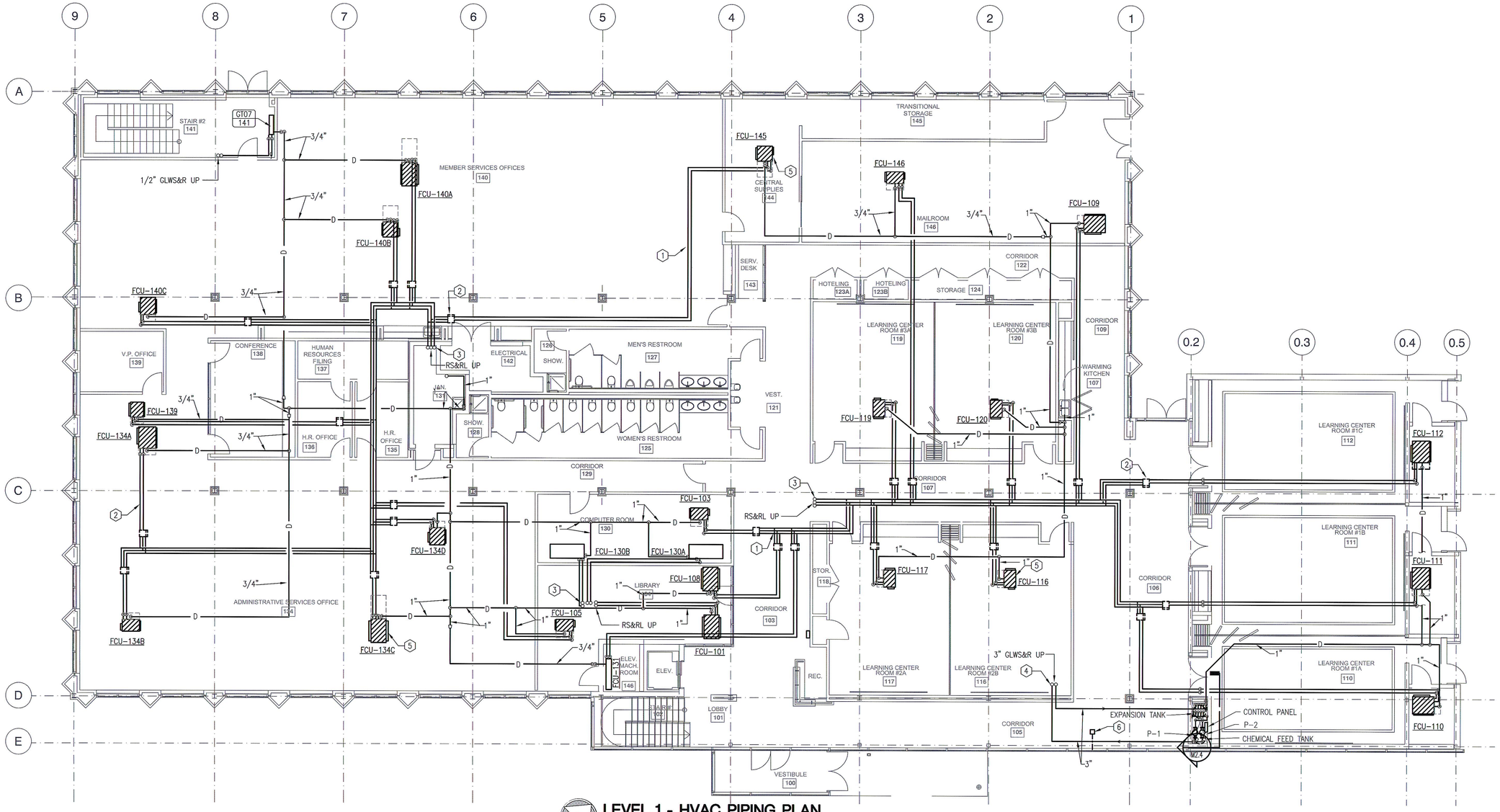
|---|---|---|
| | 7/12/07 | Final System Design |

DRAWING TITLE:
**ROOF HVAC PLAN**

PROJECT NUMBER:
**200614**

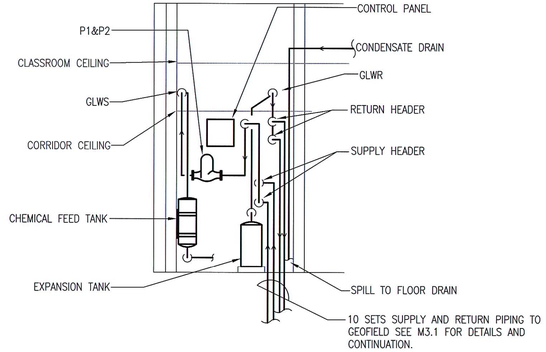
DATE:
**6/15/07**

DRAWING NUMBER:
**M2.3**




## LEVEL 1 - HVAC PIPING PLAN

SCALE: 1/8 " = 1'-0"




## SECTION AT PUMP HEADER

1 / M2.4 SCALE: 1/4 " = 1'-0"

## GENERAL NOTES

1. INSTALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS SO THAT ACCESS IS PROVIDED AS REQUIRED BY INSTALLATION MANUAL.
2. SEE DRAWING SHEETS M4.1 AND M5.1 FOR HVAC SCHEDULES AND LEGEND.
3. ALL PIPING TO BE INSTALLED ABOVE CEILING. COORDINATE PIPING TO AVOID CONFLICTS WITH STRUCTURE, LIGHTING FIXTURES AND ELECTRICAL CONDUIT/CABLING.
4. PROTECT ALL MATERIALS AND EQUIPMENT FROM DAMAGE. SEAL ENDS OF OPEN PIPING DURING CONSTRUCTION TO PREVENT ENTRY OF DUST & DEBRIS.

## KEY NOTES

1. VRV REFRIGERANT PIPING IN CEILING. EXTEND LIQUID LINE, HOT GAS AND VAPOR RETURN FROM OUTDOOR UNITS ON ROOF TO BRANCH SELECTORS. PROVIDE TWO REFRIGERANT LINES TO FAN COIL UNIT. SIZES PER MANUFACTURER.
2. BRANCH SELECTOR UNIT (TYPICAL).
3. REFRIGERANT PIPING UP THROUGH PENETRATION IN SECOND LEVEL FLOOR SLAB. SEE SHEET M2.5 FOR CONTINUATION OF PIPING.
4. GROUND LOOP WATER PIPING ABOVE CEILING. EXTEND PIPING UP TO SECOND FLOOR. SEE SHEET M2.5 FOR CONTINUATION OF PIPING.
5. VRV FAN COIL UNIT ABOVE CEILING (TYPICAL). EXTEND CONDENSATE DRAIN PIPING TO CLOSEST PLUMBING HUB DRAIN OR JANITOR CLOSET.
6. FLOW METER, SEE DETAIL 3/M5.2.

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# ASHRAE HEADQUARTERS
## ADDITION AND RENOVATION



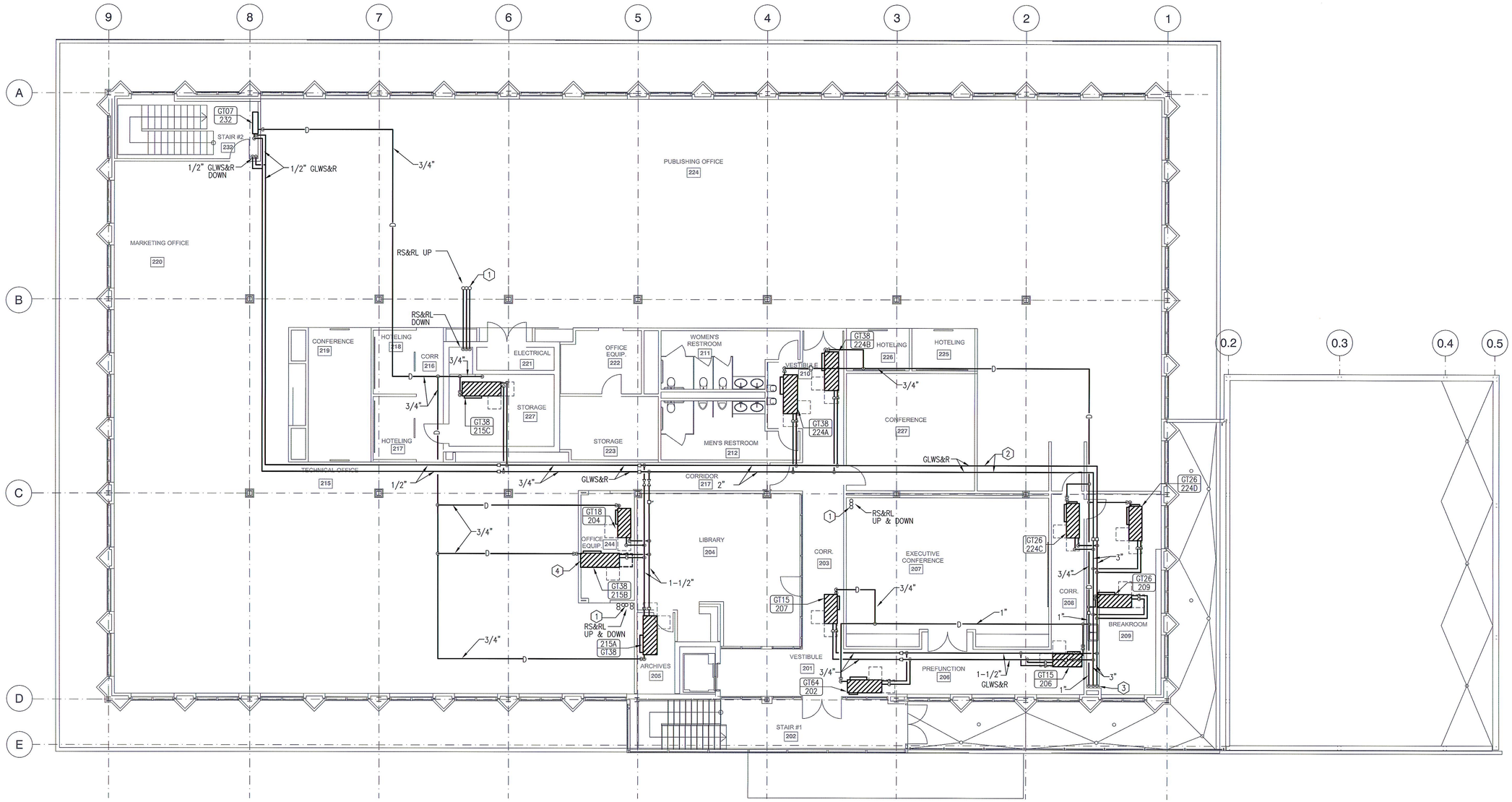
| | | |
|---|---|---|
| 7/12/07 | Final System Design | |

DRAWING TITLE:
**LEVEL 1 HVAC PIPING PLAN**

PROJECT NUMBER:
**200614**

DATE:
**6/15/07**

DRAWING NUMBER:
**M2.4**




## LEVEL 2 - HVAC PIPING PLAN

SCALE: 1/8 " = 1'-0"

## GENERAL NOTES

1. INSTALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS SO THAT ACCESS IS PROVIDED AS REQUIRED BY INSTALLATION MANUAL.
2. SEE DRAWING SHEETS M4.1 AND M5.1 FOR HVAC SCHEDULES AND LEGEND.
3. ALL PIPING TO BE INSTALLED ABOVE CEILING. COORDINATE PIPING TO AVOID CONFLICTS WITH STRUCTURE, LIGHTING FIXTURES AND ELECTRICAL CONDUIT/CABLING.
4. PROTECT ALL MATERIALS AND EQUIPMENT FROM DAMAGE. SEAL ENDS OF OPEN PIPING DURING CONSTRUCTION TO PREVENT ENTRY OF DUST & DEBRIS.

## KEY NOTES

1. REFRIGERANT PIPING UP THROUGH PENETRATION IN ROOF DECK. SEE SHEET M2.3 FOR CONTINUATION OF PIPING.
2. GROUND LOOP WATER PIPING ABOVE CEILING. EXTEND PIPING UP TO HEAT PUMP UNITS.
3. GROUND LOOP WATER PIPING UP FROM LEVEL 1. SEE SHEET M2.4 FOR CONTINUATION OF PIPING.
4. HORIZONTAL HEAT PUMP UNIT ABOVE CEILING (TYPICAL). EXTEND CONDENSATE DRAIN PIPING TO CLOSEST PLUMBING HUB DRAIN OR JANITOR CLOSET.

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# ASHRAE HEADQUARTERS
## ADDITION AND RENOVATION



| | |
|---|---|
| 7/12/07 | Final System Design |

DRAWING TITLE:

**LEVEL 2 HVAC PIPING PLAN**

PROJECT NUMBER:

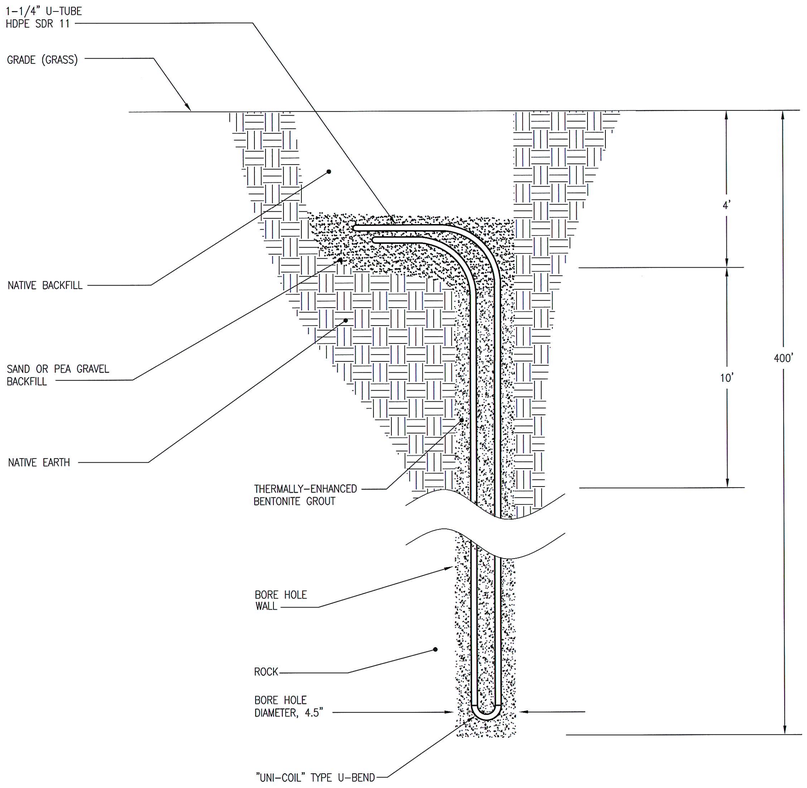
**200614**

DATE:

**6/15/07**

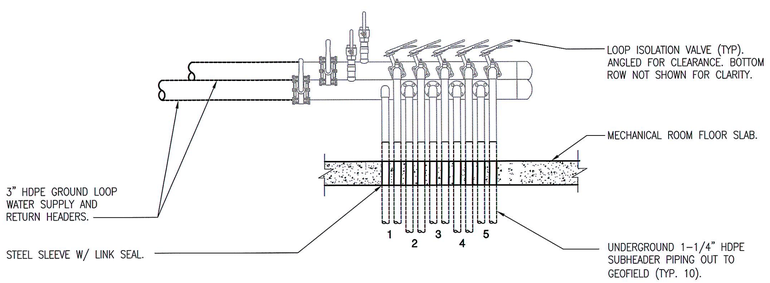
DRAWING NUMBER:

**M2.5**

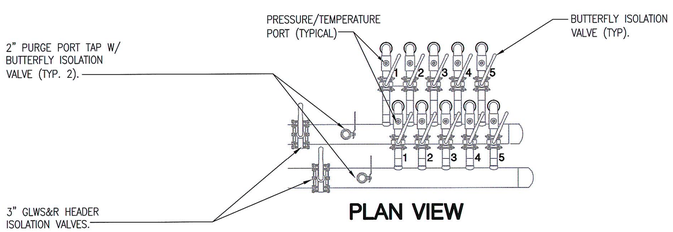



## 2 / M3-1 BORE HOLE DETAIL

SCALE: NONE



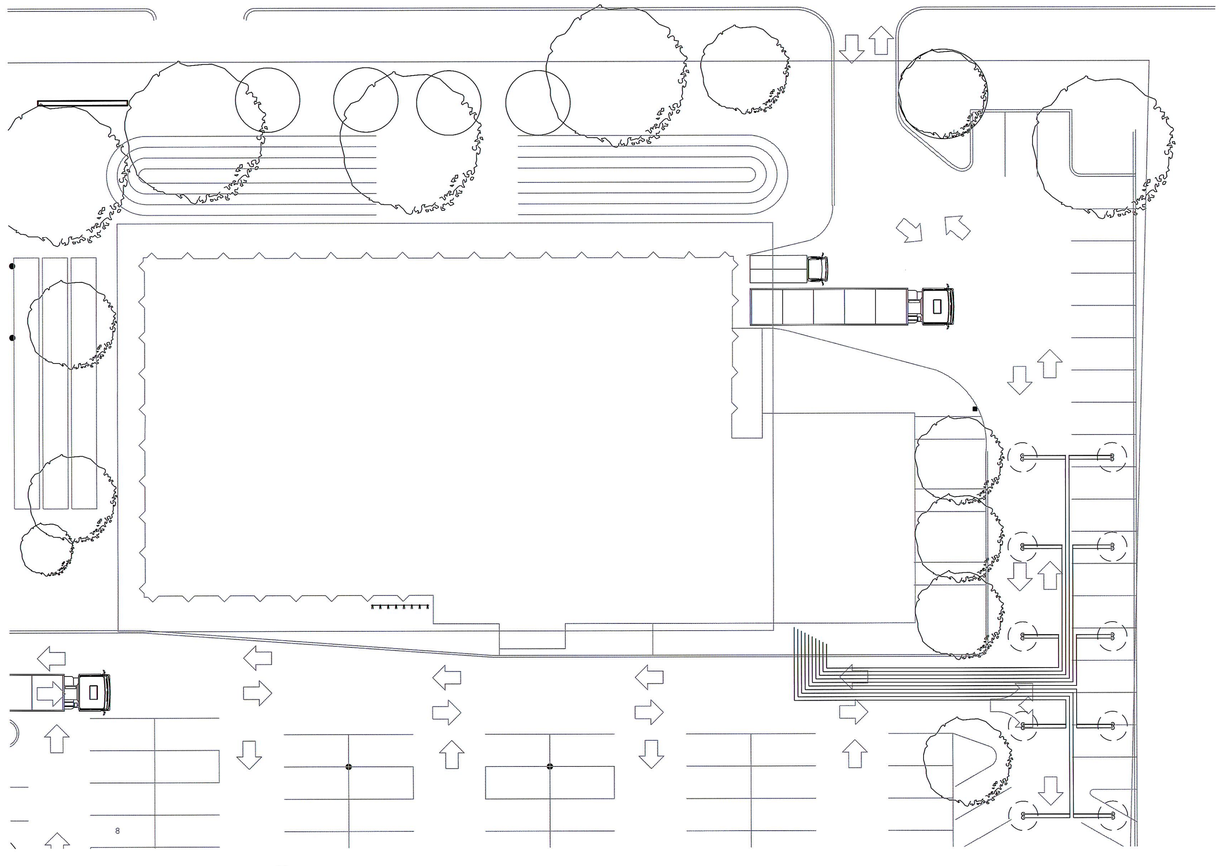

**SIDE VIEW**




**PLAN VIEW**

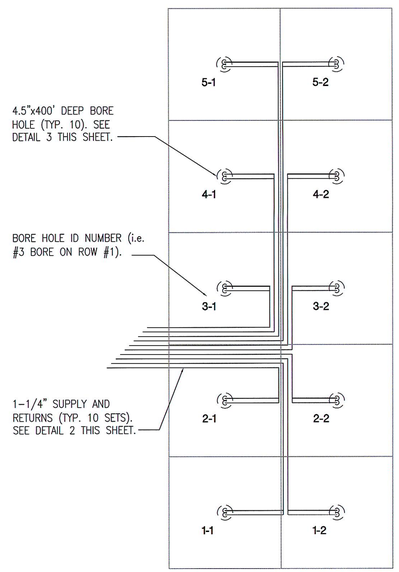
## 3 / M3-1 PIPING ENTRY DETAIL

SCALE: NONE



## N GROUND LOOP HEAT EXCHANGER PART SITE PLAN

SCALE: 1"=20'




## 1 / M3-1 GROUND LOOP PIPING SCHEMATIC

SCALE: 1/16" = 1'-0"

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# ASHRAE HEADQUARTERS
ADDITION AND RENOVATION



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|---|---|
| 7/12/07 | Final System Design |

DRAWING TITLE:

**HVAC GROUND LOOP LAYOUT AND DETAILS**

PROJECT NUMBER: **200614**

DATE: **6/15/07**

DRAWING NUMBER: **M3.1**

## GRILLE, REGISTER, AND DIFFUSER SCHEDULE

| MARK | DESCRIPTION | FINISH |
|---|---|---|
| S-1 | 24x24 STEEL SQUARE PLAQUE DIFFUSER, FLANGE FRAME, 4 WAY THROW, FULL FACE, O.B. DAMPER, WITH ROUND NECK, FACE PANEL, BACK CONE, NECK SIZE AS SHOWN. PRICE SPD. | BAKED OFF WHITE ENAMEL |
| S-2 | SAME AS S-1, 12x12 DIFFUSER, 24x24 PANEL SIZE. | BAKED OFF WHITE ENAMEL |
| S-3 | STEEL DOUBLE DEFLECTION SUPPLY DIFFUSER, ADJUSTABLE PATTERN, 3/4" SPACING BETWEEN BLADES, FLANGE FRAME, SIZE AS SHOWN, FRONT BLADES PARALLEL TO SHORT DIMENSION O.B. DAMPER. PRICE 520D. | BAKED OFF WHITE ENAMEL |
| S-4 | EXTRUDED ALUMINUM SLOT DIFFUSER, TWO 2" SLOTS, 2 FOOT LENGTH UNLESS OTHERWISE NOTED, PLENUM, STEEL 180° PATTERN CONTROLLER, FLANGE FRAME AROUND PERIMETER WITH BORDER TYPE 21, END CAPS. PRICE AS220 | ANODIZED ALUMINUM |
| S-5 | EXTRUDED ALUMINUM SLOT DIFFUSER, TWO 2-1/2" SLOTS, 4 FOOT LENGTH, PLENUM, STEEL 180° PATTERN CONTROLLER, FLANGE FRAME AROUND PERIMETER WITH BORDER TYPE 21, END CAPS. PRICE AS225 | ANODIZED ALUMINUM |
| S-6 | EXTRUDED ALUMINUM SLOT DIFFUSER, TWO 2" SLOTS, 2 FOOT LENGTH, PLENUM, STEEL 180° PATTERN CONTROLLER, FACTORY INSTALLED T-BAR ON INLET SIDE, CLIP ON OPPOSITE SIDE. PRICE AST220 | BAKED OFF WHITE ENAMEL |
| S-7 | EXTRUDED ALUMINUM SLOT DIFFUSER, TWO 1-1/2" SLOTS, 2 FOOT LENGTH, PLENUM, STEEL 180° PATTERN CONTROLLER, FACTORY INSTALLED T-BAR ON INLET SIDE, CLIP ON OPPOSITE SIDE. PRICE AST215 | BAKED OFF WHITE ENAMEL |
| S-8 | EXTRUDED ALUMINUM SLOT DIFFUSER, TWO 2" SLOTS, 4 FOOT LENGTH, PLENUM, STEEL 180° PATTERN CONTROLLER, FACTORY INSTALLED T-BAR ON INLET SIDE, CLIP ON OPPOSITE SIDE. PRICE AST220 | BAKED OFF WHITE ENAMEL |
| S-9 | EXTRUDED ALUMINUM SLOT DIFFUSER, ONE 1" SLOT, 2 FOOT LENGTH, PLENUM, STEEL 180° PATTERN CONTROLLER, FLANGE FRAME AROUND PERIMETER WITH BORDER TYPE 21, END CAPS. PRICE AS110 | ANODIZED ALUMINUM |
| S-10 | EXTRUDED ALUMINUM SLOT DIFFUSER, TWO 1" SLOTS, 2 FOOT LENGTH, PLENUM, STEEL 180° PATTERN CONTROLLER, FLANGE FRAME AROUND PERIMETER WITH BORDER TYPE 21, END CAPS. PRICE AS210 | ANODIZED ALUMINUM |
| S-11 | EXTRUDED ALUMINUM SLOT DIFFUSER, TWO 2-1/2" SLOTS, 4 FOOT LENGTH, PLENUM, STEEL 180° PATTERN CONTROLLER, FACTORY INSTALLED T-BAR ON INLET SIDE, CLIP ON OPPOSITE SIDE. PRICE AST225 | BAKED OFF WHITE ENAMEL |
| S-12 | EXTRUDED ALUMINUM SLOT DIFFUSER, ONE 2" SLOT, 4 FOOT LENGTH UNLESS OTHERWISE NOTED, PLENUM, STEEL 180° PATTERN CONTROLLER, FLANGE FRAME AROUND PERIMETER WITH BORDER TYPE 21, END CAPS. PRICE AS110 | ANODIZED ALUMINUM |
| R-1 | 24x24 OR 24x12 EGG CRATE RETURN GRILLE. 1/2"x 1/2"x 1/2" GRID CORE, ALL-ALUMINUM, NON-DUCTED/PLENUM RETURN. PRICE 80 SERIES. | BAKED OFF WHITE ENAMEL |
| R-2 | EGG CRATE RETURN GRILLE. 1/2"x 1/2"x 1/2" GRID CORE, ALL-ALUMINUM, SURFACE MOUNTED FRAME, SIZE AS SHOWN, PRICE 80 SERIES. | BAKED OFF WHITE ENAMEL |
| R-3 | STEEL SIDE WALL RETURN GRILLE, 3/4" BLADE SPACING, FLANGE FRAME, 45° FIXED DEFLECTION, FRONT BLADES HORIZONTAL. PRICE 530. | BAKED OFF WHITE ENAMEL |
| R-4 | EXTRUDED ALUMINUM SLOT RETURN, ONE 1" SLOT, 24x24 SQUARE, NON-DUCTED. PRICE ASMR210 | BAKED OFF WHITE ENAMEL |
| R-5 | EXTRUDED ALUMINUM SLOT RETURN, ONE 2" SLOT, LENGTH AS SHOWN, FLANGE FRAME AROUND PERIMETER WITH BORDER TYPE 21. PRICE AS110 | ANODIZED ALUMINUM |

## PUMP SCHEDULE

| MARK | TYPE | SERVES | GPM | DEV. HEAD | HP | RPM | VOLTAGE | DESIGN BASIS | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| P-1 | INLINE | SECOND FLOOR | 60 | 75 | 3 | 1750 | 460 | B&G 80 | (1)(2) |
| P-2 | INLINE | SECOND FLOOR | 60 | 75 | 3 | 1750 | 460 | B&G 80 | (1)(2) |

(1) 460V/3ø HIGH EFFICIENCY MOTOR
(2) 50% PUMP EFFICIENCY MINIMUM

## VRV AIR COOLED CONDENSING UNIT SCHEDULE

| MARK | REFRIGERANT TYPE | SERVES | COMPRESSOR QUANTITY | LOCATION | COOLING CAPACITY | HEATING CAPACITY | VOLTAGE | DESIGN BASIS | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| HRCU-1 | 410A | FIRST FLOOR WEST | 4 | ROOF | 123.8 MBH | 69 MBH | 208/3ø | DAIKIN REYQ168 | (1)(2) |
| HRCU-2 | 410A | FIRST FLOOR EAST | 4 | ROOF | 125.5 MBH | 95 MBH | 208/3ø | DAIKIN REYQ168 | (1)(2) |
| HRCU-3 | 410A | COMPUTER ROOM | 1 | ROOF | 36 MBH | – | 208/1ø | DAIKIN RZQ36MVJU | (1)(2) |
| HRCU-4 | 410A | ENTRANCE LOBBY | 1 | ROOF | 34.8 MBH | 15.7 MBH | 208/1ø | DAIKIN RXYMQ48 | (1)(2) |
| HRCU-5 | 410A | COMPUTER ROOM | 1 | ROOF | 36 MBH | – | 208/1ø | DAIKIN RZQ36MVJU | (1)(2) |

(1) COOLING CAPACITY BASED ON SUMMER AMBIENT 95°F DB, 75°F WB. HEATING CAPACITY BASED ON 18°F DB AMBIENT.
(2) VFD FAN, SCROLL COMPRESSOR, PATE ROOFTOP EQUIPMENT SUPPORTS.

## VARIABLE REFRIGERANT VOLUME FAN COIL UNIT

| MARK | TYPE | COOLING CAPACITY | | FAN | | | | HEATING CAPACITY | DESIGN BASIS | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | TOTAL MBH | SENSIBLE MBH | CFM | E.S.P. | WATTS | VOLTAGE | MBH | | |
| FCU-109 | CONCEALED CEILING | 13.3 | 10.8 | 740 | 0.51 | 127 | 208v/3ø | 9.8 | FXSQ24 | (1)(2)(4)(5) |
| FCU-101 | CONCEALED CEILING | 34.8 | 33.7 | 1270 | 1.0 | 433 | 208v/1ø | 15.7 | FXMQ48 | (1)(2)(3)(5) |
| FCU-103 | CONCEALED CEILING | 4.8 | 4.1 | 340 | 0.37 | 52 | 208v/3ø | 3.5 | FXSQ12 (09) | (1)(2)(4)(5) |
| FCU-105 | CONCEALED CEILING | 6.5 | 5.3 | 340 | 0.37 | 52 | 208v/3ø | 3.2 | FXSQ12 (09) | (1)(2)(4)(5) |
| FCU-108 | CONCEALED CEILING | 33.0 | 33.0 | 1270 | 1.0 | 433 | 208v/3ø | 12.9 | FXMQ48 | (1)(2)(3)(5) |
| FCU-110 | CONCEALED CEILING | 15.8 | 11.3 | 740 | 0.51 | 127 | 208v/3ø | 15.6 | FXSQ24 | (1)(2)(4)(5) |
| FCU-111 | CONCEALED CEILING | 15.7 | 10.0 | 740 | 0.51 | 127 | 208v/3ø | 12.0 | FXSQ24 | (1)(2)(4)(5) |
| FCU-112 | CONCEALED CEILING | 16.0 | 11.6 | 740 | 0.51 | 127 | 208v/3ø | 15.7 | FXSQ24 | (1)(2)(4)(5) |
| FCU-116 | CONCEALED CEILING | 7.2 | 5.1 | 340 | 0.37 | 52 | 208v/3ø | 4.8 | FXSQ12 (09) | (1)(2)(4)(5) |
| FCU-117 | CONCEALED CEILING | 7.4 | 5.1 | 340 | 0.37 | 52 | 208v/3ø | 4.6 | FXSQ12 (09) | (1)(2)(4)(5) |
| FCU-119 | CONCEALED CEILING | 7.2 | 5.0 | 340 | 0.37 | 52 | 208v/3ø | 4.6 | FXSQ12 (09) | (1)(2)(4)(5) |
| FCU-120 | CONCEALED CEILING | 7.2 | 5.0 | 340 | 0.37 | 52 | 208v/3ø | 4.6 | FXSQ12 (09) | (1)(2)(4)(5) |
| FCU-130A | CEILING SUSPENDED | 24 | 24 | 890 | – | 130 | 208v/1ø | – | FXHQ36 | (1)(2)(4)(5) |
| FCU-130B | CEILING SUSPENDED | 24 | 24 | 890 | – | 130 | 208v/1ø | – | FXHQ36 | (1)(2)(4)(5) |
| FCU-131 | WALL CABINET | 6.4 | 6.4 | 280 | – | 40 | 208v/1ø | – | FXAQ09 | (1)(2)(3)(5) |
| FCU-134A | CONCEALED CEILING | 15.4 | 14.7 | 740 | 0.51 | 127 | 208v/3ø | 7.1 | FXSQ24 | (1)(2)(4)(5) |
| FCU-134B | CONCEALED CEILING | 5.6 | 5.5 | 340 | 0.37 | 52 | 208v/3ø | 3.9 | FXSQ12 (09) | (1)(2)(4)(5) |
| FCU-134C | CONCEALED CEILING | 24.5 | 22.9 | 1020 | 0.71 | 269 | 208v/3ø | 12.7 | FXMQ36 | (1)(2)(3)(5) |
| FCU-134D | CONCEALED CEILING | 13.9 | 11.9 | 530 | 0.38 | 82 | 208v/3ø | 3.3 | FXSQ18 | (1)(2)(4)(5) |
| FCU-139 | CONCEALED CEILING | 6.2 | 6.0 | 340 | 0.37 | 52 | 208v/3ø | 2.6 | FXSQ12 (09) | (1)(2)(4)(5) |
| FCU-140A | CONCEALED CEILING | 24.2 | 22.5 | 1020 | 0.71 | 269 | 208v/3ø | 14.0 | FXMQ36 | (1)(2)(3)(5) |
| FCU-140B | CONCEALED CEILING | 20.4 | 17.3 | 690 | 0.66 | 157 | 208v/3ø | 4.9 | FXMQ30 | (1)(2)(3)(5) |
| FCU-140C | CONCEALED CEILING | 10.9 | 10.4 | 530 | 0.38 | 82 | 208v/3ø | 5.6 | FXSQ18 | (1)(2)(4)(5) |
| FCU-145 | CONCEALED CEILING | 19.8 | 19.1 | 690 | 0.66 | 157 | 208v/3ø | 10.2 | FXMQ30 | (1)(2)(3)(5) |
| FCU-146 | CONCEALED CEILING | 8.1 | 7.4 | 340 | 0.37 | 52 | 208v/3ø | 6.2 | FXSQ12 | (1)(2)(4)(5) |

(1) COOLING CAPACITY AT SUMMER ROOM TEMPERATURE: 75°F DB/ 50% RH. HEATING CAPACITY AT WINTER ROOM TEMPERATURE: 70°F DB.
(2) R-410A REFRIGERANT
(3) PROVIDE CONDENSATE PUMP.
(4) INTEGRAL CONDENSATE PUMP.
(5) SEE OSA SCHEDULE ON PLAN SHEETS FOR OSA DESIGN CFM. OUTSIDE AIR TEMPERATURE SUPPLIED TO UNIT: 55°F DB/ 54°F WB SUMMER, 60°F DB WINTER.

## VARIABLE VOLUME TERMINAL SCHEDULE

| MARK | SERVES | MAXIMUM CFM | MINIMUM CFM | MAXIMUM STATIC PRESS. DROP | ELECTRIC HEAT | | | REMARKS |
|---|---|---|---|---|---|---|---|---|
| | | | | | RESISTANCE KW | STEPS | VOLTAGE | |
| VAV-105 | FCU VARIOUS | 350 | 350 | 0.2" WC | – | – | 24 | – |
| VAV-110 | LEARNING CENTER 110 | 570 | 115 | 0.2" WC | – | – | 24 | – |
| VAV-111 | LEARNING CENTER 111 | 570 | 115 | 0.2" WC | – | – | 24 | – |
| VAV-112 | LEARNING CENTER 112 | 570 | 115 | 0.2" WC | – | – | 24 | – |
| VAV-116 | LEARNING CENTER 116 | 260 | 0 | 0.2" WC | – | – | 24 | – |
| VAV-117 | LEARNING CENTER 117 | 260 | 0 | 0.2" WC | – | – | 24 | – |
| VAV-119 | LEARNING CENTER 119 | 260 | 50 | 0.2" WC | – | – | 24 | – |
| VAV-120 | LEARNING CENTER 120 | 260 | 50 | 0.2" WC | – | – | 24 | – |
| VAV-122 | HOTELING | 120 | 0 | 0.2" WC | – | – | 24 | – |
| VAV-133 | FCU ADMIN. SERVICES | 275 | 80 | 0.2" WC | – | – | 24 | – |
| VAV-135 | H.R. OFFICE | 120 | 40 | 0.2" WC | – | – | 24 | – |
| VAV-138 | CONFERENCE | 190 | 0 | 0.2" WC | – | – | 24 | – |
| VAV-140A | FCU MEMBER SERVICES | 390 | 120 | 0.2" WC | – | – | 24 | – |
| VAV-140B | FCU MEMBER SERVICES | 175 | 90 | 0.2" WC | – | – | 24 | – |
| VAV-145 | FCU VARIOUS | 345 | 345 | 0.2" WC | – | – | 24 | – |
| VAV-206 | FCU VARIOUS | 455 | 135 | 0.2" WC | – | – | 24 | – |
| VAV-227 | CONFERENCE | 140 | 0 | 0.2" WC | – | – | 24 | – |
| VAV-215B | FCU TECH OFFICE | 435 | 130 | 0.2" WC | – | – | 24 | – |
| VAV-204 | FCU TECH OFFICE | 295 | 90 | 0.2" WC | – | – | 24 | – |
| VAV-217 | HOTELING | 120 | 0 | 0.2" WC | 0.5 | SCR | 208/3ø | (1) |
| VAV-225 | HOTELING | 120 | 0 | 0.2" WC | 0.5 | SCR | 208/3ø | (1) |
| VAV-219 | CONFERENCE | 95 | 0 | 0.2" WC | – | – | 24 | – |
| VAV-224C | FCU PUBLISHING | 345 | 105 | 0.2" WC | – | – | 24 | – |
| VAV-224A | FCU PUBLISHING | 460 | 140 | 0.2" WC | – | – | 24 | – |

(1) MINIMUM 70 CFM HEATING.

## EXHAUST TERMINAL SCHEDULE

| MARK | SERVES | MAXIMUM CFM | MINIMUM CFM | MAXIMUM STATIC PRESS. DROP | ELECTRIC HEAT | | | REMARKS |
|---|---|---|---|---|---|---|---|---|
| | | | | | RESISTANCE KW | STEPS | VOLTAGE | |
| EVAV-126 | FIRST FLOOR EXHAUST | 1245 | 1245 | 0.2" WC | – | – | 24 | – |
| EVAV-211 | SECOND FLOOR EXHAUST | 450 | 450 | 0.2" WC | – | – | 24 | – |

## GROUND LOOP (GEOTHERMAL) HEAT PUMP SCHEDULE

| SIZE | CONFIGURATION | NOMINAL TONS | CFM | EXT. S.P. | FAN H.P. | COOLING CAPACITY | | HEATING CAPACITY MBH | GPM | TWS&R PIPE | VOLTAGE/ø | MAX WPD | DRAIN PIPE | DESIGN BASIS | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | TOTAL MBH | SENSIBLE MBH | | | | | | | | |
| GT07 | WALL CABINET | 0.5 | 350 | – | 1/20 | 6.5 | 6.5 | 9.4 | 1.6 | 1/2" | 208/1ø | 1.5' | 3/4" | CLIMATEMASTER TRC09 | (1)(4) |
| GT15 | HORIZONTAL | 1.5 | 500 | .50" | 1/2 | 14.1 | 10.5 | 16.3 | 3.5 | 3/4" | 208/1ø | 15.0' | 3/4" | CLIMATEMASTER TTH026 | (1)(2)(3)(4) |
| GT18 | HORIZONTAL | 2 | 600 | .50" | 1/2 | 17.4 | 12.6 | 20.9 | 3.5 | 3/4" | 208/1ø | 15.0' | 3/4" | CLIMATEMASTER TTH026 | (1)(2)(3)(4) |
| GT26 | HORIZONTAL | 2.5 | 850 | .50" | 1/2 | 21.2 | 16.1 | 25.7 | 8 | 3/4" | 208/1ø | 15.0' | 3/4" | CLIMATEMASTER TTH026 | (1)(2)(3)(4) |
| GT38 | HORIZONTAL | 3 | 1250 | .50" | 1/2 | 30.5 | 24.1 | 36.7 | 9 | 3/4" | 208/1ø | 15.0' | 3/4" | CLIMATEMASTER TTH038 | (1)(2)(3)(4) |
| GT64 | HORIZONTAL | 5 | 1825 | .70" | 1 | 51.8 | 39.8 | 59.6 | 15 | 1" | 208/3ø | 15.0' | 3/4" | CLIMATEMASTER TTH064 | (1)(2)(3)(4) |

(1) COOLING CAPACITY AT 64°F EWT. SUMMER ROOM TEMPERATURE: 75°F DB/ 50% RH, OUTSIDE AIR TEMPERATURE SUPPLIED TO UNIT: 55°F DB/ 54°F WB.
HEATING CAPACITY AT WINTER ROOM TEMPERATURE: 70°F DB.
(2) R-410A REFRIGERANT
(3) ECM VARIABLE SPEED FAN MOTOR (BRUSHLESS-DC)
(4) CONDENSATE PUMP WITH MINIMUM 25 FT HEAD.

## DEDICATED OUTSIDE AIR SYSTEM SCHEDULE

| MARK | SERVES | NOMINAL UNIT SIZE (TONS) | | SUPPLY FAN | | | | COOLING COIL (DX) | | | | ENERGY RECOVERY WHEEL (TOTAL ENTHALPY) | | | | | CONDENSER | | HEATING SECTION | | | AIR FILTERS | | ELECTRICAL VOLTAGE | DESIGN BASIS | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | CFM | | ESP | HP | REFRIGERANT TYPE | MIN. TOTAL CAPACITY (MBH) | MIN. SENSIBLE CAPACITY (MBH) | STAGES | EXHAUST FAN | | WHEEL DESIGN PERFORMANCE | | | TYPE | COMPRESSOR QUANTITY | HEAT TYPE | INPUT | HEAT STAGES | PRE-FILTER | FINAL FILTER | | | |
| | | UNIT | WHEEL | MAX. | MIN. | | | | | | | ESP | HP | SUPPLY | EXHAUST | EFFICIENCY | | | | | | | | | | |
| DOAS-1 | 1ST AND 2ND FLOOR | 20 | 15 | 6000 | 4600 | 2.3" | 15 | R-410A | 391 | 225 | 2 | 1.0 | 7.5 | 6000 | 5400 | 75% MIN. | AIR COOLED | 4 | ELECTRIC | 40 KW | SCR | 1" THROWAWAY | MERV 13 | 208/3ø | TRANE CDQ | (1)(2)(3)(4)(5)(6) |

(1) SUMMER 95°F DB/75°F WB AMBIENT, WINTER 18°F DB AMBIENT.
(2) SUPPLY AIR TEMP 55°F DB/46°F DEWPOINT SUMMER, 60°F DB/46°F DEWPOINT WINTER.
(3) SEE SPECIFICATION FOR OPTIONS.
(4) VFD MOTOR CONTROLLERS SUPPLY AND EXHAUST.
(5) EXHAUST AIR: 80°F DB/ 67°F WB SUMMER, 75°F DB/ 62.5°F WB WINTER.
(6) MODULATING HOT GAS REHEAT COIL.

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RICHARD + WITTSCHIEBE

# ASHRAE HEADQUARTERS
ADDITION AND RENOVATION



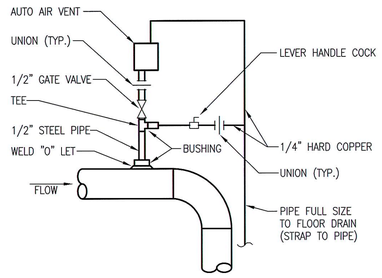
| | | |
|---|---|---|
| 7/12/07 | Final System Design | |

DRAWING TITLE:
**HVAC SCHEDULES**

PROJECT NUMBER:
**200614**

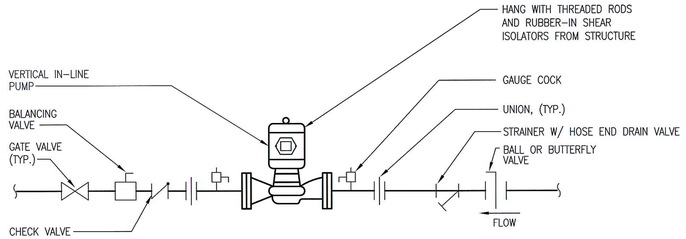
DATE:
**6/15/07**

DRAWING NUMBER:
**M4.1**



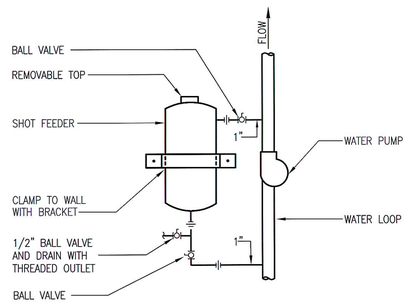

## AUTOMATIC AIR VENT INSTALLATION

6 / M5.1 SCALE: NO SCALE



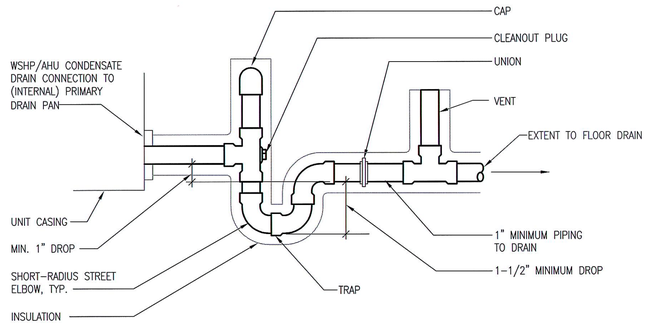

## VERTICAL IN-LINE PUMP DETAIL

3 / M5.1 SCALE: NOT TO SCALE




## SHOT FEEDER DIAGRAM

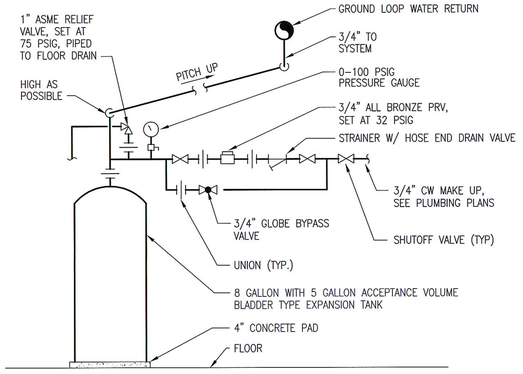
5 / M5.1 SCALE: NO SCALE




## CONDENSATE TRAP DETAIL

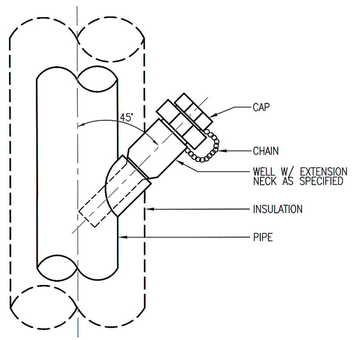
2 / M5.1 SCALE: NOT TO SCALE

DRAIN LINE SHALL BE INSTALLED WITH A MINIMUM SLOPE OF 1/8" PER LINEAR FOOT.




## GROUND LOOP WATER MAKE-UP/ EXPANSION TANK PIPING DETAIL

4 / M5.1 SCALE: NO SCALE




## THERMOMETER WELL DIAGRAM

1 / M5.1 SCALE: NOT TO SCALE

## HVAC LEGEND & ABBREVIATIONS

| SYMBOL | DESCRIPTION |
|---|---|
| | THERMOMETER |
| | PRESSURE GAUGE |
| | DRIP LEG |
| | THERMOMETER WELL |
| | PIPE FLOW ARROW |
| GLWR | GROUND LOOP WATER RETURN |
| GLWS | GROUND LOOP WATER SUPPLY |
| D | CONDENSATE DRAIN |
| RL | REFRIGERANT LIQUID |
| RS | REFRIGERANT SUCTION |
| OR | ECCENTRIC REDUCER FLAT SIDE ON BOTTOM OR FLAT SIDE ON TOP |
| | CONCENTRIC REDUCER |
| | PIPE UNION |
| | PIPE RISE |
| | PIPE DROP |
| | CAP ON END OF LINE |
| | GATE VALVE |
| | BUTTERFLY VALVE |
| | BALANCING VALVE |
| | CHECK VALVE |
| | METERING VALVE |
| | SOLENOID VALVE |
| | GLOBE VALVE |
| | NEEDLE VALVE |
| | TWO WAY MODULATING MOTORIZED CONTROL VALVE |
| | BALL VALVE |
| | PRESSURE REDUCING VALVE |
| | RELIEF VALVE |
| | STRAINER |
| | SIGHT GLASS |
| | AUTOMATIC AIR VENT |
| | MANUAL AIR VENT |
| | TEST PLUG |
| | GAUGE COCK |

## HVAC LEGEND & ABBREVIATIONS

| SYMBOL | DESCRIPTION |
|---|---|
| 00x00 | RECTANGULAR AIR DUCT – FIRST DIMENSION IS SIDE SHOWN |
| | ROUND DUCT (A"ø) OR FLAT OVAL (AxB) |
| | LINED DUCTWORK, DIMENSIONS ARE OUTER METAL TO OUTER METAL |
| | AIR DUCT FLEXIBLE CONNECTOR |
| OR | SUPPLY AIR RECTANGULAR DUCT RISE OR DROP |
| OR | RETURN OR OUTSIDE AIR RECTANGULAR DUCT RISE OR DROP |
| OR | EXHAUST AIR RECTANGULAR DUCT RISE OR DROP |
| | 45° BRANCH TAKE-OFF WITH SPLITTER DAMPER AND CONTROL ROD |
| | |
| | DOUBLE ELBOW WITH SPLITTER DAMPER WITH CONTROL ROD |
| F.D. | FIRE DAMPER |
| SD | SMOKE DAMPER |
| F/SD | COMBINATION FIRE/SMOKE DAMPER |
| | MOTOR OPERATED DAMPER SAME SIZE AS DUCT UNLESS OTHERWISE NOTED |
| | DUCT-MOUNTED STATIC PRESSURE SENSOR |
| MD | MANUAL VOLUME DAMPER |
| SKD | SMOKE DETECTOR FURNISHED UNDER ANOTHER DIVISION. MOUNT IN DUCTWORK. |
| | BACKDRAFT DAMPER |
| | SQUARE ELBOW WITH TURNING VANES |
| | DUCT TRANSITION, RECTANGULAR TO ROUND OR OVAL |
| | DUCT TRANSITION, RECTANGULAR TO RECTANGULAR |
| | RADIUS ELBOW TAKE-OFF |
| G | FLEX DUCT AT DIFFUSER |
| | SINGLE LINE DUCT TRANSITION |
| UP OR DN | GRADE ARROW-INDICATES RISE OR DROP IN DUCT OR PIPE |
| | REFRIGERANT BRANCH SELECTOR SWITCH |
| S | DDC TEMPERATURE SENSOR (TEMPERATURE & HUMIDITY) |
| SP | SPACE STATIC PRESSURE SENSOR |
| TS | REMOTE THERMISTOR |
| C | CARBON DIOXIDE SENSOR |
| E | EMERGENCY FAN SHUTDOWN SWITCH |
| R.O. | RETURN AIR OPENING IN WALL ABOVE CEILING |
| AFF | ABOVE FINISHED FLOOR |
| BOS | BOTTOM OF STRUCTURE |
| MOD | MOTOR OPERATED DAMPER |
| OSA | OUTSIDE VENTILATION SUPPLY AIR |
| FM | FILTER MODULE (AT FAN COILS) |

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RICHARD + WITTSCHIEBE

# ASHRAE HEADQUARTERS
ADDITION AND RENOVATION



| | | |
|---|---|---|
| | 7/12/07 | Final System Design |

DRAWING TITLE:

**HVAC DETAILS & LEGEND**

PROJECT NUMBER:

**200614**

DATE:

**6/15/07**

DRAWING NUMBER:

**M5.1**

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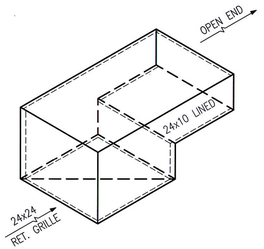
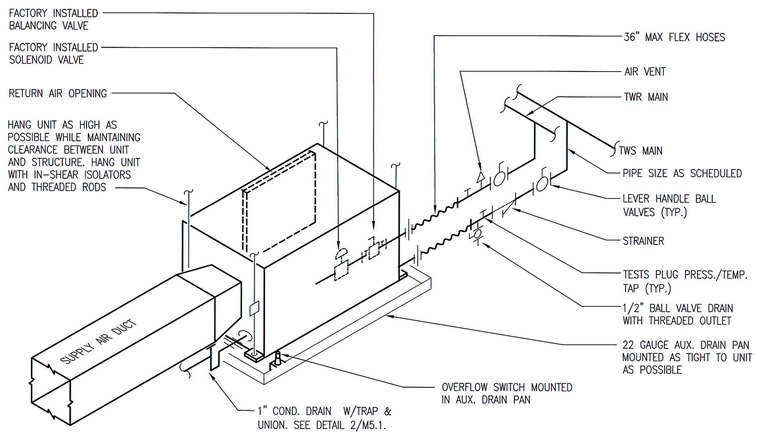


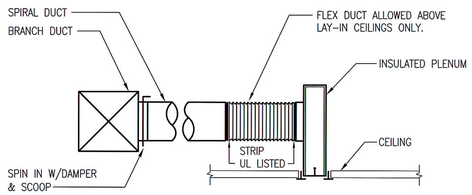

## 8 M5.2 LINED ELBOW
SCALE: NO SCALE



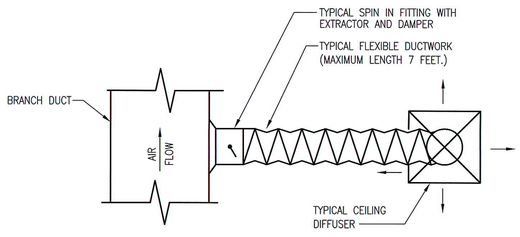

NOTES
1: MAINTAIN MANUFACTURERS REQUIRED CLEARANCES ON ALL SIDES AND DO NOT LOCATE UNIT OVER CEILING FIXTURES, LIGHTS, SPRINKLERS, AND PIPING.
2: SEE PLAN FOR RIGHT HAND/LEFT HAND DUCT CONFIGURATION.
3: COORDINATE WITH OTHER TRADES TO KEEP SERVICE ACCESS CLEAR.

## 5 M5.2 HORIZONTAL GROUND LOOP HEAT PUMP PIPING
SCALE: NO SCALE

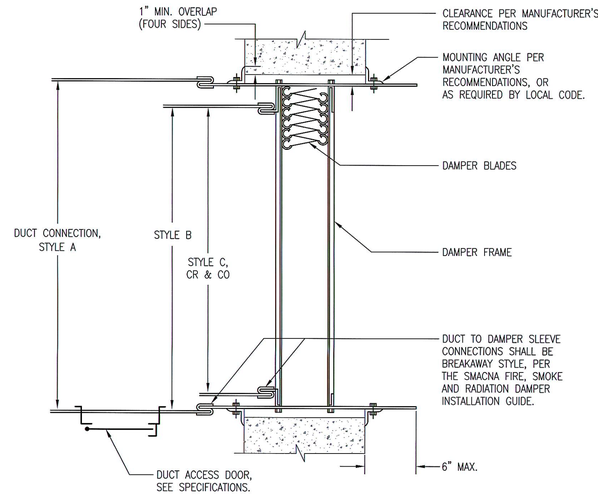
ALL HEAT PUMPS LOCATED ABOVE LAY-IN CEILINGS SHALL BE ACCESSIBLE WITHOUT HAVING TO CUT MAIN CEILING RUNNERS. HEAT PUMP INSTALLER SHALL COORDINATE WITH THE CEILING INSTALLER TO ACHIEVE THIS RESULT BY SPECIAL PLACEMENT OF THE MAIN RUNNERS.




## 7 M5.2 LINEAR DIFFUSER DIAGRAM
SCALE: NOT TO SCALE
SEE SPECS FOR MAX. FLEX DUCT LENGTH

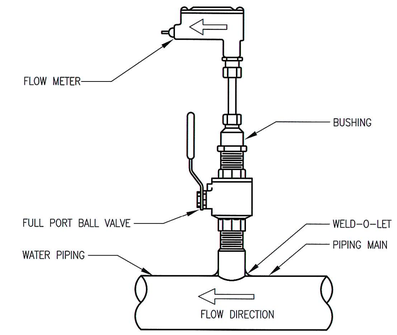



## 6 M5.2 FLEXIBLE DUCT TAKE-OFF DETAIL
SCALE: NO SCALE

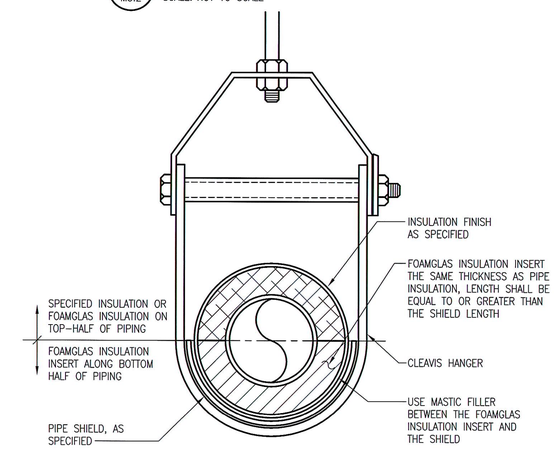



## 4 M5.2 FIRE DAMPER DETAIL
SCALE: NOT TO SCALE

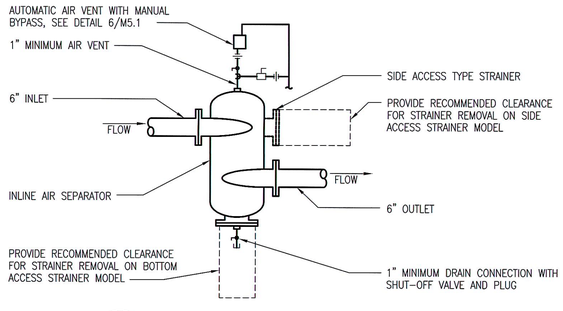
NOTE: SINGLE DAMPER SECTION SHOWN, SEE MANUFACTURER'S REQUIREMENTS FOR INSTALLATION OF MULTIPLE DAMPER SECTIONS.




## 3 M5.2 FLOW METER PIPING
SCALE: NOT TO SCALE




## WATER PIPING SUPPORT DETAIL: FOAMGLAS INSERT
2 M5.2
SCALE: NOT TO SCALE
FOR ALL WATER PIPING 2" AND LARGER.




## 1 M5.2 INLINE AIR SEPARATOR DETAIL
SCALE: NO SCALE

NOTE: PROVIDE UNION AT INLET AND OUTLET TO SEPARATOR IF SEPARATOR IS NOT PROVIDED WITH FLANGED CONNECTIONS.

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# ASHRAE HEADQUARTERS
ADDITION AND RENOVATION



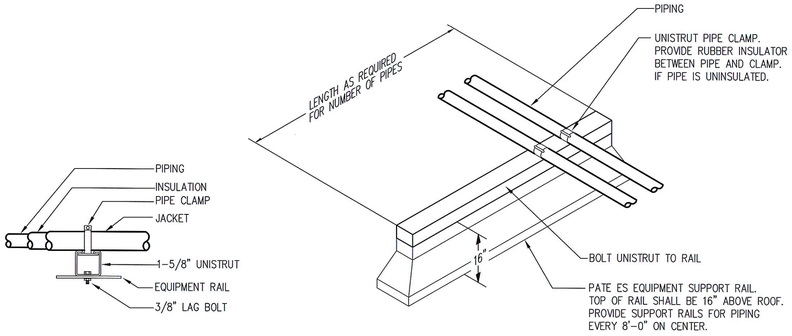
| | | |
|---|---|---|
| | 7/12/07 | Final System Design |

DRAWING TITLE:
**HVAC DETAILS**

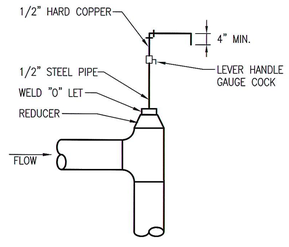
PROJECT NUMBER:
**200614**

DATE:
**6/15/07**

DRAWING NUMBER:
**M5.2**

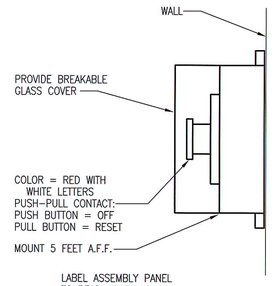



1 / M5.3 **REFRIGERANT PIPING SUPPORT DETAIL**
SCALE: NO SCALE




2 / M5.3 **MANUAL AIR VENT INSTALLATION**
SCALE: NO SCALE

NOTE: IF MAIN BRANCH OF PIPING IS COPPER, ALL VENT SUBSEQUENT PIPING SHALL BE COPPER.




LABEL ASSEMBLY PANEL TO READ AS FOLLOWS:
**"EMERGENCY HVAC STOP SWITCH"**
LABEL BUTTON TO READ AS FOLLOWS:
**"PULL TO RESET"**

3 / M5.3 **EMERGENCY HVAC STOP SWITCH DETAIL**
SCALE: NO SCALE

COMPLETE EMERGENCY "POWER OFF" PUSH BUTTON PILLA MODEL SERIES ST120SL

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# ASHRAE HEADQUARTERS
## ADDITION AND RENOVATION



| | | |
|---|---|---|
| | 7/12/07 | Final System Design |

DRAWING TITLE:
**HVAC DETAILS**

PROJECT NUMBER:
**200614**

DATE:
**6/15/07**

DRAWING NUMBER:
**M5.3**

# SEQUENCE OF OPERATIONS

DEDICATED OUTSIDE AIR UNIT: DOAS-1

1. Unit shall be normally started/stopped by the DDC system.
2. The supply fan and exhaust fan shall be manually started and stopped from the HAND and OFF positions of the HAND-OFF-AUTO switch on the Variable Frequency Drive (VFD) and automatically started and stopped by the DDC system when the switch is in the AUTO position. All safety devices of the VFD shall operate with the switch in the HAND or AUTO position. DDC system shall monitor the HOA position and alarm if the switch is in the HAND or OFF position. The DDC system shall initiate an alarm on the VFD failure as indicated by the VFD alarm.
3. DOAS shall operate based on an occupied/unoccupied schedule as designated by the owner.
4. DOAS unit shall remian off durning morning warm-up or cool down.
5. Upon start-up, the outside air and exhaust air dampers shall open and the supply fan and exhaust fan shall slowly ramp up to static pressure setpoint.
6. In the event of a power interruption of fan shutdown, the outside air and exhaust air dampers shall close. DOAS shall automatically restart after a power failure.
7. Supply air fan speed and exhaust air fan speed shall be modulated via the variable frequency drive to maintain associated duct static pressures based on signals from the associated duct mounted static pressure sensors. Initial static pressure setpoint shall be set at (+) 0.5 w.g. (adjustable) for supply and (-) 0.5 w.g. (adjustable) for exhaust. Final setpoint shall be determined by the test and balance contractor. Variable frequency drive shall be normally stopped. Upon failure of static pressure sensor, the associated fan shall remain at its previous setting and an alarm shall be initiated.
8. The units own internal controls shall modulate to maintain discharge air temperature as follows:
   a. When ambient temperature is below 60°F (adjustable): heat wheel shall stop/operate and the electric shall energize/modulate based on the SCR controller only during heat wheel operation (applicable to non-failure of the heat wheel) to maintain a discharge temperature between 50°F and 70°F (adjustable). Discharge temperature shall be reset based on a call for heating from any DX fan coil or heat pump. On a call for heat dsicharge temperature shall reset upwards 5°F every 10 minutes until there are no space heating calls. Provide a 30 minute time delay before temperature reset is made unless there is a call for space heating. Discahrge air supply shall then be reset down 5°F every 10 minutes.
   b. When ambient temperature is between 60°F (adjustable) and 75°F (adjustable), the heat wheel shall stop.
   c. When ambient temperature us above 75°F (adjustable), the heat wheel shall operate, first stage of mechanical cooling shall energize, and DDC shall modulate hot gas reheat coil face and bypass dampers to maintain a discharge temperature between 55°F and 75°F (adjustable). Hot gas reheat coil face and bypass shall be in full bypass until or unless a zone temperautre drops to or is below 72°F (adjustable). If a space temperature is at or below 72°F, the hot gas reheat coil face bypass dampers shall modulate to raise the discharge air temperature 5°F every 10 minutes. Provide a 30 minute time delay before reseting the discharge temperature. If all space temperatures are above 74°F the hot gas reheat coil face and bypass dampers shall modulatee dropping the discharge temperature 5°F every 15 minutes. If discharge temperature cannot be maintained with the first stage of cooling, the second stage of mechanical cooling shall energize. If both stages of mechanical cooling are energized and the hot gas reheat valve is 90% (adjustable) opening, the second stage of mechanical cooling shall de-energize.
   d. On a rise in space humidity as sensed by a minimum of two space humidity sensors (as applicable) in the occupied area above 60% RH (adjustable), dehumidification mode shall energize; heat wheel shall operate, cooling shall energize to maintain a 55°F cooling coil leaving air temperature and hot gas reheat coil face and bypass dampers shall modulate to maintain discharge air temperature subject to "c" above. On a drop in humidity below 50% RH (adjustable) dehumidification mode shall stop.
9. A smoke detector in the supply and exhaust duct will signal fire alarm for unit shut down.
10. Supply and exhaust duct static pressures shall be reset upwards/downwards in 0.15" increments based on associated supply air VAV's or exhaust dampers. If a terminal unit or damper is 95% open or greater, the static pressure shall be reset up. If the worst-case terminal unit or damper is between 85% and 95% static pressure, setpoint shall remain constant. If the worst-case terminal unit or damper is less than 85% open static pressure, setpoint shall reset down. Provide a 5 minute (adjustable) time delay between each incremental step.
11. Activation of the Emergency Fan Stop switch shall stop the supply and exhaust fans.
12. Activation of Fan Stop signal from the fire alarm panel shall stop the DOAS unit.
13. DDC shall monitor the units supply airflow and exhaust airflow.
14. DDC shall monitor the units supply and exhaust air temperastures and humidities as designated in the point list.
15. DDC shall monitor Amps and KWH and trend log results for the DOAS unit.
16. DDC shall calculate building leakage based on the difference between the outside supply airflow and the exhaust airflow.

OUTSIDE AIR SUPPLY VARIABLE VOLUME TERMINAL UNITS, VAV:

1. Units shall be enabled/disabled by the DDC system based on a time schedule.
2. Units shall provide airflows as scheduled.
3. VAV's shall modulate to maintain carbon dioxide concentration levels at 700 PPM above outdoor concentration levels as sensed by the associated carbon dioxide space sensor as applicable.
4. Outside airflow and temperature shall be monitored by the DDC system.

EXHAUST AIR MODULATING DAMPERS:

1. Exhaust VAV's (EVAV) serving the toilet area shall modulate based on input from the airflow station to maintain constant exhaust oriflow as scheduled.
2. General exhaust dampers (GED) serving the occupied space shall modulate based on space static pressure sensors to maintain a space static pressure of (+) 0.05" (adjustable) as sensed by the space static pressure sensors.

## INPUT/ OUTPUT SUMMARY

| | OUTPUTS | | | | | INPUTS | | | | | | | | | | | | | SOFTWARE | | | | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DIGITAL | | | | ANALOG | DIGITAL | | | | | ANALOG | | | | | | | | ALARM | | | ENERGY MANAGEMENT | | | |
| | START/STOP | OPEN/CLOSE | ENABLE/DISABLE | OCCUPIED/UNOCCUPIED | DDC MODULATION | SETPOINT ADJUST | DIFF. PRESS. SWITCH | CURRENT SWITCH | ON/OFF | OPEN/CLOSE CONTACT | MANUAL OVERRIDE | AIRFLOW (CFM) | STATIC PRESSURE | GPM | %SPEED/Hz/CURRENT | TEMPERATURE | HUMIDITY/DEWPOINT | POWER (AMPS/KW/KWH) | CO2 LEVEL (PPM) | DIFFERENTIAL PRESSURE | EQUIPMENT FAILURE | HI/LO LIMIT | TEMPERATURE | TIME SCHEDULE | RUN TIME | OVERRIDE PROGRAM | DAY/NIGHT SETBACK | |
| DEDICATED OUTSIDE AIR UNIT | X | | | | | | | | | | | | | | | | | | | | X | | | X | | X | | |
| SUPPLY AIR FAN (VFD) | | | | | X | | | | | | | | | | X | | | | | | X | | | | | | | |
| SUPPLY FAN VFD HOA POSITION | | | | | | | | | | X | | | | | | | | | | | | | | | | | | TOTAL OF THREE POSITIONS |
| SUPPLY FAN STATUS | | | | | | | | X | | | | | | | | | | | | | | | | | | | | |
| EXHAUST FAN (VFD) | | | | | X | | | | | | | | | | X | | | | | | X | | | | | | | |
| EXHAUST FAN VFD HOA POSITION | | | | | | | | | | X | | | | | | | | | | | | | | | | | | TOTAL OF THREE POSITIONS |
| EXHAUST FAN STATUS | | | | | | | | X | | | | | | | | | | | | | | | | | | | | |
| SUPPLY DUCT STATIC PRESSURE | | | | | | | | | | | | | X | | | | | | | | X | | | | | | | |
| EXHAUST DUCT STATIC PRESSURE | | | | | | | | | | | | | X | | | | | | | | X | | | | | | | |
| SPACE STATIC PRESSURE | | | | | | | | | | | | | X | | | | | | | | X | | | | | | | (3) |
| SUPPLY AIR TEMPERATURE | | | | | | | | | | | | | | | | X | | | | | | X | | | | | | DISCHARGE FROM UNIT |
| COOLING STAGES (VARIES) | | | X | | | | | | | | | | | | | | | | | | | | | | | | | (4) (5) |
| COOLING COIL SUPPLY AIR TEMPERATURE | | | | | | | | | | | | | | | | X | | | | | | | | | | | | |
| RECOVERY WHEEL #1 OPERATION | | | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| RECOVERY WHEEL #1 STATUS | | | | | | | | X | | | | | | | | | | | | | X | | | | | | | |
| RECOVERY WHEEL #1 BYPASS DAMPERS | | X | | | | | | | | | | | | | | | | | | | | | | | | | | TOTAL OF TWO |
| RECOVERY WHEEL #2 OPERATION | | | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| RECOVERY WHEEL #2 STATUS | | | | | | | | X | | | | | | | | | | | | | X | | | | | | | |
| RECOVERY WHEEL #2 BYPASS DAMPERS | | X | | | | | | | | | | | | | | | | | | | | | | | | | | TOTAL OF TWO |
| OSA/EXHAUST DAMPERS | | X | | | | | | | | | | | | | | | | | | | | | | | | | | TOTAL OF TWO |
| BYPASS DAMPER EXHAUST TO SUPPLY | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SMOKE DETECTOR | | | | | | | | | | X | | | | | | | | | | | | | | | | | | (6) |
| AIR FILTER DIFFERENTAL PRESSURE | | | | | | | | | | | | | | | | | | | | X | | X | | | | | | (7) |
| AIR FILTER DIFFERENTAL PRESSURE | | | | | | | | | | | | | | | | | | | | X | | X | | | | | | (8) |
| AIR FILTER DIFFERENTAL PRESSURE | | | | | | | | | | | | | | | | | | | | X | | X | | | | | | (9) |
| OUTSIDE AIR SUPPLY VAV | | | | | X | | | | | | | X | | | | | | | | | | | | | | | | (3) |
| GEMERAL EXHAUST AIR DAMPERS (GED) | | | | | X | | | | | | | | | | | | | | | | | | | | | | | (3) |
| GEMERAL EXHAUST AIRFLOW | | | | | | | | | | | | X | | | | | | | | | | | | | | | | |
| TOILET EXHAUST VALVES (EVAV) | | | | | X | | | | | | | X | | | | | | | | | | | | | | | | (3) |
| SPACE STATIC PRESSURE SENSORS | | | | | | | | | | | | | | X | | | | | | | | | | | | | | (3) |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DEDICATED OUTSIDE AIR UNIT ENCHANCED POINTS | | | | | | | | | | | | | | | | | | | | | | | | | | | | (1) |
| OUTSIDE AIR FLOW | | | | | | | | X | | | | X | | | | | | | | | | | | | | | | UNIT INTAKE |
| EXHAUST AIR FLOW | | | | | | | | X | | | | X | | | | | | | | | | | | | | | | UNIT EXHAUST |
| SUPPLY AIR TEMPERATURE UP | | | | | | | | | | | | | | | | X | | | | | | | | | | | | (10) |
| SUPPLY AIR HUMIDITY UP | | | | | | | | | | | | | | | | | X | | | | | | | | | | | (10) |
| SUPPLY AIR TEMPERATURE DOWN | | | | | | | | | | | | | | | | X | | | | | | | | | | | | (11) |
| SUPPLY AIR HUMIDITY DOWN | | | | | | | | | | | | | | | | | X | | | | | | | | | | | (11) |
| SUPPLY AIR HUMIDITY UP | | | | | | | | | | | | | | | | | X | | | | | | | | | | | (12) |
| SUPPLY AIR HUMIDITY DOWN | | | | | | | | | | | | | | | | | X | | | | | | | | | | | (13) |
| EXHAUST AIR TEMPERATURE UP | | | | | | | | | | | | | | | | X | | | | | | | | | | | | (10) |
| EXHAUST AIR HUMIDITY UP | | | | | | | | | | | | | | | | | X | | | | | | | | | | | (10) |
| EXHAUST AIR TEMPERATURE DOWN | | | | | | | | | | | | | | | | X | | | | | | | | | | | | (11) |
| EXHAUST AIR HUMIDITY DOWN | | | | | | | | | | | | | | | | | X | | | | | | | | | | | (11) |
| AMPS | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| KWH | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| BUILDING LEAKAGE | | | | | | | | | | | | X | | | | | | | | | | | | | | | | (2) |
| OUTSIDE AIR VAV SUPPLY AIR TEMPERATURE | | | | | | | | | | | | | | | | X | | | | | | | | | | | | (3) |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

(1) ENHANCED POINTS ASSOCIATED WITH THE LIVING LAB
(2) BASED ON THE DIFFERENCE BETWEEN THE SUPPLY AIRFLOW AND EXHAUST AIRFLOW
(3) SEE PLANS FOR QUANTITY AND LOCATION
(4) MONITORING ONLY BY THE DDC SYSTEM, UNIT CONTROLS FUNCTION
(5) PROVIDE SERIAL INTERFACE FROM THE DDC SYSTEM TO DOAS-1 FOR FULL MONITORING MONITORING OF UNIT INCLUDING OPERATION OF THE 5 ASSOCIATED CONDENSING UNITS.
(6) TWO IN THE SUPPLY DUCT, ONE IN THE EXHAUST DUCT.
(7) SUPPLY AIR PRE-FILTER.
(8) SUPPLY AIR FINAL FILTER.
(9) EXHAUST AIR FILTER.
(10) UPSTREAM OF TOTAL ENERGY RECOVERY WHEEL #1.
(11) DOWNSTREAM OF TOTAL ENERGY RECOVERY WHEEL #1.
(12) UPSTREAM OF CDQ WHEEL #2.
(13) DOWNSTREAM OF CDQ WHEEL #2.
(14) DOWNSTREAM OF COOLING COIL.

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# ASHRAE HEADQUARTERS
## ADDITION AND RENOVATION



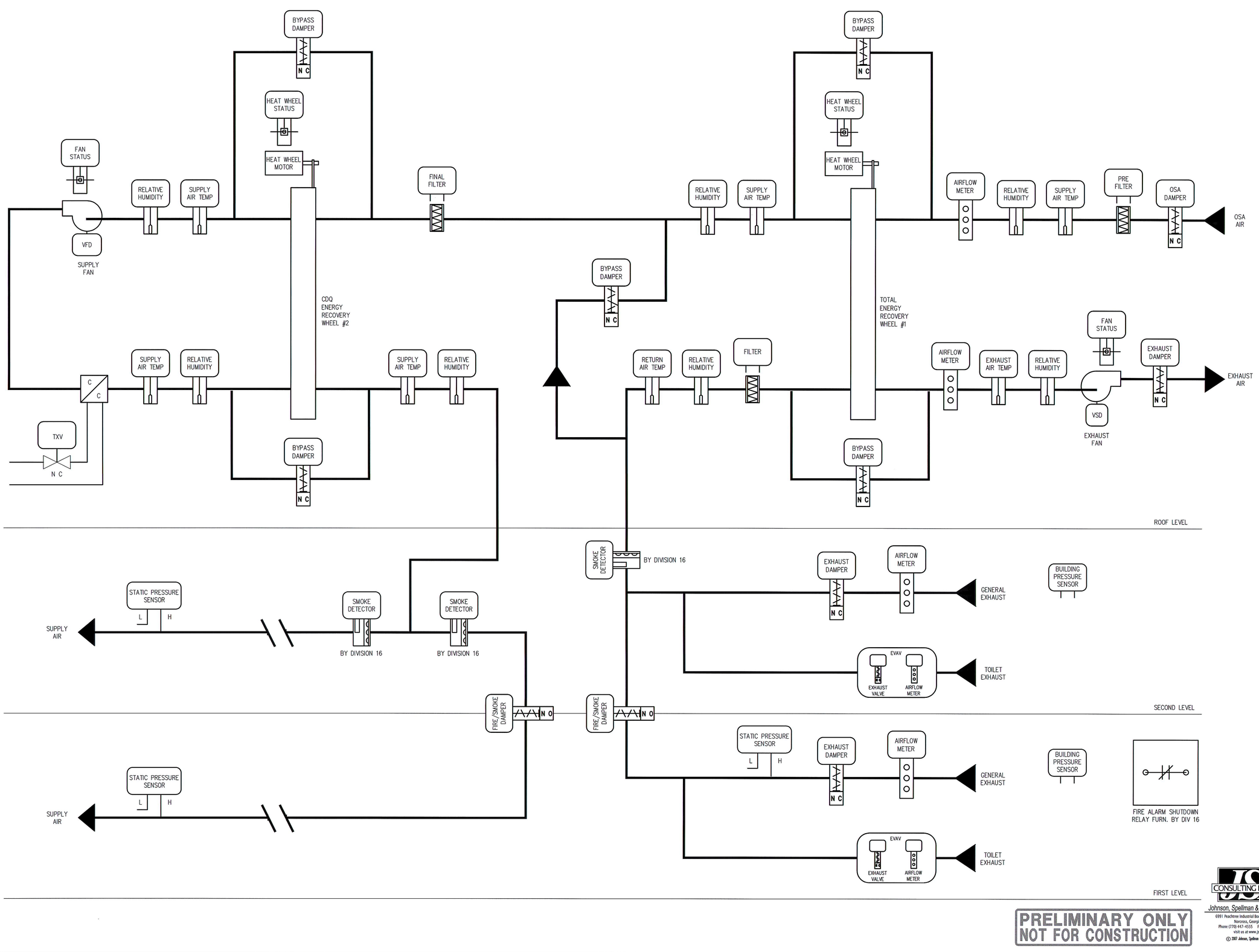
| | | |
|---|---|---|
| | 7/12/07 | GMP System Design |

DRAWING TITLE:
**DOAS-1 CONTROL SEQUENCE & POINTS LIST**

PROJECT NUMBER:
**200614**

DATE:
**6/15/07**

DRAWING NUMBER:
**M6.1**

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# ASHRAE HEADQUARTERS
## ADDITION AND RENOVATION



| | | |
|---|---|---|
| 7/12/07 | Final System Design | |

DRAWING TITLE:

**DOAS-1 CONTROL SCHEMATIC**

PROJECT NUMBER:

**200614**

DATE:

**6/15/07**

DRAWING NUMBER:

**M6.1A**

# SEQUENCE OF OPERATIONS

VARIABLE REFRIGERANT FLOW (DAIKIN) SYSTEM:

1. The variable refrigerant flow system, including the outdoor condening units, indoor fan coil units, and refrigerant controllers, shall operate under their internal controls. A serial interface is provide for remote changes through the DDC system and provide alarms for the Diakin control system. The Diakin control system will control all thermal expansion valves, compressor operation, etc. See the Input/Output Sumary list of available interface points and remote control options.

DDC MONITORING OF THE FIRST FLOOR:

1. DDC shall monitor space temperature, CO2 levels and humidity as shown per the floor plans.
2. DDC shall monitor each fan coil electronic filter module for differential pressure.

MORNING WARM-UP AND MORNING COOL DOWN:

1. Morning Warm-up and Cool Down – DDC shall enable the Diakin system to achieve Occupied heating/cooling setpoint at the start of Occupied hours. Software shall calculate unit start time based on indoor and outdoor temperatures.

| INPUT/ OUTPUT SUMMARY | OUTPUTS | | | | | | INPUTS | | | | | | | | | | | | | | SOFTWARE | | | | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DIGITAL | | | | ANALOG | | DIGITAL | | | | ANALOG | | | | | | | | | | ALARM | | | ENERGY MANAGEMENT | | | |
| | START/STOP | OPEN/CLOSE | ENABLE/DISABLE | OCCUPIED/UNOCCUPIED | DDC MODULATION | SETPOINT ADJUST | DIFF. PRESS. SWITCH | CURRENT SWITCH | ON/OFF | OPEN/CLOSE CONTACT | MANUAL OVERRIDE | AIRFLOW (CFM) | STATIC PRESSURE | GPM | %SPEED/HZ/CURRENT | TEMPERATURE | HUMIDITY/DEWPOINT | POWER (AMPS/KW/KWH) | CO2 LEVEL (PPM) | DIFFERENTIAL PRESSURE | EQUIPMENT FAILURE | HI/LO LIMIT | TEMPERATURE | TIME SCHEDULE | RUN TIME | OVERRIDE PROGRAM | DAY/NIGHT SETBACK | |
| DIAKIN VRV SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | (1) |
| START/STOP (CONTROL) | X | | | | | | | | | | | | | | | | | | | | | | | X | | X | X | (2) |
| START/START (MONITORING) | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) |
| TRIP | | | | | | | | | | | | | | | | | | | | | X | | | | | | | (2) (10) |
| MALFUNCTION CODE | | | | | | | | | | | | | | | | | | | | | X | | | | | | | (2) (14) |
| AIR CONDITIONING MODE (SETTING) | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (15) |
| AIR CONDITIONING MODE (MONITORING) | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) |
| AIR FLOW RATE (SETTING) | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (4) |
| AIR FLOW RATE (MONITORING) | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (4) |
| ROOM TEMPERATURE INDICATOR | | | | | | | | | | | | | | | | X | | | | | | | | | | | | (2) (3) |
| TEMPERATURE ADJUST | | | | | | X | | | | | | | | | | | | | | | | | | | | | | (2) (3) |
| FILTER SIGN | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (5) |
| FILTER SIGN RESET | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (5) |
| REMOTE CONTROL MODE SETTING (START/STOP) | X | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) |
| REMOTE CONTROL MODE SETTING (A/C MODE) | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) |
| REMOTE CONTROL MODE SETTING (TEMP ADJUST) | | | | | | X | | | | | | | | | | | | | | | | | | | | | | (2) |
| CENTRAL/LOCAL EQUIPMENT OPERATION | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (5) |
| SYSTEM FORCED OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (9) |
| AIR DIRECTION (SETTING) | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (5) |
| AIR DIRECTION (MONITORING) | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (5) |
| FORCED THERMO OFF (SETTING) | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (6) |
| FORCED THERMO OFF (MONITORING) | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (6) |
| ENERGY EFFICIENCY (SETTING) | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (7) |
| ENERGY EFFICIENCY (MONITORING) | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (7) |
| THERMO OPERATION STATUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (8) |
| COMPRESSOR OPERATION STATUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) |
| INDOOR FAN OPERATION STATUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) |
| HEATER OPERATION STATUS | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) (5) |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| SPACE TEMPERATURE | | | | | | | | | | | | | | | | X | | | | | | | | | | | | (11) (12) |
| SPACE HUMIDITY | | | | | | | | | | | | | | | | | X | | | | | | | | | | | (11) |
| SPACE CO2 LEVEL | | | | | | | | | | | | | | | | | | X | | | | | | | | | | (11) |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FAN COIL FILTER MODULE | | | | | | | | | | | | | | | | | | | X | | | X | | | | | | (13) |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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(1) SEE FLOOR PLANS FOR THE LOCATION OF ALL FAN COILS AND CONDENSING UNITS.
(2) BACNET SERIAL INTERFACE POINTS FROM THE DIAKIN SYSTEM.
(3) DIAKIN GENERATES TEMPERATURES IN CELSIUS THEREFORE A CONVERTER WILL BY REQUIRED BY ALC.
(4) FAN SPEED
(5) NOT USED
(6) FAN ONLY – SHUT OFF OF AC OR HEAT
(7) SPACE TEMPERATURE RESET WITH NO CHANGE IN THE DISPLAY OF SPACE TEMPERATURE SET POINT
(8) CALL FOR HEATING OR COOLING
(9) FIRE ALARM TIE-IN
(10) FOR EACH FAN COIL AND CONDENSING UNIT
(11) SEE FLOOR PLANS FOR LOCATION. TEMPERATURE SENSOR/OVERRIDE SHALL BE PROVIDED FOR EACH FAN COIL.
(12) TEMPERATURE SENSOR FOR MONITORING SPACE TEMPERATURE
(13) FILTER DIFFERENTIAL PRESSURE SWITCH FOR DYNAMIC (ELECTRONIC) FILTER MODULE ASSOCIATED WITH EACH DIAKIN FAN COIL
(14) AN ALPHA NUMERIC CODE GENERATED BY THE DIAKIN SYSTEM
(15) COOLING/HEATING/STANDBY MODE

PRELIMINARY ONLY
NOT FOR CONSTRUCTION


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RICHARD + WITTSCHIEBE

ASHRAE HEADQUARTERS
ADDITION AND RENOVATION



| | | |
|---|---|---|
| | 7/12/07 | Final System Design |

DRAWING TITLE:
**DAIKIN VRV SYSTEM SEQUENCE & POINTS LIST**

PROJECT NUMBER:
**200614**

DATE:
**6/15/07**

DRAWING NUMBER:
**M6.2**

1. BUILDING OCCUPANCY SCHEDULES:

A. Provide occupancy schedules for the area served by the ground loop heat pump system. The dedicated outside air system (DOAS) unit shall be independently scheduled for occupancy such that the operator can change the DOAS operating schedule independently of the associated zone/floor it serves.

B. The ground loop water pumps shall be operational when any heat pump is in the occupied mode.

C. The DDC System shall transition from scheduled unoccupied to occupied mode (morning warm-up/cool down) with optimized unit start-up to reach occupied setpoint at the start of occupied time, based on historical trended data, in a minimal amount of time, and stager start-up to prevent low/high loop water supply temperatures.

2. GROUND LOOP WATER LOOP CONTROL:

A. The DDC system shall maintain ground loop water supply (GLWS) setpoint for cooling and heating modes. The pumps shall be manually started and stopped from the HAND and OFF position of the HAND-OFF-AUTO switch on the variable frequency drive (VFD) and automatically started and stopped by the DDC system when the switch is in the AUTO position. All safety devices shall operate with the VFD in the HAND or AUTO position. DDC system shall monitor the HOA position and alarm if the switch is in the HAND or OFF position.

B. The lead ground loop water pump shall run during the occupied mode and the stand-by pump shall be off. The lead pump VFD shall modulate pump speed to maintain the loop differential setpoint (20 psi, adjustable). Failure of the lead pump or VFD failure, as sensed by loss of current or alarm contact, shall start the stand-by pump and activate a pump fail alarm. The lead pump shall be automatically alternated every 30 days (adjustable). On a loop dp sensor failure, the pupm shall continue to opeerate at it's current speed and an alarm shall be initiated.

C. TEMPERATURE/FLOW MONITORING. The BAS shall monitor the entering and leaving water temperatures of the ground loop water supply and return to the ground loop heat exchanger and to the connected building load (4 temperatures). DDC system shall measure ground loop water flow in GPM.

D. SELF-TEMPERING MODE: When GLWS is between 60°F (adjustable) and 80°F (adjustable), the ground loop heat exchanger shall be bypassed by opening the ground loop loop recirculation valve. The lead ground loop water pump shall continue to run during the occupied mode.

E. HEATING MODE: Upon a drop in the ground loop water supply (GLWS) temperature below 60°F (adjustable), the ground loop loop recirculation valve shall modulate from 100% open to 50% closed. The valve shall fully closed at GLWS temperatures below 55°F (adjustable). Upon a fall in GLWS temperature to 45°F, the BAS shall disable 4 heating mode GLHP's for 15 minutes (adjustable). If after these 15 minutes the GLWS is still below 45°F, a second group of 4 heating mode GLHP's shall be disabled for 15 minutes, with the process repeated for a third or fourth group until the TWS is above 45°F. A drop in the GLWS temperature below 40°F (adjustable) shall activate a low loop water temperature alarm.

F. COOLING MODE: Upon a rise in the ground loop water supply (GLWS) temperature above 80°F (adjustable), the ground loop loop recirculation valve shall modulate from 100% open to 50% closed. The valve shall fully closed at GLWS temperatures above 85°F (adjustable). A rise in the GLWS above 95°F (adjustable) shall activate a high loop water temperature alarm.

3. GROUND LOOP HEAT PUMP UNITS

A. The ground loop heat pumps are packaged premium efficiency units, that include a variable speed supply fan, and two-stage compressor. Each unit is controlled by the DDC system using electric actuation and is scheduled for automatic operation on a time of day basis. Occupied, Unoccupied and Safety modes are as follows:

B. Occupied:

a. The supply fan operates continuously without cycling. The units ECM fan motor speed is automatically adjusted to maintain constant cfm over the static operating range of the fan.

b. Zone space sensors provide feedback for maintaining the space temperature and humidity set points of 75°F/50%rh (adjustable) for cooling and 70°F (adjustable) for heating. Space temperature is controlled by the heat pump unitary controller based on requests for either cooling or heating from the DDC system as follows:

c. COOLING: Upon a rise in space temperature of 1.5°F above the cooling setpoint, the unitary controller shall register a demand for cooling and energize the first stage of cooling. Upon a further rise in space temperature 2.5°F or greater than the cooling setpoint, the unitary controller shall execute a call for second stage cooling. If conditions are being satisfied with first stage only, based on the Optimized Staging conclusion, second stage shall be delayed until conditions are no longer being maintained by first stage. Upon a decline in demand to 1.0°F of setpoint, second stage cooling shall be released. Upon a further decline in demand to 0.4°F of setpoint, first stage cooling shall be released.

d. HEATING: Upon a fall in space temperature of 1.5°F below the heating setpoint, the unitary controller shall register a call for first stage heating. Upon a further fall in space temperature of 2.5°F below the heating setpoint, the unitary controller shall execute a call for second stage heating. If conditions are being satisfied by first stage only based on the Optimized Staging conclusion, second stage shall be delayed until conditions are no longer being maintained by first stage. Upon a decline in demand to 1.0°F of the heating setpoint, second stage heating shall be released. Upon a further decline in demand to 0.4°F of the heating setpoint, first stage heating shall be released.

e. DEHUMIDIFICATION: If room humidity increases above 60% relative humidity (adjustable), the unit controller starts first stage cooling and reduces the supply fan airflow by 25% until the humidity is reduced to below set point.

f. Normally open ground loop water solenoid valve shall close when the compressor stops (both cooling and heating modes).

g. See Input/Output Summary for the various status inputs to be monitored.

C. Unoccupied:

a. If space temperature increases to 85°F (adjustable) or drops to 55°F (adjustable), the unit supply fan will cycle with operation of the respective cooling or heating sections until the space temperature is satisfied.

b. Upon activation of the override switch the DDC system shall change the system status to the occupied mode.

D. Safety:

a. The heat pumps are hard-wired from the factory with a 5-minute anti-short cycle delay timer for each compressor

b. Upon activation of the override switch the DDC system shall change the system status to the occupied mode.

c. A smoke detector in the supply duct will shut down the unit fan when activated (selected heat pumps).

d. Each heat pump equipped with a duct-mounted smoke detector shall be provided with a fire alarm shutdown (hardwired, no DDC processing) interlocked with the fire alarm system to shut down upon activation. Extend wiring from unit connection to fire alarm relay and coordinate final connection with fire alarm contractor.

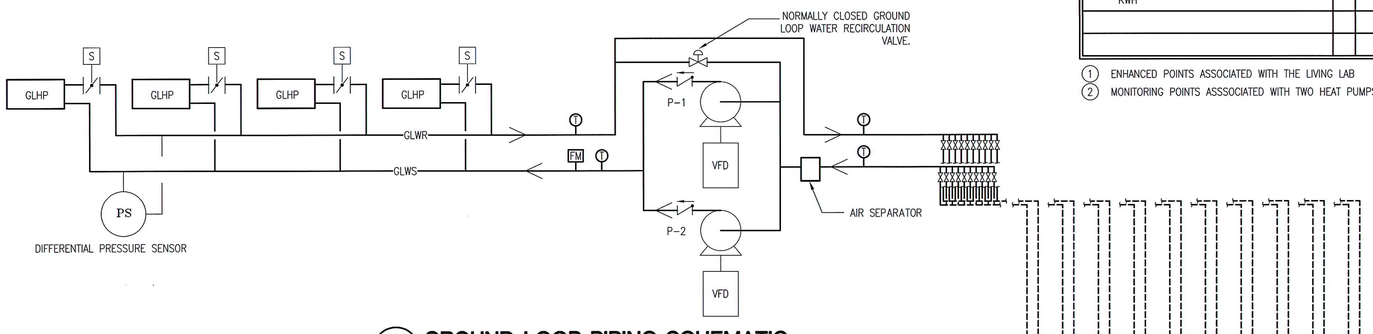
e. Activation of the Emergency Fan Stop switch shall stop all heat pump supply fans.

f. Activation of the overflow switch in the auxiliary drain pan shall stop the unit (where shown).

## INPUT/ OUTPUT SUMMARY

| | OUTPUTS | | | | | | INPUTS | | | | | | | | | | | | | SOFTWARE | | | | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DIGITAL | | | | ANALOG | | DIGITAL | | | | | ANALOG | | | | | | | | ALARM | | | ENERGY MANAGEMENT | | | |
| | START/STOP | OPEN/CLOSE | ENABLE/DISABLE | OCCUPIED/UNOCCUPIED | DDC MODULATION | SETPOINT ADJUST | DIFF. PRESS. SWITCH | CURRENT SWITCH | ON/OFF | OPEN/CLOSE CONTACT | MANUAL OVERRIDE | AIRFLOW (CFM) | STATIC PRESSURE | GPM | %SPEED/HZ/CURRENT | TEMPERATURE | HUMIDITY/DEWPOINT | POWER (AMPS/KW/KWH) | CO2 LEVEL (PPM) | DIFFERENTIAL PRESSURE | EQUIPMENT FAILURE | HI/LO LIMIT | TEMPERATURE | TIME SCHEDULE | RUN TIME | OVERRIDE PROGRAM | DAY/NIGHT SETBACK | |
| GROUND LOOP PLANT | | | | | | | | | | | | | | | | | | | | | | | X | | X | | |
| GROUND LOOP WATER SUPPLY PUMPS (VFD) | X | | | | | | | X | | | | | | | X | | | | | X | | | | X | | | TYPICAL OF 2 |
| SUPPLY PUMP VFD POSITION | | | | | | | | | | X | | | | | | | | | | X | | | | | | | TOTAL OF THREE POSITIONS |
| GROUND LOOP WATER DP SENSOR | | | | | | | | | | | | | | | | | | | X | X | | | | | | | |
| GROUND LOOP WATER RECIRCULATION VALVE | | | | | X | | | | | | | | | | | | | | | | | | | | | | |
| GROUND LOOP WATER SUPPLY TEMP. | | | | | | | | | | | | | | | | X | | | | | X | | | | | | GROUND LOOP & BUILDING LOOP |
| GROUND LOOP WATER RETURN TEMP. | | | | | | | | | | | | | | | | X | | | | | X | | | | | | GROUND LOOP & BUILDING LOOP |
| GROUND LOOP WATER FLOW | | | | | | | | | | | | | | | X | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUND LOOP HEAT PUMPS | X | | | | | | | | | | X | | | | | | | | | X | | | X | | X | | SEE PLANS FOR LOCATIONS |
| SPACE TEMPERATURE | | | | | | | | | | | | | | | | X | | | | | X | | | | | | SEE PLANS FOR LOCATIONS |
| SPACE HUMIDITY | | | | | | | | | | | | | | | | | X | | | | | | | | | | SEE PLANS FOR LOCATIONS |
| SPACE CO2 | | | | | | | | | | | | | | | | | | | X | | | | | | | | SEE PLANS FOR LOCATIONS |
| FAN OPERATION STATUS | | | | | | | | X | | X | | | | | | | | | | X | | | | | | | |
| OPERATION MODE STATUS | | | | | | | | | | X | | | | | | | | | | | | | | | | | COOLING/HEATING/FAN ONLY |
| REVERSING VALVE POSITION | | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| COMPRESSOR OPERATION COMMAND | | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| DISCHARGE AIR TEMPERATURE | | | | | | | | | | | | | | | | X | | | | | X | | | | | | |
| RETURN AIR TEMPERTURE | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| MIXED AIR TEMPERATURE | | | | | | | | | | | | | | | | X | | | | | | | | | | | DOWNSTREAM OF O.A. TIE-IN |
| COOLING STAGES | | | X | | | | | | | | | | | | | | | | | | | | | | | | 2 STAGES |
| HEATING STAGES | | | X | | | | | | | | | | | | | | | | | | | | | | | | 2 STAGES |
| GROUND LOOP WATER SOLENOID VALVE | | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONDENSATE OVERFLOW ALARM | | | | | | | | | | X | | | | | | | | | | X | | | | | | | |
| AIR FILTER DIFFERENTAL PRESSURE | | | | | | | | | | | | | | | | | | | X | | X | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUND LOOP HEAT PUMPS ENCHANCED POINTS | | | | | | | | | | | | | | | | | | | | | | | | | | | (1) (2) |
| DISCHARGE AIR HUMIDITY | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| RETURN AIR HUMIDITY | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| MIXED AIR HUMIDITY | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| OUTSIDE AIR HUMIDITY | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| WATER FLOW | | | | | | | | | | | | | | | X | | | | | | | | | | | | |
| EWT | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| LWT | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| DISCHARGE AIRFLOW | | | | | | | | | | | | X | | | | | | | | | | | | | | | |
| RETURN AIRFLOW | | | | | | | | | | | | X | | | | | | | | | | | | | | | |
| OUTSIDE AIRFLOW | | | | | | | | | | | | X | | | | | | | | | | | | | | | |
| MIXED AIRFLOW | | | | | | | | | | | | X | | | | | | | | | | | | | | | |
| OUTSIDE AIRFLOW | | | | | | | | | | | | X | | | | | | | | | | | | | | | |
| AMPS | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| KWH | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |

(1) ENHANCED POINTS ASSOCIATED WITH THE LIVING LAB
(2) MONITORING POINTS ASSSOCIATED WITH TWO HEAT PUMPS SERVING THE SECOND FLOOR




1 M-6.3 **GROUND LOOP PIPING SCHEMATIC**
SCALE: NO SCALE

PRELIMINARY ONLY NOT FOR CONSTRUCTION

RICHARD + WITTSCHIEBE

# ASHRAE HEADQUARTERS
ADDITION AND RENOVATION



| | | |
|---|---|---|
| | 7/12/07 | Final System Design |

DRAWING TITLE:
**GROUND LOOP HEAT PUMP SEQUENCE & POINTS LIST**

PROJECT NUMBER:
**200614**

DATE:
**6/15/07**

DRAWING NUMBER:
**M6.3**

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LIGHTING

1. DDC system shall turn lights on/off based on the zoning floor plans, see sheet M6.4A and M6.4B. Lights shall be enabled and disabled base on a time schedule designated by the owner. During unoccupied hours lights can be overridden by the momentary light switch. All lights shall be turned off by the DDC system every 2 hours during the unoccupied mode.

2. The light on the exterior zone shall be turned off based input from the photo cell. Lights shall be zoned per the electrical drawings.

3. The lighting zones controlled by occupany sensors will have no DDC interface.

ENERGY CONSUMPTION

1. DDC system shall monitor and calculate electrical energy usage for each of the three main hvac systems: ground loop heat pump system serving the second floor, the variable refrigerant volume system (Diakin) serving the first floor and the outside air heat recovery system. DDC shall calculate energy use for the doas system a as whole. DDC system shall proportion energy use to each of the systems serving first floor and second floor based on airflows summarized from the vav's supplying outside airflow to the heat pumps or dx fan coils.

2. DDC system shall monitor and calculate electrical energy usage for each floor of the building.

3. DDC system shall monitor and calculate electrical energy usage for the domestic water system including the water heater and circulating pump.

4. DDC system shall monitor and calculate total building electrical energy useage.

WEATHER STATION

The on-site weather station shall have a serial interface to the ddc system. all points listed shall be monitored with log trending and all points hall be stored once at the top of the hour for a one year time period.

PDK WEATHER STATION

The DDC system shall monitor and trend points listed via the internet.

EMERGENCY STOP SWITCH

Provide wall mounted emergency stop switch, located as shown on the plans, to shut down all air moving equipment (all ahu's, fan coils, exhaust fans, etc.) upon activation.

FIRE ALARM SYSTEM

Provide fire alarm interlock with the fire alarm system to shut down all air handling units upon activation.

OUTDOOR AIR CONDITIONS

DDC system shall monitor outdoor temperature, pressure, CO2 levels and relative humidity independent of the weather station.

| INPUT/ OUTPUT SUMMARY | OUTPUTS: DIGITAL: START/STOP | OUTPUTS: DIGITAL: OPEN/CLOSE | OUTPUTS: DIGITAL: ENABLE/DISABLE | OUTPUTS: DIGITAL: OCCUPIED/UNOCCUPIED | OUTPUTS: ANALOG: DDC MODULATION | OUTPUTS: ANALOG: SETPOINT ADJUST | INPUTS: DIGITAL: DIFF. PRESS. SWITCH | INPUTS: DIGITAL: CURRENT SWITCH | INPUTS: DIGITAL: ON/OFF | INPUTS: DIGITAL: OPEN/CLOSE CONTACT | INPUTS: DIGITAL: MANUAL OVERRIDE | INPUTS: ANALOG: AIRFLOW (CFM) | INPUTS: ANALOG: STATIC PRESSURE | INPUTS: ANALOG: GPM | INPUTS: ANALOG: %SPEED/HZ/CURRENT | INPUTS: ANALOG: TEMPERATURE | INPUTS: ANALOG: HUMIDITY/DEWPOINT | INPUTS: ANALOG: POWER (AMPS/KW/KWH) | INPUTS: ANALOG: CO2 LEVEL (PPM) | INPUTS: ANALOG: DIFFERENTIAL PRESSURE | INPUTS: ANALOG: KWH/AMPS | SOFTWARE: ALARM: EQUIPMENT FAILURE | SOFTWARE: ALARM: HI/LO LIMIT | SOFTWARE: ENERGY MANAGEMENT: TEMPERATURE | SOFTWARE: ENERGY MANAGEMENT: TIME SCHEDULE | SOFTWARE: ENERGY MANAGEMENT: RUN TIME | SOFTWARE: ENERGY MANAGEMENT: OVERRIDE PROGRAM | SOFTWARE: ENERGY MANAGEMENT: DAY/NIGHT SETBACK | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LIGHTING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OCCUPANCY SENSOR | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | |
| PHOTOCELL | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | |
| FULL LIGHTING | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PARTIAL LIGHTING | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DOMECTIC WATER HEATER | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DOMECTIC WATER CIRC. PUMP | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ELECTRICAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HEAT PUMP SYSTEM KWH | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| VRV SYSTEM KWH | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| ODAS SYSTEM KWH | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| FIRST FLOOR LIGHTING KWH | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| SECOND FLOOR LIGHTING KWH | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| DOMESTIC WATER HEATER & PUMP | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| TOTAL BUILDING ENERGY | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| FIRST FLOOR PLUG LOADS | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| SECOND FLOOR PLUG LOADS | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WEATHER STATION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (1) |
| WIND DIRECTION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | AS REPORTED |
| WIND SPEED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | AS REPORTED |
| OUTDOOR TEMPERATURE | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | AS REPORTED |
| DEW POINT | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | AS REPORTED |
| RELATIVE HUMIDITY | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | AS REPORTED |
| BAROMETRIC PRESSURE | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | AS REPORTED |
| SOLAR RADIATION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | AS REPORTED |
| UV RADIATION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | AS REPORTED |
| BACKGROUND LUMINANCE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | AS REPORTED |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PDK WEATHER STATION INFORMATION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (2) |
| WIND DIRECTION AND SPEED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | AS REPORTED |
| VISIBILITY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | AS REPORTED |
| SKY CONDITIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | AS REPORTED |
| WEATHER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | AS REPORTED |
| TEMPERATURE | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | AS REPORTED |
| DEW POINT | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | AS REPORTED |
| RELATIVE HUMIDITY | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | AS REPORTED |
| PRESURE | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | AS REPORTED |
| MAX AND MIN TELPERATURES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | PAST 6 HOURS |
| MAX AND MIN TEMPERATURES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | PAST 24 HOURS |
| 24 HOUR SUMMARY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | PAST 24 HOURS |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | (3) |
| EMERGENCY STOP SWITCH | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FIRE ALARM | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OUTSIDE AIR TEMPERATURE | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| OUTSIDE AIR PRESSURE | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | |
| OUTSIDE AIR CO2 | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | |
| OUTSIDE AIR HUMIDITY | | | | | | | | | | | | | | | | | | X | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

(1) WEATHER STATION PROVIDE BY CONTRACTOR AND INSTALLED AS SHOWN ON THE PLANS
(2) PEACHTREE DEKALB AIRPORT WEATHER STATION DATA GATHERED THROUGH AN INTERNET INTERFACE AND REPORTED THROUGH THE DDC SYSTEM
(3) 24 HOUR SUMMARY INCLUDES TIME, TEMPERATURE, DEW POINT, PRESSURE, WIND (DIRECTION AND MPH), AND WEATHER

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

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Norcross, Georgia 30092
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visit us at www.jsace.com


RICHARD + WITTSCHIEBE

# ASHRAE HEADQUARTERS
ADDITION AND RENOVATION



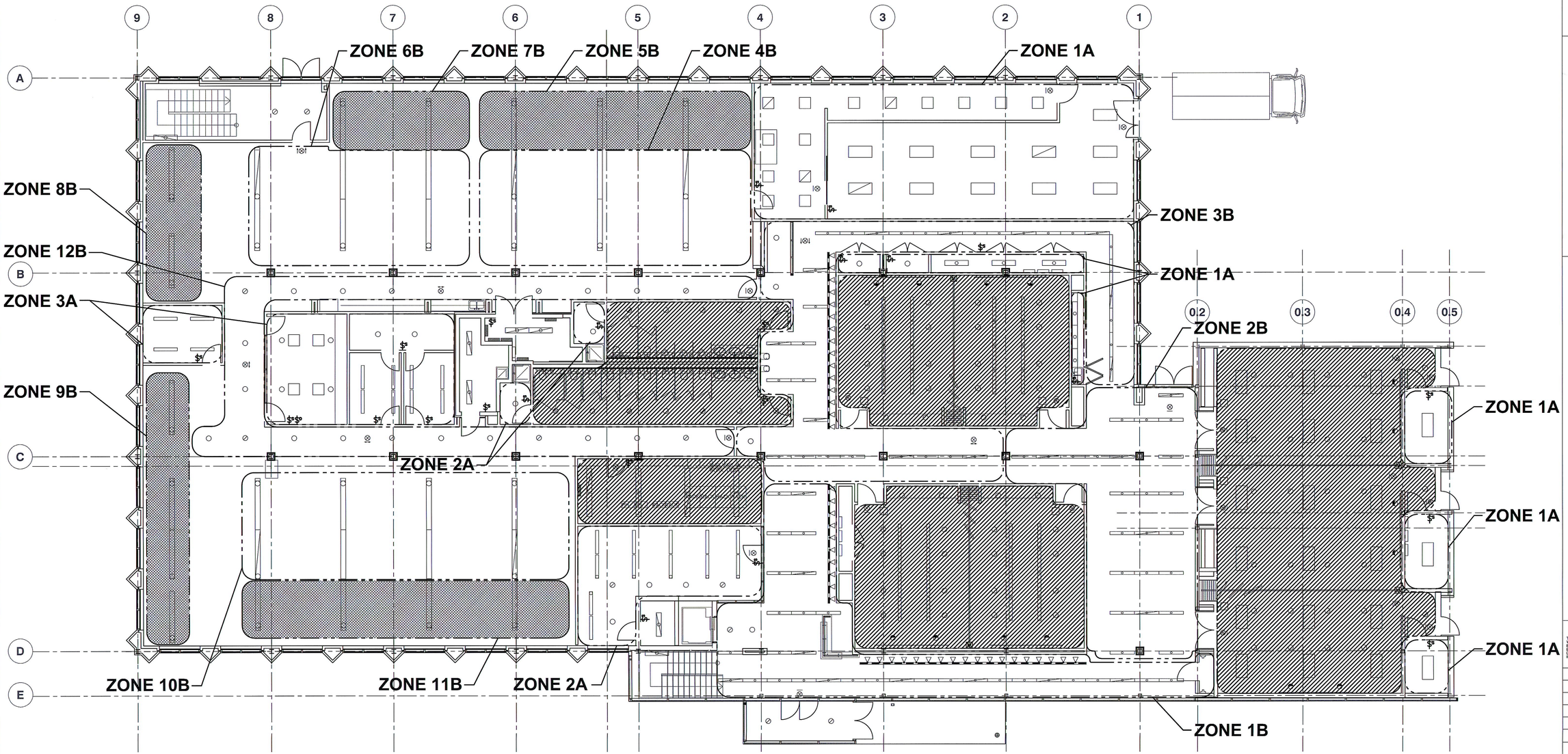
| | | |
|---|---|---|
| | 7/12/07 | GMP System Design |

DRAWING TITLE:
**MISCELLANEOUS SEQUENCES & POINTS LISTS**

PROJECT NUMBER:
**200614**

DATE:
**6/15/07**

DRAWING NUMBER:
**M6.4**




## ZONING LEGEND (THIS SHEET ONLY)

PHOTOCELL CONTROLLED ZONES

OCCUPANCY SENSOR CONTROLED

SWEEP SWITCH CONTROLED (SWEEP OFF EVER 2 HOURS AFTER CLOSE OF BUISNESS)
- –ZONE 1A
- –ZONE 2A
- –ZONE 3A

OPEN OFFICE WITH MANUAL OVERRIDE
(SWEEP OFF ONLY AFTER CLOSE OF BUISNESS AND 2 HOURS AFTER OVERRIDE)
- –ZONE 1B
- –ZONE 2B
- –ZONE 3B
- –ZONE 4B
- –ZONE 5B (PHOTOCELL CONTROLLED)
- –ZONE 6B
- –ZONE 7B (PHOTOCELL CONTROLLED)
- –ZONE 8B (PHOTOCELL CONTROLLED)
- –ZONE 9B (PHOTOCELL CONTROLLED)
- –ZONE 10B
- –ZONE 11B (PHOTOCELL CONTROLLED)
- –ZONE 12B

N

## LEVEL 1 - LIGHTING ZONING PLAN

SCALE: 1/8 " = 1'–0"

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# ASHRAE HEADQUARTERS
ADDITION AND RENOVATION



| | |
|---|---|
| 7/12/07 | Final System Design |

DRAWING TITLE:

LEVEL 1 LIGHTING ZONING PLAN

PROJECT NUMBER:

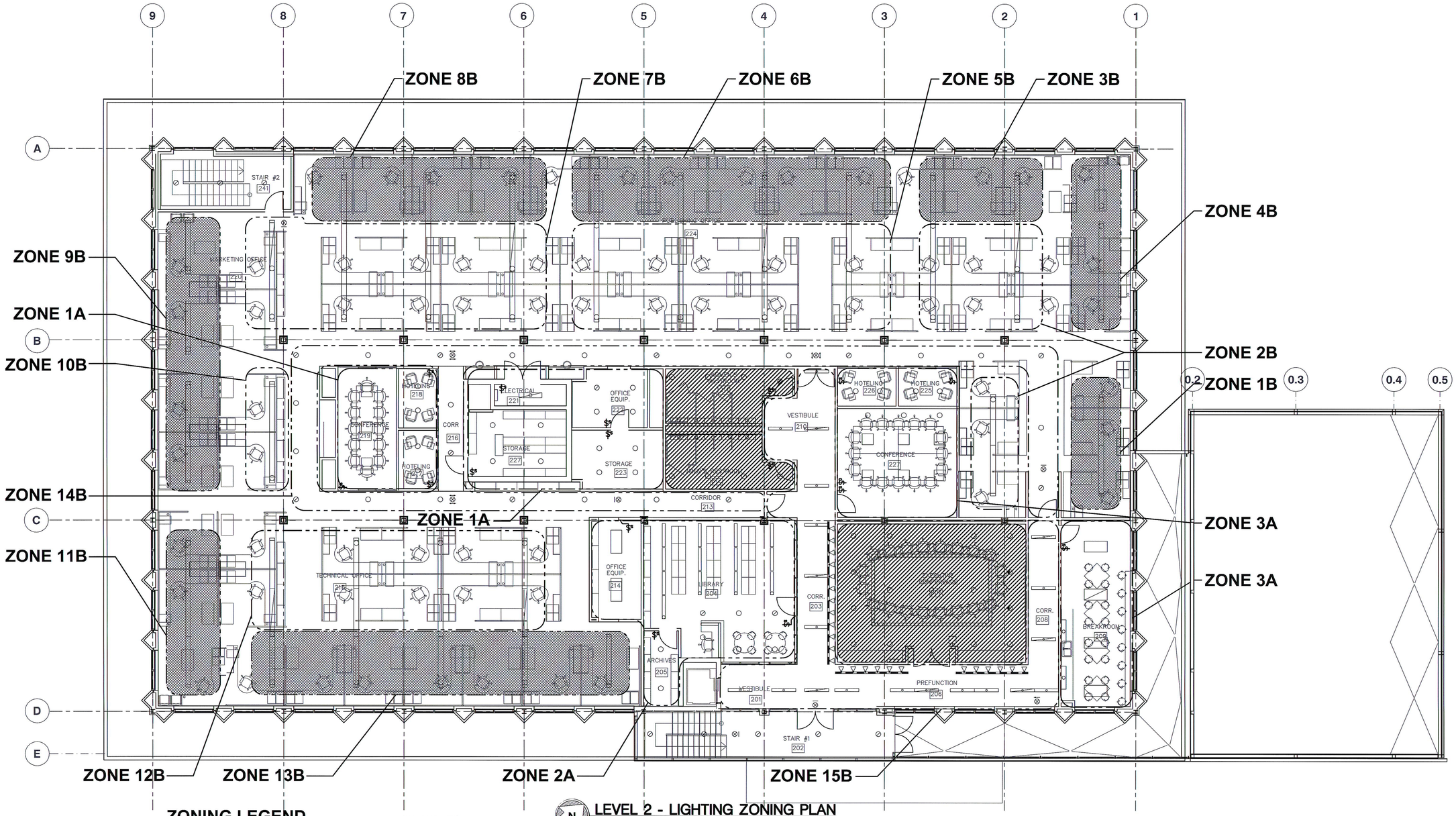
200614

DATE:

6/15/07

DRAWING NUMBER:

M6.4A




N

## LEVEL 2 - LIGHTING ZONING PLAN

SCALE: 1/8 " = 1'-0"

## ZONING LEGEND (THIS SHEET ONLY)

PHOTOCELL CONTROLLED ZONES

OCCUPANCY SENSOR CONTROLED

SWEEP SWITCH CONTROLED (SWEEP OFF EVER 2 HOURS AFTER CLOSE OF BUISNESS)
- –ZONE 1A
- –ZONE 2A
- –ZONE 3A

OPEN OFFICE WITH MANUAL OVERRIDE
(SWEEP OFF ONLY AFTER CLOSE OF BUISNESS AND 2 HOURS AFTER OVERRIDE)
- –ZONE 1B (PHOTOCELL CONTROLLED)
- –ZONE 2B
- –ZONE 3B (PHOTOCELL CONTROLLED)
- –ZONE 4B (PHOTOCELL CONTROLLED)
- –ZONE 5B
- –ZONE 6B (PHOTOCELL CONTROLLED)
- –ZONE 7B
- –ZONE 8B (PHOTOCELL CONTROLLED)
- –ZONE 9B (PHOTOCELL CONTROLLED)
- –ZONE 10B
- –ZONE 11B (PHOTOCELL CONTROLLED)
- –ZONE 12B
- –ZONE 13B (PHOTOCELL CONTROLLED)
- –ZONE 14B
- –ZONE 15B

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# ASHRAE HEADQUARTERS ADDITION



| | |
|---|---|
| 7/12/07 | Final System Design |

DRAWING TITLE:
LEVEL 2 LIGHTING ZONING PLAN

PROJECT NUMBER:
200614

DATE:
6/15/07

DRAWING NUMBER:
M6.4B